Institutional, Socio-Cultural and Technical challenges to Digital Health Literacy among Universities’ Students

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Declaration

It is here by declared that the dissertation on the topic “Institutional, Socio-Cultural and Technical challenges to Digital Health Literacy among Universities’ Students” is the requirement for the completion of PhD degree. It is declared that it is the original work of the undersigned. I performed it under the supervision of Prof. Dr. Muhammad Zakria Zakar (Chairman Institute of Social and Cultural Studies, Dean of Social Sciences, University of the Punjab). Nobody is allowed to use the data, content and material without the prior permission of the writer.

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<th>Description</th>
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<td>BBH</td>
<td>Benazir Bhutto Hospital</td>
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<td>BHU</td>
<td>Basic Health Unit</td>
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<td>BP</td>
<td>Blood Pressure</td>
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<tr>
<td>Bs</td>
<td>Bachelor of Science</td>
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<td>DF</td>
<td>Degree of Freedom</td>
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<td>DHQ</td>
<td>District Headquarter</td>
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<tr>
<td>DHL</td>
<td>Digital Health Literacy</td>
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<tr>
<td>DV</td>
<td>Dependent Variable</td>
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<td>eHAP</td>
<td>Digital Health Association of Pakistan</td>
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<tr>
<td>Ehealth</td>
<td>Electronic Health</td>
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<td>EHM</td>
<td>Electronic Health Management</td>
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<tr>
<td>EHR</td>
<td>Electronic Health Record</td>
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<tr>
<td>FGD</td>
<td>Focus Group Discussion</td>
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<td>GC</td>
<td>Government College</td>
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<td>GDP</td>
<td>Gross Domestic Product</td>
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<tr>
<td>GP</td>
<td>General Practitioner</td>
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<tr>
<td>HEC</td>
<td>Higher Education Commission</td>
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<tr>
<td>HIT</td>
<td>Health Information Technology</td>
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<tr>
<td>HKM</td>
<td>Health Knowledge Management</td>
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<tr>
<td>HMIS</td>
<td>Health Management Information System</td>
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<tr>
<td>Ho</td>
<td>Null Hypothesis</td>
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<td>HOPE</td>
<td>Health Oriented Preventive Education</td>
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<td>H1</td>
<td>Alternative Hypothesis</td>
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<td>ICT</td>
<td>Information and Communication Technology</td>
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<td>IV</td>
<td>Independent Variable</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>KPK</td>
<td>Khaibar Pakhtun Khaw</td>
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<tr>
<td>LHV</td>
<td>Lady Health Visitor</td>
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<tr>
<td>LHW</td>
<td>Lady Health Worker</td>
</tr>
<tr>
<td>M.A.</td>
<td>Masters of Arts</td>
</tr>
<tr>
<td>MBBS</td>
<td>Bachelor of Medicine, Bachelor of Surgery</td>
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<tr>
<td>MOH</td>
<td>Ministry of Health</td>
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<tr>
<td>Ms</td>
<td>Masters of Science</td>
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<tr>
<td>N</td>
<td>Population Size</td>
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<tr>
<td>n</td>
<td>Sample Size</td>
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<tr>
<td>PBUH</td>
<td>Peace Be Upon Him</td>
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<tr>
<td>PC</td>
<td>Personal Computer</td>
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<tr>
<td>PEOU</td>
<td>Perceived Ease of Use</td>
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<td>PhD</td>
<td>Doctorate of Philosophy</td>
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<tr>
<td>PU</td>
<td>Perceived Usefulness</td>
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<td>RHC</td>
<td>Rural Health Centre</td>
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<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
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<td>TAM</td>
<td>Technology Acceptance Model</td>
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<td>TB</td>
<td>Tuberculosis</td>
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<tr>
<td>THQ</td>
<td>Tehsil Headquarters</td>
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<td>TV</td>
<td>Television</td>
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<tr>
<td>UK</td>
<td>United Kingdom</td>
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<td>UNICEF</td>
<td>United Nations Children's Fund</td>
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<td>USA</td>
<td>United States of America</td>
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<tr>
<td>VIP</td>
<td>Very important Personality</td>
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<td>VU</td>
<td>Virtual University</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WTDC</td>
<td>World Telecommunication Development Conference</td>
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Abstract

The present study is an effort to probe into different kinds of institutional, socio-cultural and technical challenges to digital health literacy. Technology Acceptance Model (TAM) by Davis (1985) was used as grounded theory that depicted that technology usage was affected by Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). This study included different objectives and tried to explore different factors, causing as barriers to digital health literacy. Qualitative portion of the research tried to answer to overcome the challenges identified.

The research, which was conducted in 16 Higher Education Commission (HEC), Pakistan’s recognized universities in Lahore, used mixed research method. Both male and female students ranging from Bs programs to PhD programs were the focus of the research. Quantitative data was collected through survey method using stratified random sampling as there were different kinds of strata in population i.e. general universities, health sciences universities, engineering universities and animal sciences universities. The research encompassed a total of 89664 students in 16 universities, from which sample size (1513) was drawn through research advisor table (2006). Proportional allocation formula was used to specify the number of respondents from each university. Non-parametric statistics was used since data was not normal. Kruskal-Wallis H test and Mann-Whitney U test were applied to measure the difference of effect of groups of independent variable on the dependent variable. For qualitative portion eight Focus Group Discussions (FGDs) and eight in-depth interviews were conducted, each and every FGD was including six students who were randomly selected.

Results of quantitative portion depicted that belonging to different types of institutions, age groups, and levels of educations etc. were differently affecting the level of usage and that of expertise in digital health literacy among university students. Results of qualitative portion elaborated different kinds of health information sources among university students i.e. doctors’ advice, media, internet and seminars and so on so forth. Different themes, considered as barrier to digital health literacy, were also drawn, whilst different kinds of solutions to overcome the barriers were also explored through FGDs.
1. Introduction

Digital health literacy refers to the aptitude of a person to use electronic resources e.g. computers, T.V, multimedia, mobile phones and other electronic resources to search and find out health related information e.g. health tips, different diseases, variety of physical exercises and information on diets etc. (Norman et. al., 2006). Accessing health information through digital resources is grounded with certain basic abilities. If a person wants to get health information through electronic resources, he/she must have knowledge of certain literacy. Traditional literacy (ability of a person to read and write), health literacy (ability to search, find out and use health related information through different information sources), information literacy (where is the need of information, how to use it, for what purpose it should be used?), scientific literacy (ability of using science based concepts for decision making, getting knowledge and solving the problem), media literacy (ability of analyzing, accessing and creation of messages in different forms) and computer literacy (ability to get benefit from computers and other related technologies) (Norman et al, 2006). Expertise in these six aspects (traditional, health, information, media, scientific, and computer literacy) would make an individual capable to conduct searches at primary and advanced levels, differentiate between authoritative and bogus information tools, and using pertinent websites etc. (Norman et al, 2006). As a matter of fact there is enough fake, bogus, and irrelevant information on internet; many websites are editable on the internet (Flanagin et al. 2000). There are certain discussion blogs, on which every person can comment. So, there are greater chances of fake knowledge (Flanagin et al. 2000). Same is the situation with health literacy. There are number of websites, articles, journals, blogs and other sources connected to health information. A lay person can get access to erroneous information about health which may cause negative effects on his/ her health (Cline et al. 2001). So, Norman and Skinner (2006) have depicted the above mentioned six competencies. An individual having good exposure to the above cited competencies can get access to pertinent, reliable and scientific information relating digital health literacy.
Now, access to and availability of computers, internet and other ICTs are there among developed countries while developing countries are also trying to make investments in this field (Kozma et al. 2014). Now, almost, every country institutions have access to technologies, but how to create a difference between primary and secondary sources of information is a major question. Same situations and challenges are being faced by digital health literacy. There are certain authentic health information sources e.g. government agencies (National Health Institute, Health Canada, Centre for Control and Prevention of Disease) and medical enterprises (Medical Association of Canada, WebMD, Mayo Clinic). Such agencies and government organization are a symbol of authentic health information (Kozma et al. 2014).

From the studies, it is evident that digital health may further be divided into different types. These may also be the advantages and usages of technology in health literacy. Internet and ICTs can be used for solving many health problems. Electronic Health Records (EHR) can preserve patients record for doctors (Baudendistel et al. 2015), and eprescribing facilitates the doctors to give printed prescription to patients as well as pharmacies (Hack et al. 2014). Similarly, Health Knowledge Management (HKM) provides the latest updates to doctors and patients in field of medicine and health (Hume et al. 2014). Telemedicine gives the facility of distance health to patients (Frederick 2013) and mhealth increases the usage of mobile phones in collecting patients’ data (Kay et al. 2011).
The focus of the present research was the university students. Students of universities have been taken for this research, as they have accessibility, availability of ICT resources at their educational institutions. Then the university students have good expertise in operating ICT resources for searching information on different topics (Heuberger 2011).

Then university students have better skills, abilities, knowledge and understanding level. The students also meet the criteria of six competencies pointed out by Norman et al. (2006) i.e. scientific literacy, traditional literacy, health literacy, information literacy, computer literacy and media literacy. Knowledge of mentioned competencies results into increased level of digital health literacy (Norman et al. 2006).

University students, at a larger scenario, belong to youth segment. According to Pew Internet and American life Project (“Using Internet”, 2016), ten out of hundred persons in the world are using internets. Among these ten users, seven belong to the category of youth. According to the ministry of youth affairs, Pakistan (“Youth Ministry”, 2015), individuals having age from 15 to 29 years, fall under the definition of youth. According to the same ministry, youth was 27 percent of the whole population of the country in 2011, while in 2013 it increased up to 35 percent of the total population which shows that majority of Pakistani population is youth. Universities have majority of youth segment (from 15-29 years). Then according to UNICEF (2013) literacy rate of males (15-24 years old) is 79.1 percent and 64.5 percent in females, which shows that youth has good literacy rate. As compare to youth segment, older adults have little access to, knowledge about and availability of internet usage. According
to Campbell et al. (2005), there are certain proficiency related challenges among the older adults. Because of these reasons, the focus of the study was the university students.

Regardless of advantages, there are certain hurdles and challenges in successful implementation of digital health literacy. These challenges vary from region to region and country to country (Norman et al. 2006).

These challenges may be, inequality in access, (Yu 2006), poor web access to mobile phones (Hauge et. al., 2008), gap in proficiency of technology usage and less understanding of new diffused technologies (Yu 2006). While Chu et al. (2007) elaborated that less confidence in using computer, feeling anxiety with computer usage, and fewer abilities in computer usage in older adults, are some great hurdles in the successful implementation of digital health literacy.

1.1. Digital Health Literacy in Pakistan

Pakistan falls under the definition of lower middle class countries according to the analysis of world Band income groups. In Pakistan life expectancy at birth is 63 years (“Demographics”, 2016). According to World Health Organization (WHO, 2009) Pakistan spends 2.9 percent of Grand Domestic Product (GDP) on health every year. The number of Pakistan is at 128 in the ranking of ICT Development Index. In Pakistan 11.30 individuals are using internet from every 100 individuals of the total population.

Like many other nations in the world, Pakistan had also made struggle to introduce technology in health literacy but is facing huge problems in its successful implementation because of diverse cultural patterns and low literacy rate (Mumtaz et al. 2014). The constitution of Pakistan directs that health is the basic right of every citizen of Pakistan, but lack of health budget, limited access to technology and gap of technology in rural and urban areas are some main hurdles in technology implementation in this sector. Country policy makers have come to conclusion that to address some major health issues, eHealth resources utilization is dire needed. (Khoja et al.2008). The major work done relating to eHealth in Pakistan was the creation of digital health association of Pakistan (e-HAP) in 2009, established by one of the proposal from the Rockefeller conference in Bellagio (Ali 2013). Creation of this association was a joint effort of different officials of government, faculty members of different universities in Pakistan, different NGOs and other institutions working mainly in telemedicine. The major aim of e-HAP was to
co-ordinate between different stake holders of eHealth, and to create general awareness among mass population regarding the advantages of digital health literacy (Ali, 2013).

e-HAP suggested that digital health is cheaper enough that a country like Pakistan (lower-middle income group) must take advantages of this facility. Dr. Haroon Khan, the president of e-HAP Pakistan, elaborates that in Pakistan, only 27 percent of the total population is enjoying full health facilities, while the other 73 percent have much economic issues. If they spend on health, then they had to suffer budget problem in other necessities of life. While health situation in Pakistan is much drastic, as 94 out of 1000 children die before reaching the age of five years, 61 percent women could not get trained birth attendances, 40 percent of women could not get pre-natal care, while there is one doctor for every 11327 individuals in Pakistan (“e-HAP”, 2015).

While keeping in mind such type of frightening situation, there should be a health system which should be cheaper and easily accessible. So, digital health literacy may fulfill the desired goals. Here is an example from two of the hospitals in Pakistan, PIMS (Pakistan Institute of Medical Sciences) and Benazir Bhutto Hospital (BBH). In PIMS, there is computerized system to evaluate the laboratory tests of patients, while same tests are manually manipulated in BBH. But there is difference in cost of each laboratory test.

**Cost per 100 tests in USD** (“e-HAP”, 2015)

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<tr>
<th>Test</th>
<th>BBH</th>
<th>PIMS</th>
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<tbody>
<tr>
<td>Urine R/E</td>
<td>30.64</td>
<td>27.59</td>
</tr>
<tr>
<td>Glucose</td>
<td>29.96</td>
<td>15.21</td>
</tr>
<tr>
<td>CBC</td>
<td>26.70</td>
<td>24.84</td>
</tr>
<tr>
<td>Blood Urea</td>
<td>14.74</td>
<td>13.67</td>
</tr>
</tbody>
</table>

*Figure 1.3 - : Benazir Bhutto Hospital (Manual) and Pakistan Institute of Medical Sciences (computerized)*

The above mentioned situation is depicting that digital health access can decrease the expenditures in health. Such cost management may be very fruitful for a country like Pakistan. Its advantages can be increased by inculcating awareness among mass population of Pakistan.
1.2. Significance
Digital health literacy is emerging as an important concept, which can result into grand positive changing in health institution. It was adopted by developed countries first, and now developing countries are also making struggles to adopt it. According to pew internet and American life project, the population growth of the world is increasing at the speed of 1.4 percent every year, while the users of technology are getting growth at the speed of 7.9 percent every year, which means that using technology is becoming a preferred source of getting information (“Using Internet”, 2016). So, it can be easy to integrate it into health education.

The advantages of digital health literacy can be categorized in terms of easy to access, low in cost, quick in results and secure for patients’ privacy (DeMonte et al. 2015). According to survey reports, 81 percent adults of United States of America (USA) use the internet, from which 59 percent have gone to search health related webs or tools (Pew internet and American life project). The usage of mobile phones is also increasing throughout the world at a larger speed, and is also being used to get health related information in different countries. According to the report of pew internet, 52% percent smart mobile phone owners had searched for health information through their mobiles for more than one time.

Then eHealth can save expenditures of patients and a society as well (DeMonte et al. 2015). According to e-HAP, the population of country is increasing at a rapid speed while the budget is very low, which has led to far more challenges to fulfill the health needs of the society. According to Koh et al. (2012) a society can save 73 billion USD annually through using digital health. Even the history of eHealth also shows that this program was introduced to meet the needs of developing countries. In 1994, world Tele Communication Development Conference (WTDC), proposed to use ICTs to improve the health condition of developing countries, as it will result in reducing expenditures (Radu et al. 2014). Then in 2005 WHO strongly recommended to start digital health literacy programs to reduce the costs of expensive medical systems. Integration of electronic resources in medical system can result into the cost of installation and maintenance of technologies, but this will not hamper the cost saving effect of digital health (“eHealth”, 2015).

1.3. Theoretical Framework
The process of implementation of technology into different fields is much expensive and very difficult, but implementation can result into greater significance in almost all fields (Alam et al. 2009). Since seventies, many researches focused upon the integration of technology and its importance. The researches tried to create positive perceptions relating usage of technology. At the beginning such types of researches make extensive studies to search out the factors that facilitate the technology usage (Usluelet al. 2008). Researchers presented many factors but they were of little use. Still, there was a dire need of model that can group different factors of technology usage.

In 1985, Technology Acceptance Model (TAM) was introduced by Fred Davis. This model depicted the factors that can influence the technology acceptance. There were two main groups i.e. Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). According to Davis (1985), both groups result into positive attitude towards technology acceptance. But a question arise here, how to measure PEOU and PU? Davis in his model used different type of questions and items to measure the PEOU and PU. According to him PEOU can be measured by certain items:

i. Learning through any technology is very easy for me.

ii. It is easy to do my desired work by using technology.

iii. Applications of computer are not difficult to understand.

iv. Computer applications are flexible to interact with etc.

In the same manner, Davis also elaborated the factors, which are supportive in measuring PU of technology. These are as follows:

i. Productivity is increased by using some technology.

ii. Performance increases by the increasing level of technology usage.

iii. Performance goes on its peak by using technology in work.

iv. Technology usage enhances effectiveness.

v. Technology usage provides a useful role during job.
vi. Quality of work is improved by using technology.

vii. A person can get well control over his work with the help of technology etc.

All these factors can measure the perceived ease of use (PEOU) and perceived usefulness (PU) of technology.

![Figure 1.4 - Attitude towards Technology Usage](image)

In the present research Technology Acceptance Model (TAM) has been taken as grounded theory. The present study reveals that university students have certain type of challenges in using digital technology while seeking health information. On internet, there is lot of health information. Students, like other general members of society also suffer different types of diseases, but they confront many challenges relating digital health literacy. The research further elaborated the view that digital health literacy is lacking among university students. This research is going to use TAM model to observe, whether PEOU and PU are playing vital role for creating positive attitude towards technology acceptance or not? The research has used certain new indicators to measure PEOU and PU of technology. Certain other measuring elements have been included while operationalizing PEOU and PU. PEOU is measured through the indicators e.g. availability of technological resources in university, accessibility of technology, technological
support from the institution, efficiency of computer labs of the university, provision of enough financial resources and administrative support from the institution. Certain indicators are used to measure the PEOU of the university students relating usage of digital health literacy. Likewise, PU is measured through different indicators i.e. presence of health information, knowledge about illness, presence of data relating pain, provision of access to doctors, knowledge about the symptoms of different diseases, help in medication, guidance relating dieting plan, and awareness about different physical exercises etc. All these elements determine the usefulness of technology.

![Diagram of Perceived Ease of Use (PEOU) and Perceived Usefulness (PU)](image)

**Figure 1.5- Operationalization of Perceived Ease of Use (PEOU) and Perceived Usefulness (PU)**

The current research is an effort to probe into different challenges to digital health literacy among students. The researcher had categorized three different types of challenges creating hurdles in the successful implementation of technology into seeking health i.e. institutional, socio cultural and technical challenges. All the three terms (institutional, socio
cultural and technical challenges) are very deep and vast in their meanings and scope. The researcher made operational definitions to make them simple. According to the operational definition the institutional challenges include lack of availability and accessibility of ICT resources, technical support, efficient labs, enough financial resources, and administrative support. If there is lack of these things, then there will be institutional barriers. While the operational definition of socio cultural aspect includes the level of education, level of age, category of gender, institution type (i.e. engineering, health sciences, animal sciences and general universities), and level of time spent on computer. Likewise, technical challenges will include lack of guidance, difficult to get health information, difficult to implement, lack of training, poor performance of technology in health, cost of technology, lack of new health information and threat to privacy.

1.4.Objectives

There are three main objectives of the study.

I. To trace institutional challenges (availability, accessibility, technical and administrative support) and their relation with digital health literacy.

II. To trace socio-cultural limitations in digital health literacy among university students.

III. To probe the technological barriers related to digital health literacy among university students.

Qualitative portion of the research tried to meet the following objectives:

I. To trace out different sources of health information.

II. To explore why people are not using digital health literacy?

III. To explore some suggestions from the respondents to improve digital health literacy.
1.5. Conceptual Framework

For the conceptual framework of the present study, the variables are divided into two categories i.e. independent variables and dependent variables. Independent variables are those which cause change to the dependent variable and dependent variables are those which are affected by the independent variables. For the present study, there are different independent variables in terms of age, category of gender, level of education, type of institution, institution sector, level of time spent on computer and ICT Skills, whereas dependent variables include level of expertise in searching health, technological perceived barriers, and level of technology usage in health literacy.
Independent variables

<table>
<thead>
<tr>
<th>Gender</th>
<th>Level of education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution type</td>
<td>Level of time spent</td>
</tr>
<tr>
<td>ICT skills</td>
<td>Level of Age</td>
</tr>
</tbody>
</table>

Dependent variables

<table>
<thead>
<tr>
<th>Level of expertise in digital health literacy</th>
<th>Level of technological barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of institutional barriers</td>
<td>Level of usage of digital health literacy</td>
</tr>
</tbody>
</table>

Figure 1.7 Independent and Dependent Variables

1.6. List of Null Hypothesis

Statements for null hypothesis for Kruskal-Wallis H tests are written in following manner:

Null Hypothesis (Ho): Different groups of independent variable have same distribution for independent group (Siegel et al. 1989). Statements for null hypothesis for Mann-Whitney U tests are written in following manner: Null Hypothesis (Ho): The ranks of groups of independent variable are same for dependent variable (“Kruskal-Wallis H”, 2015).

I. The four different types of institutions have the same distribution for level of usage in digital health literacy

II. The four different types of institutions have the same distribution for level of expertise in digital health literacy.

III. The four different types of institutions have the same distribution for level of technological barriers relating digital health literacy.

IV. The four different types of institutions have the same distribution for level of institutional barriers relating digital health literacy.

V. The three different levels of education have the same distribution for level of usage of digital health literacy.

VI. The three different levels of education have the same distribution for level of expertise in digital health literacy.

VII. The three different levels of age have the same distribution for level of usage of digital health literacy.

VIII. The three different levels of age have the same distribution for level of expertise in digital health literacy.
IX. The four different levels of time spent on computer have the same distribution for level of usage of digital health literacy.

X. The four different levels of time spent on computer have the same distribution for level of expertise in digital health literacy.

XI. The ranks of gender are same for level of usage of digital health literacy.

XII. The ranks of gender are same for level of expertise in digital health literacy.

1.7. Operationalization of Variables

Operationalization is researcher’s definition of some immeasurable variable or concept to make it measurable by using different indicators. Different variables and concepts were operationalized in this research in the following manner.

1.7.1. Education

Conceptually education is defined as an institution which inculcates knowledge to learn culture and skills (Macionis 2012), but in this research education of respondent was categorized in three stages.

i. BS or Masters

ii. MS or MPhil

iii. PhD.

Only those students were incorporated who were studying in the above mentioned categories. Students rather than these categories were not included in this research. So here, level of education means from BS level to PhD level.

1.7.2. Institution Type

There were four different kinds of institutions types, which were selected for research. These included engineering universities, health sciences universities, animal sciences universities and general universities.

1.7.3. ICT Skills

ICT stands for Information and Communication Technology. ICT skills were measured through following indicators.

a. Computers skills
b. Spreadsheet program skills

c. Graphics skills

d. Word process skills

e. Desktop publishing skills

f. CD ROM, DVD skills

g. Presentation skills

h. Internet skills

i. Electronic mail

j. Authoring e-content

1.7.4. Expertise in Searching Health

Level of expertise in searching health was also an immeasurable concept. In this research few indicators were developed to make this concept measureable. These include:

a. Knowledge of available health resources on internet.

b. Knowledge about where to find health on internet.

c. Knowledge of how to find health on internet.

d. Knowledge of getting answer from internet about health.

e. Knowledge of using health information collected from internet.

f. Knowledge of differentiation between low and high quality health resources on internet.

1.7.5. Technological Challenges

As a matter of fact, university students face a lot of technological barriers relating digital health literacy. These technological barriers were measured through the following indicators.

a. Lack of guidance
b. Difficult to use

c. Difficult to implement

d. Lack of ICT training

e. Poor performance of technology

f. Expensive

g. Lack of new information

h. Threat for privacy

1.7.6. Institutional Challenges

The term institution meant here “universities”. Institutional challenges were operationalized in this research with the help of following indicators.

a. Availability of ICT resources.

b. Accessibility to ICT

c. Technical support

d. Efficient labs

e. Enough financial resources from institution relating ICT

f. Administrative support from institution

If the universities were not providing the mentioned facilities, it meant that students were facing institutional challenges relating ICT.

1.7.7. Level of Technology Usage in Health Literacy

Level of technology usage in health literacy was made measurable with the help of following indicators.

a. Level of getting health information through ICT.

b. Getting knowledge about illness
c. Getting knowledge about pain

d. Getting access to doctor

e. Getting knowledge about symptoms of diseases

f. Getting knowledge about self-medication

g. Getting knowledge about dieting plan

h. Getting knowledge about exercises

1.7.8. Universities

Only those universities were included which fulfill the following criteria.

a. HEC recognized

b. Universities in Lahore

c. The universities, which have online students are not included in this research

1.7.9. Socio Cultural

The term socio cultural is deeper in its meaning. A few socio cultural characteristics were included in this research, which included age, gender, education, institution type and sector and daily time spent on computer.

1.7.10. Digital Health Literacy

Digital health literacy means, seeking, finding and understanding health information through electronic resources. (Norman et al. 2006).
2. Literature Review

The literature review tried to search out the earlier researches connecting to digital health literacy. Using of internet, electronic resources and online sources is becoming a preferred way of enhancing knowledge in different aspects of life. Health related information is also being searched out through these sources (Tustin 2010). Digital health literacy refers to the aptitude of a person to use electronic resources like computers, T.V, multimedia, mobile phones and other electronic resources to find out, seek out and search out the health related information like health tips, different diseases, different exercises and different diets etc. (Norman et al. 2006).

Health information can be accessed from variety of resources like websites, homepages, different blogs, and from social media (Sillence et al. 2007). Studies are concluding that the number of online health customers is increasing which may result into the changing relationship between doctors and patients and dynamics of health and diseases (Tang et al. 2006).

2.1. Strategy to Deal
The present literature will be dealt in the following manner.

2.1.1 Rationale for the literature review

2.1.2 Objectives of the review

2.1.3 Searching review strategy.

2.1.1. Rationale for the Literature Review
The review of the previous researches will be resulted into a greater significance like:

I. Indicate the gap in methodologies of different researches.

II. It will create knowledge about the researches relating digital health literacy till now

III. This will guide the health policy makers and practitioners for logical decision making

IV. Compare and contrast the views and reviews of different authors relating health information

V. It will help the researchers to avoid themselves from duplication of researchers on the same topic.
2.1.2. **Objectives of the Review**  
The present literature will fulfill the following objectives:

i. Socio cultural challenges to digital health literacy.

ii. Institutional challenges to digital health literacy

iii. Technical challenges to digital health literacy

iv. Challenges faced by students in successful implementation of digital health literacy

2.1.3. **Searching Review Strategy**

i. Peer reviewed journals and articles

ii. Local journals

iii. Presentations in conferences

iv. Online sources

2.2. **Literature Review**

The literature review of the present study will be categorized in socio cultural, institutional and technical challenges. Then challenges faced by students at different level in different countries will also be included.

2.2.1. **Socio Cultural Challenges**

The term socio cultural includes a wider range of meanings and aspects in it. For example it includes population, age, gender, education, language, ethnicity, caste, class and so many other aspects. In this part of literature review, the studies showing relationship between socio cultural variables and digital health literacy were included.

The usage of new digital, electronic and online technologies is being increased in every part of the world at a larger pace. This usage of technology can be seen in every sphere of life. In health, it is also being used at a larger scale. Still there are certain challenges in the successful implementation of technological resources into health. Different studies had pointed out different factors which are being included in this research.
Another study by Mancini et al. (2010) pointed out the same results. The research was conducted in France. The respondents were the patients of breast cancer. The researcher concluded that there was an inverse relationship between age and level of usage of electronic resources in searching health information.

Then another socio-cultural characteristic ‘education’ also has association with digital health literacy. Dickerson et al. (2004) pointed out the relationship of education and ethnicity of patients with health seeking behavior on internet. He divided the patients in two categories, those who attended the college and those who did not attend the college at all. He made the conclusion that the patients who attended college in their life had higher use of technology in seeking health as compare to those who did not attended the college, which means that level of education determines the level of technology usage in health. Same type of result may be seen in Fogel et al. (2002) research who pointed out that level of education and level of annual income are associated with use of computer and internet at home. Flynn et al. (2006) made a longitudinal study in USA to find out the association between education and health seeking behavior via internet. This was a phone and mail self report study. Only those graduates were included who were having age between 63-67 years. It was concluded that the respondents with internet access and higher years of education had a positive association with searching health related information online. James et al. (2007) also reported same kind of relationship between education and health literacy.

Like education, literacy level also affects digital health literacy. Birru et al. (2004) took a study, which was the combination of both qualitative and quantitative methods. The study included 8 low literate subjects, which were defined as the subjects having literacy level between 3rd to 5th grades of USA grade. The subjects were given with self directed searches of health information. It was observed that the subjects were not good at understanding the health information, which was present on different websites.

Motivation of the patients to search out health information is also another great factor which can affect the level of usage of health literacy via electronic resources. Such kind of motivation is difficult to measure but researchers used many indicators to measure such kind of motivations. These indicators may include level of interest of a person relating his own or his family health, his experience of searching pertinent information and its implementation and
successful outcomes in past etc. Such kind of study was undertaken by William et al. (2003) at a hospital in Musselburgh in Scotland. The patients were attending the GP surgery. The participants of the study were females having the age between 55-74 years. Thirteen in-depth interviews were conducted. The researchers pointed out that the patients had less interest in using touch screen health information kiosks. The majority of the respondents were thinking that kiosks were only for practitioners and they had no curiosity to use them. Lack of interest is also a motivational issue. This lack of interest was pointed out by Peterson et al. (2003) in a study at USA. Structured interviews were conducted on 200 cancer patients. The results showed that majority of the respondents think the information invalid, which is present on the internet relating health. Helft et al. (2005) conducted the research on the non user of internet in seeking health information. Such respondent were cancer patients but were not using internet to get knowledge about their diseases. From the total respondent 44 percent told that they would like to use internet in seeking health if they had access to internet. While 49 percent of the respondents were not willing to use internet, having the belief that cancer information was not present on the internet.

Having the prior knowledge and skills of using ICTs, also have an association with the digital health literacy. Skinner et al. (2003) pointed out that lack of searching skills resulted into lack of eHealth literacy. The research included 210 people of Ontario in Canada. Twenty seven FGDs were conducted. The researchers pointed out that searching music, pornography and sports was easy as compare to searching health. Health related information requires advanced searching skills. Bowen et al. (2003) made a research to point out the relationship between searching skills and collection of online health information among women having the age from 18 to 74 years in Washington State, USA. Telephonic survey was done for the collection of data. Number of respondents was 431. The research concluded that majority of respondent inhibit eHealth literacy due to lack of searching experience.

Then expectations of different users vary. Most of the respondents wish the availability of information on internet of their own will. Anhøj (2004) made a comparison of two groups of asthma patients who frequently used Link media. Link media is online asthma diary from which the asthma patients can calculate their level of disease. From the view point of expectations, the results of 85 individuals indicated two groups. Both kinds of groups had different kinds of
expectation from Link media. The first group which was named as ‘outside in perspective’, expected concise information, pertinent advice and monitoring to their disease. They did not expect scientific articles and experts opinions from Link media. The second group which was named as ‘inside out perspective’ expected fast access to their pertinent problem. The researcher concluded that satisfaction of expectation may result into the increased level of technology usage in health seeking behavior. Trust in getting help from online resources is another factor which changes the level of e health literacy among patients, practitioners and general members of society. Mancini et al. (2006) categorized the respondents from the view point of their opinion regarding searching health through internet. From the total respondent, 11.1 percent respondents were those who expressed both positive and negative aspects of using internet in health. And 23.8 percent of the respondents expressed positive view, while 31.7 percent negative and 33.3 percent respondents made no comments. The respondents who made negative comments were of the view that searching health via internet was a stressful activity. Khechine et al. (2008) made a research on 121 English speaking Canadians, from which 79 percent respondents used to visit science, medical and government websites relating chronic illnesses. The respondents were of the view that this usage was based upon their trust on the validity and authenticity of information available on internet. But this trust is not universal. Glenton et al. (2006) took four FGDs with the patients of back pain in Norway. This study not only included the patients but care givers and family members of the patients were also included. The purpose of the study was to estimate the use of health related information. The respondents had access to online resources. The respondents were of the view that research material relating health available on websites, was not easy to implement to solve a health problem. Greenbalgh (2008) reported in his study that negative experience of past also had effect on the level of usage of digital health information seeking. Chung et al. (2008) made a quantitative research, including 113 respondents. Survey method was adopted as the data collection technique, while self administered questionnaire was used as data collection tool. The results indicated that the respondents considered the health related blogs credible and full of fruitful information.

2.2.2. Technological Barriers

There are also some technological barriers which are being faced by patients, practitioners and general members of society, relating search of health information from the
internet. These may include lack of access, lack of training, lack of technical knowledge, limited knowledge to implement and lack of ICT equipments etc.

From technological point of view, if we estimate the American situation, we shall come to know that 42 percent of the total population of America were not using internet at all. From these 42 percent of non users, 69 percent were those who had never used internet during the course of their lives (Pew internet and American life project). Pennbridge et al. (1999) made a quantitative research to evaluate the attitude of the respondent, who had internet access. In this study 1007 respondents from California were included. It was a questionnaire based survey research which concluded that access of internet had a positive association with level of technology usage in seeking health. Helft et al. (2005) made a research which indicated that only 10 percent of the total respondent were using internet for health information. From the total number of respondent, 44 percent were those who assured to use internet in seeking health if they would have access to internet. Same kind of conclusion was drawn by Blackburn et al. (2005), who noted that non users of digital health literacy had limited or no access to computers at home. These results were also supported by the research of Ibrahim et al. (2006), who made a difference between users and non users of electronic resourced in health. They pointed out that main difference was due to the availability of internet resources. Dart (2008) also believed that accessibility and availability were the main reasons for using or not using eHealth knowledge. Boukhors et al. (2003) conducted a research on diabetes patients. The purpose of the study was to observe the effects of computer assisted insulin management program on the improvement of quality of life and knowledge about the disease. The study was based on pre and post treatment questions. The subjects responded that because of this computer assisted program, there was no change occurred to the quality of life but the subjects get good knowledge about their disease and its treatment. Anhoj et al. (2004) made a research on Asthma patients. The purpose was to assess the level of usage of tele-health services relating to the disease of Asthma, it was concluded that the main obstacle which abstained from tele health service was the speed of connection of internet. Bruwer et al. (2005) made a survey on the supporters of two internet groups. The respondents were sufferer of hair pulling. The questionnaire was emailed to the respondents. The sample size of the research was 1010. The purpose of the research was to measure the perceived effectiveness of each internet group by its supporters. Supporters from both sides were satisfied
with their internet group, but certain barriers were pointed out by them. For example majority of the respondents did not like vast illustrations, deviation from the topic and complex terminology.

Accuracy of available information is another obstacle which hinders the users to implement health information. Esquivel et al. (2006) made a research to assess the accuracy of the health information, on the internet. For this purpose they evaluated 4600 postings relating health information on different websites by different bloggers or opinion makers and authors. They identified that 10 out of 4600 positing were misleading or completely false. However, 7 out of these 10 mistakes were identified, amended or changed by other participants. Using internet for health knowledge sometimes results into threat for privacy. Certain kinds of diseases are of private concern. People especially, VIPs don’t want to share information about their private diseases to others. But online searching health may be a threat to privacy. Pennbride et al. (1999) made a research on the respondents who had easy access to internet. The conclusion was drawn that sharing of health information on different blogs was felt as threat for privacy by different respondents.

2.2.3. Institutional / Organizational Barriers

It is much difficult to implement technology in health seeking behavior with the help of one individual or some groups of individuals. Organizational and institutional level efforts are required in this regard. While observing the phenomena it becomes evident that there were different kinds of institutional and organizational level barriers which were creating obstacles in the successful implementation of online technologies into health literacy. Such kinds of obstacles may include less expertise of seniors in hierarchy, absence of team work and co-operation, non-friendly policies relating technologies and lack of training and support from the organization etc. Yee et al. (2008) explained the factors behind unsuccessful digital health literacy. They were of the view that the fault was with the seniority of hierarchy of the institution. They consider ‘Y’ generation can change the attitude towards eHealth literacy. ‘Y’ generation includes those people who born after 1978. They had good exposure towards using technologies, so in the same manner they could do something to implement technology into health. In contradiction, in hierarchy, seniors were those who born before 1978, who had less exposure towards using latest and new ICT technologies. Therefore, there was dire need to re-engineer the hierarchy of institutions. Ash et al. (2004) Pointed out that shift of power from the seniority may result as a
barrier to eHealth literacy. There should be a powerful clinician control over health related organizations, so that health friendly and health facilitating policies could be introduced. Ludwick (2009) introduced that team efforts and mutual co-ordination between different organizations, health departments, primary health care, hospitals, doctors and paramedical staff was needed for the successful implementation of ICT into health seeking behavior. Mostashari et al. (2009) also agreed upon the mutual co-ordination among different segments for introducing the concept of digital health literacy.

Shortliffe (2005) pointed out that HIT was much functional, but doctors may not like the flourishing of such concept, as because of it there will be a decreased number of face to face interactions between doctors and patients. So there will be depersonalization in health care system which may results into the disadvantage to the doctors. So, doctors and different stakeholders in health may become a hurdle in the successful implementation of ICT into health literacy. Shekelle (2006) suggested that to implement technology in health, there is dire need to train the end user of health field. The end user meant here, the patients. Patients with training of using HIT can perform well in searching health and level of HIT will increase rapidly. The research of Flynn et al. showed that training of the patient had positive relationship with level of usage of technology in health literacy. They were also of the view that it can result into financial savings. Meade et al. (2009) indicated in their study at Ireland that barriers to health literacy can be categorized. They ranked the “Lack of time” as top of the list barrier, while “lack of training” was the second more influencing barrier to HIT. Macfarlane et al. (2006) also made a study at Ireland and also ranked categories of the different barriers to the implementation of HIT. At first they put lack of trainings and skill development workshops for lack of eHealth literacy.

Lack of support from colleagues and institutions also result as a barrier to HIT. Such kind of support is also required at policy making stage.

2.3. Digital Health Literacy among Students

The literature review also included the usage of health literacy through internet among students at different levels. Students usually have access to digital devices like computers, internet and smart phones. They have knowledge to use all these devices and they have knowledge how to search out the required information. Escoffery et al. (2005) pointed out the level of usage of eHealth literacy in 3 different colleges of the USA. The students were asked; to
what extent they have used the internet for searching health in the previous day, week or month. Every college had different level of users. The students of first college, who ever used internet for health knowledge were 67 percent of the total number of the students, while 73.9 percent students from the second college had ever used websites for health information during their life, and 71 percent students of the third college performed ever such kind of activity in the past. In the same study it was reported that 14.9 percent college students were of the view that they had gone for health information online in the previous day or previous week. While less than one-third students of 3 colleges had visited health relating website in the previous month. Students were also asked about their interest to become the participant of some online health survey. Only 27.5 percent students were those who reported that they would not like to become the part of the any online health survey, while 72.5 percent students were willing to become the part of such kind of activity. Nsuanganiet al. (2006) pointed out a little bit different outcome. The researchers studied 136 students of some college to know about the level of involvement of students with different interactive websites and internet applications relating to health literacy. A majority of the students (119) showed unwillingness to use some health related application, which meant that 87.5 percent of students did not like to use internet for seeking health. Castren J. (2008) made a study on the college students in Finland. The purpose of the study was to know the students’ level of getting benefit from college health services which were mentioned online on college websites. In this study 3153 students were studied. Only 370 students were those who had ever gone for online health information, provided by health department of college. Some students also reported that they had lack of knowledge and skills to search out the desired and pertinent health information on the internet. Escoffery et al. (2005) made a research on 743 students of college. Survey method was used as data collection technique. Out of 743 students, 393 (52.9 %) students reported that they had lack of skills regarding searching online health. While 661 out of 743 (89%) students were those who made the opinion that they had never got desired health information on the internet. Only 82 students, out of 743 (11%) claimed that they felt themselves capable of finding health information on the internet.

There were also certain researches which tried to answer the gap of usage among male and female students. Redmond (2007) found that there was no significant co-relation between male and female students using level of internet in health literacy. Ivanitskaya (2010) elaborated that students had less critical aptitude to use internet for health literacy. Redmond (2007) pointed
out that college students may suffer two kinds of problem while searching health online. First of all they had no visions or less vision to differentiate between primary and secondary sources of data and the second problem was that they may not differentiate between authentic and non-authentic information on the internet, which may cause threat to their health. Ivanitskaya et al. (2010) elaborated a difference between two groups. One were those who consulted health information through internet and second were those who located health information through non-electronic resources. The results showed that students had less serious aptitude of Judgment among those who went for health information through non-electronic resources.

Studies were also there who made comparison between the tendency of usage of eHealth among rural and urban students, as both rural and urban students were belonging to different kinds of health setups. Redmond (2007) ranked the students in two categories; ‘rural’ and ‘were rural’. The level of usage of digital devices for searching health was greater among rural students, while there was no statistically significant relationship between the perceived proficiency levels among both groups. In the findings of Escoffery (2005), 35 percent of the students told serious concern about their perceived abilities of using internet in health, while 7 percent of the students told no concern at all about their perceived abilities.

In the same manner different studied had been conducted to estimate the level of usage by university students regarding digital health literacy. The present study is also going to trace the barriers faced by university student. There was lack of studies on the topic. The previous researches elaborated the prevailing situation of internet usage in health by the university students. Some searches showed that internet usage was a preferred source of getting knowledge, by the university students. Heuberger (2011) elaborated that it was dire need to evaluate the skills, abilities and trends of university students. He depicted certain reasons. He was of the view that university students had access to digital resources. They also had knowledge to use these devices and they could also consult authorities for further assistance. Zarcadoolas (2011) made further illustration and elaborated that only access to digital devices could not ensure the level of usage of digital health literacy. He suggested that proper knowledge and skills were required to integrate technology into health literacy: like searching pertinent information, authentic information and latest information. He concluded that university students had such kind of abilities to successfully integrate technology into health literacy.
2.4. Digital Health Literacy in Pakistan

Pakistan is a country which is facing many kinds of social issues and problems in almost every field of life. The major concentration of the country is to fight the war against terrorism. The overall economic situation is very bad. Economic situation is also related with health situation. There is not a good situation of health in Pakistan, especially in rural areas. Rural areas are facing bundle of problems relating health. There is no availability of proper dispensaries, hospitals and pharmacies. Doctors, physicians and paramedical staff are least interested to go to rural areas. People belonging to rural areas could not access to doctors because of transportation and economic issues. (Saleem 2010). Elaborating the telecommunication facilities, Ansari et al. (2012) explained that broadband connection was available in more than 1800 cities of Pakistan, while optical fiber was used by 400 cities in Pakistan. The researchers were of the view that Pakistan was also facing problems of technological integration.

In Pakistan majority of the population was living in rural areas. Approximately 28 percent population in the country was living in urban areas, while 72 percent were living in rural areas. In 2000s the situation of the availability of doctors was very frightening, where there were only 74 physicians for one hundred thousand populations. In rural areas majority of the population, were of the view that they had never attended any capable physician during their life (Bhutto et al. 2010).

Such kind of situation was also elaborated by Durrani et al. (2012) in rural Sindh, the province of Pakistan. According to them urban areas were well equipped with medical facilities while there was frightening situation of health in rural Sindh. They were of the view that Karachi, the city of Sindh province, was well equipped with digital health technologies. They recommend that such kind of medical facilities should be shared with rural areas through online connectivity. In their study Malik et al. (2008) recommended that there should be technological integration into health services for dealing with the cases of emergency. In situation of accidents, heart attacks, organ damage and pain, there should be quick availability of information to handle the problem. For this purpose there should be provision of health related information through online resources, so that the patients could inform themselves. Bhutto et al. (2010) further explained that only availability of health information on the internet could not solve the problem. As Pakistani population was also facing problem to the access of online facilities, so how could they search for health? Then people were not much trained to use the health related information
available on the internet. So first of all, there should be policies to assure access of technology to the people, especially in rural areas.

Then there should be trainings relating digital health literacy which should guide people to use the information relating health. And they should also be introduced with the benefits of using digital health literacy. According to Ali et al. (2002) significance of health information technology could not be falsified in a country like Pakistan, because all kind of treatments depends upon the well timed and accurate information. And if people could get this information through online resources, they could make their treatment successful. Qazi et al. (2004) elaborated the historical dimensions of the topic and elaborated that in Pakistan, health information related programs ended before 1990. The reason behind this was the mixture of fake and false information in the date. In 1992 Ministry of Health, Pakistan took action to pure this information through consultative procedures.

Ansari et al. (2012), while pointing out the efforts of Ministry of Health Pakistan, elaborated that bundle of efforts were made to improve the health information system. For this purpose, new managing policies, new check and balance strategies and improved service delivery services were introduced in every district of each province. But the desired out comes could not be achieved. The main hurdle was that different stake holder like practitioners, physicians and surgeons were not consulted to know about the grass root level obstacles in health information system. Bhutto et al. (2010) made a review of previous reports of Health Management Information System (HMIS) and noted that there was issue of reliability and authenticity in the results of reports. The information was un-related. Because of this it could not guide the policy makers to further make beneficial policies relating health information system. The researchers recommended that there should be improved system to make the reports of HMIS reliable. Ishtiaq et al. (2012) further continued the argument and stated that the issue was not with the authenticity of the reports of HMIS. The data present in the reports was good to greater extent. The problem was that health and disease statistics were changing every day. Then new policies relating health were also there. Because of which the data of HMIS looked as irrelevant. To improve the reliability level of HMIS, Mostafa et al. (2011) suggested that with every new day, technology was improving itself. So the Ministry of Health (MOH) should also improve its technological requirement. While using new kinds of software relating health
information system, could improve the reliability and advantages of HMIS. The researcher advised the Ministry of Health to use open access software development method, which had the characteristics that it could be used and changed by some other operator while having the knowledge of codes. Durrani et al. (2012) further continued the discussion while elaborating that MOH had no ICT capacity to change or modify the software. The researchers also advised to use open access software design. They elaborated the advantages of using this design. This could be redesigned and restructured by any computer experts, who had not developed it. Because of this software MOH could modernize and change the varying statistics relating health and diseases, which will further give benefit to policy makers and health practitioners.

There were certain kinds of socio-cultural factors which became a hurdle for the integration of technology into health information system. Durrani et al. (2012) pointed out different kinds of socio-cultural barriers. Lack of interest of the stake holders was the major reason. Then lack of motivation, lack of new ideas, lack of acceptance of new technologies, anxiety in leaving the traditional methods and less readiness to change the system etc. were some of the barriers to health information system. In a broader perspective Qureshi et al. (2014) pointed out the major issues and barriers in Pakistan relating the health information system and its integration with ICT. They categorized the barriers as socio-cultural barriers, structural barriers and technological barriers. Socio-cultural barriers included: lack of education, less motivation to adapt latest technologies and attachment with traditional methods, while structural barriers included: less efficient policies of government regarding health information system, lack of efforts made by different organizations, no availability of infra-structural equipments and lack of professionalism and provision of trainings from the organizations relating health and technology. Then, there were also some technological constraints pointed out by the researchers which included: lack of access, lack of availability, lack of skills and lack of guidance and training in technology. Cost was also elaborated as a major barrier, as the technological equipments are much costly.

2.5. The Gaps to Be Filled in Literature

Different kinds of pertinent researches throughout the world, as well as from Pakistan have been included which are elaborating different kinds of challenges from the view point of different authors, writers and researchers relating digital health literacy. All the researchers put a tremendous effort to depict the issues of their locality of health information system. Some
researches remained focused to their local areas, while some reached out over a diverse geographical area. Some researchers focused on educational institutions, while other had focused on health stakeholders. Some criticized government policies, while others pointed out micro level deficiencies. Some are of the view that socio-cultural challenges are a greater hurdle in health literacy, while other say technological barriers should be minimized. In short, there are number of different analyses to put focus on this topic. Here, the researcher is going to point out some of the gaps, which are present in previous researches. And the researcher will try to fill these gaps to greater extent.

While keenly observing into literature review, it is observed that previous researches had small sample sizes. Small sample size may have small representative characteristics. So there is need of researches with larger sample sizes. While studying the literature it will be known that Brenner et al. (2003) included only 235 respondents while tracing the barriers to health information literacy. In the same manner Peterson et al. (2003) included 200 cancer patients while doing research on this topic. Rogers et al. (2004) made only 17 semi-structured interviews. Only 210 respondents were included in the research of Skinner et al. (2003). Bowen et al. (2003) included 431 respondents, who were female. The number of total respondents was 500 in the research of Houston et al. (2002), who traced out the gap of perception between healthier and non-healthier patients. Anhoj (2004) included 85 asthma patients to find out the gap in opinion about health literacy among two groups. Dickerson (2005) included only 21 respondents in his research. Khoo et al. (2008) interviewed 360 parents in his survey. Research of Pennbirde et al. (1999) included 1007 respondents. The size of sample is good, but the research is much old, whose results may not be applicable to present situations and prospects. Escoffery (2005) included 743 college students in his research, while 306 college students were included in the research of Ivanitskaya (2010). To summarize, we can conclude that different researchers included different sample sizes ranging approximately form 20 to 1000 people.

Previous researches are also lacking the relative analysis of difference of effects of different variables. Most of the researchers elaborated the effect of different variables on the dependent variables. But, to what extent each variable is causing change to dependent variable was not mentioned. For example Dickerson et al. (2004) pointed out that education and ethnicity had significant relationship with the level of usage of health literacy. But the research was not
answering that to what extent education was affecting the dependent variable and to what extent ethnicity was affecting the dependent variable. In the same manner studies were also lacking to answer, which category in a group was much affecting the dependent variable. For example, Flynn et al. (2006) pointed out that changing the level of education will result in changing levels of health searching behavior, but education was a group with various categories. The researchers did not answer to what extent each category was responsible for changing in level of health seeking behavior. The current study tried to solve out such kind of problems. The previous studies were also lacking the comparative analysis among different institutes and organizations. The studies were conducted on colleges, hospitals and schools. These had not tried to make comparison among the respondents of different type of colleges i.e. medical colleges, engineering colleges, and commerce colleges etc. and these had not mentioned the difference of views of doctors, health professional and other respondents from public and private sectors.
3. Methodologies

This chapter is about the methods used in the research. Methodology chapter included study area at a glance, research methods, research design, sampling technique, data collection tool, and statistical analysis techniques etc.

3.1. Study Area at a Glance

It is compulsory to introduce the study area so that the readers could understand the context, problems, demographic situation, social setup and other circumstances, which will help the readers to co-relate the study with these situations. This is also compulsory to elaborate so that the readers could understand different justifications of methods and techniques used in the research.

3.2. Pakistan: The Studying Country

Pakistan is officially named as Islamic Republic of Pakistan. The estimated population of Pakistan in 2014 was 180 million and is ranked as the sixth most populous country in the world. Total area of Pakistan is 796096 square kilometer. In the past, the region was ruled by different dynasties and empires, which had contributed to amalgamation of different cultures. Pakistan is federal republic with four provinces i.e. Punjab, Sindh, KPK and Baluchistan (“Pakistan”, 2016). While discussing the health situation, according to WHO report of 2012, only 2.7 percent of GDP is being spent on health. Average life expectancy at birth is 67 years in the country (“Life expectancy”, 2015).

3.3. Punjab: The Studying Province

Punjab is the most populous province of Pakistan, comprising 56 percent of the total population of the country. It is very prosperous region from agricultural and industrial point of view. Natural resources are also there in a large quantity. Not only Punjabi speaking people live here, but also Hindko, Saraiki, and Potohari speaking people live here. Caste system is also diverse that includes Rajput, Jutt, Araen, Malik and Syed to mention a few. Historically, the region has been largely ruled by outsiders, who brought their culture with them. So, heterogeneity can be traced into caste system, tribes, ethnicities and races in the Punjab province. There are 36 districts in this province with Lahore as the biggest city of Punjab (“Punjab”, 2016).

3.4. Lahore: The Studying City.

Lahore is the capital city of Punjab Province, Pakistan. It is the second largest city of the country. Being a major population hub, the city remains a centre of commercial, industrial,
culture entertainments and educational activities (“Lahore”, 2016). There are 17 different kinds of Public and private sector universities, approved by Higher Education Commission (HEC), Pakistan (“Universities”, 2013).

The study was conducted in Lahore, which is the capital of Punjab province. Justification for choosing Lahore was that:

- In Lahore there were number of public and private sector universities.
- Youth was educated and can participate in survey as respondents.
- Students and teachers came across the whole country.
- Lahore educational institutions were well equipped with technology.
- Educational institutions were heterogeneous in characteristics e.g. Health Sciences, engineering, and general universities.
- Researcher had an easy access to approaching Lahore.

### 3.5 Study Population

According to HEC list 2013 there were 17 public and private sector universities in Lahore (“Universities”, 2013). From which nine universities were public, while eight universities were private sector. There were four different types of universities. These were: General (more than one disciplines), Engineering, Health Sciences, and Animal sciences universities. Type, sector and number of students of these universities were mentioned below categorically. Yet, Virtual University was not included in this research, because it was an online university, and approaching online students was a very difficult phenomenon. So this research included 16 public and private sector universities.

#### Table 3.1 List of Universities in Lahore

<table>
<thead>
<tr>
<th>No</th>
<th>University Name</th>
<th>Type</th>
<th>Number of Students</th>
<th>Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lahore College for Women University, Lahore.</td>
<td>General</td>
<td>4582</td>
<td>Public</td>
</tr>
<tr>
<td>2</td>
<td>University of Veterinary and Animal Sciences,</td>
<td>Animal</td>
<td>3000</td>
<td>Public</td>
</tr>
<tr>
<td>No</td>
<td>University Name</td>
<td>Type</td>
<td>Number of Students</td>
<td>Sector</td>
</tr>
<tr>
<td>----</td>
<td>-------------------------------------------------------------</td>
<td>-----------------</td>
<td>--------------------</td>
<td>--------</td>
</tr>
<tr>
<td></td>
<td>Lahore.</td>
<td>Sciences</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>King Edward Medical University, Lahore.</td>
<td>Health sciences</td>
<td>1826</td>
<td>Public</td>
</tr>
<tr>
<td>4</td>
<td>GC University, Lahore.</td>
<td>General</td>
<td>7438</td>
<td>Public</td>
</tr>
<tr>
<td>5</td>
<td>University of Health Sciences, Lahore.</td>
<td>Health sciences</td>
<td>156</td>
<td>Public</td>
</tr>
<tr>
<td>6</td>
<td>University of Engineering and Technology, Lahore.</td>
<td>Engineering</td>
<td>9399</td>
<td>Public</td>
</tr>
<tr>
<td>7</td>
<td>University of The Punjab.</td>
<td>General</td>
<td>24961</td>
<td>Public</td>
</tr>
<tr>
<td>8</td>
<td>University of Education, Lahore.</td>
<td>General</td>
<td>10369</td>
<td>Public</td>
</tr>
<tr>
<td>9</td>
<td>University of South Asia, Lahore</td>
<td>General</td>
<td>1171</td>
<td>Private</td>
</tr>
<tr>
<td>10</td>
<td>Beaconhouse National University, Lahore</td>
<td>General</td>
<td>1178</td>
<td>Private</td>
</tr>
<tr>
<td>11</td>
<td>Hajvery University, Lahore</td>
<td>General</td>
<td>2758</td>
<td>Private</td>
</tr>
<tr>
<td>12</td>
<td>Lahore University of Management Sciences, Lahore</td>
<td>General</td>
<td>2356</td>
<td>Private</td>
</tr>
<tr>
<td>13</td>
<td>Minhaj University, Lahore</td>
<td>General</td>
<td>1464</td>
<td>Private</td>
</tr>
<tr>
<td>14</td>
<td>University of Central Punjab, Lahore</td>
<td>General</td>
<td>4237</td>
<td>Private</td>
</tr>
<tr>
<td>15</td>
<td>University of Lahore, Lahore</td>
<td>General</td>
<td>11461</td>
<td>Private</td>
</tr>
<tr>
<td>16</td>
<td>University of Management &amp; Technology, Lahore</td>
<td>General</td>
<td>3308</td>
<td>Private</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>89664</td>
<td></td>
</tr>
</tbody>
</table>

**3.6. Sampling Technique**

As shown in table 3.2, the population had different strata e.g. general, health Sciences, engineering, management studies, animal sciences, and others. Because of which stratified sampling (random) technique was employed in this research. Since this sampling technique allows researcher to make strata or subset on the basis of some similar characteristics that the whole population does not share (Neuman 2005). Justification for choosing stratified sampling was that the categories in our population were heterogeneous. The sub populations within an overall population, was varying. In computational
statistics stratified sampling is used for reduction of variance when population is known (Martinez et al. 2007). Therefore, the disciplines in which these institutes offered education had taken as subset that differ from the whole population because the attitude of engineering students towards social network sites might differ from the attitude of social sciences students.

3.7. Sample Size

The total number of students in 16 universities was 89664. To calculate the sample size, the researcher used Sample Size Table from the Research Advisors 2006 (research-advisors.com). While keeping 95 percent confidence interval and keeping 2.5 percent margin of error, the calculated sample size for total population was 1513.

3.8. Proportional Allocation to Each University

The population was stratified. In each stratum there was different number of students. In such kind of situation proportional allocation formula was used to determine the number of studying respondents from each stratum. This formula was as follows:

\[ n_i = n \left( \frac{N_i}{N} \right) \]

Where:

\( n_i \) = sample size for each stratum, \( n \) = sample size, \( N_i \) = Stratum Size, \( N \) = Population Size
Table 3.2. Allocation of the Sample after Applying Formula

<table>
<thead>
<tr>
<th>Strata</th>
<th>Universities Name</th>
<th>Students in Selected University</th>
<th>Selected Students in Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>University of South Asia, Lahore</td>
<td>1171</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>University of Management &amp; Technology</td>
<td>3308</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>University of Lahore, Lahore</td>
<td>11461</td>
<td>193</td>
</tr>
<tr>
<td></td>
<td>University of Central Punjab, Lahore</td>
<td>4237</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>Minhaj University, Lahore</td>
<td>1464</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Lahore University of Management Sciences</td>
<td>2356</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Hajvery University, Lahore</td>
<td>2758</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Beaconhouse National University, Lahore</td>
<td>1178</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>University of Education, Lahore.</td>
<td>10369</td>
<td>174</td>
</tr>
<tr>
<td></td>
<td>University of The Punjab.</td>
<td>24961</td>
<td>421</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7438</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4582</td>
<td>77</td>
</tr>
<tr>
<td>Health sciences</td>
<td>King Edward Medical University</td>
<td>1826</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>University of Health Sciences, Lahore</td>
<td>156</td>
<td>4</td>
</tr>
<tr>
<td>Engineering</td>
<td>University of Engineering &amp; Technology</td>
<td>9399</td>
<td>158</td>
</tr>
<tr>
<td>Animal Sciences</td>
<td>University of Veterinary &amp; Animal Sciences</td>
<td>3000</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total 89664</td>
</tr>
</tbody>
</table>

3.9.Methods

This study used the mixed method research, which means that it was the mixture of both qualitative and quantitative methods. Justifications for choosing this method were that this method allows in depth and in breadth knowledge of a specific phenomenon, minimizes the weaknesses of both qualitative and quantitative method. It also helps the researcher to look at the problem from different angles and to validate the results from other method (Neuman 2005). Quantitative method only tried to get answer from the respondent about the predetermined
themes. In quantitative portion data collection tool was close ended. Respondents were limited to make opinion about the mentioned themes. They were not free to discuss about their views in open ended manner. So, quantitative portion was followed by qualitative method. This method allowed the respondents to express their views in open ended way. Qualitative method resulted into generation of new themes, which not only validated the previous predetermined themes but also determined new insights into the field. Quantitative method was used prior to qualitative method to answer the first three objectives of the study. For this purpose both descriptive and inferential statistics were used. It was used earliest in the research as the researcher was primarily interested to find out the demographic characteristics, frequencies, and percentage distributions of the respondent to get an overall picture of the whole population. Quantitative method not only depicted the demographic characteristics but also analyzed their relationship with digital health literacy.

Then, the next three questions were answered through qualitative method. It was used subsequent to the quantitative portion, as the participants of qualitative research were employed from the sample of survey respondents. This method helped to induce emergent themes relating digital health literacy.

3.10. Data Collection Techniques
Survey method was used as data collection technique in the quantitative portion. Justifications for using survey method were that this technique is relatively inexpensive, takes up little time to conduct, and the sample is taken from the whole population (Neuman 2005). The present study had also taken data from the whole population i.e. HEC recognized universities in Lahore. Then survey technique is less biased and the results can be generalized to a vast population (Neuman 2005).

For qualitative portion, Focus Group Discussions (FGDs) and in-depth interviews were used as data collection techniques. In this technique, the researcher raises the issue in front of a group, and gets the information through the discussion of that group (Wong 2008).

3.11. Research Design
Cross-sectional research design was used in this research. Cross-sectional research design was used as it is low in cost, precise in results, can be generalized to a larger population and can compare different groups at a single time (Neuman 2005). The quantitative portion of the present
research was focusing to compare different age groups, different institutions, different educational levels, categories of gender and their effect on digital health literacy at a single point of time.

3.12. **Data collection Tool**

Structured questionnaire was used to collect the data from the respondents. Questionnaire is a series of question, which the researcher asks from the respondents (Neuman 2005). Large amount of information can be collected in a very easy manner through this tool. All the data was collected by the researcher himself, no person was recruited for data collection. The researcher went to all 16 universities (virtual University was not included), and collected data.

3.13. **Pre-testing**

To estimate the workability and accuracy of the tool, pre-testing was also performed. After the formulation of a questionnaire, there might be different kinds of technical mistakes, repetitions and other flaws of such kind, so pre-testing were compulsory. After pre-testing few things were added, removed and modified. The pretesting was done on 20 respondents. After pretesting, section ‘Vii’ of question 6 was deleted, as it was giving same meaning as section ‘Vi’. Then section ‘b’ of question 3 was molded. First there was written the term ‘medical universities’ which was altered with ‘health sciencesuniversities’. Then the categories in question 7 were not mutually exclusive. There was a statistical fault. It was corrected after pre-testing. The anonymity and privacy was ensured in the cover letter, but some respondents suggested that there should be written the word of ‘confidential’ on the top right corner of the cover letter. So, this was also included.

3.14. **Data Editing**

Quickly after receiving the questionnaire from the respondents, the researcher used to read the answers of the tool, because later it becomes difficult to approach the same respondents. This habit of the researcher minimized the level of missing values. After receiving every fifteen questionnaires, researcher used to enter the data in Statistical Package for Social Sciences (SPSS).

Data was stored on more than one place to avoid any kind of damage in future. While using SPSS, all the questions were entered into ‘variable view’. Here all variables were defined, given types, labels, values and measures (i.e. Nominal, ordinal or scale). Values were given with different levels of liking and disliking, ranging from strongly agree to strongly disagree, from
excellent to very bad and from greater extent to no extent. In the same manner different categories of age, gender, education and university types were given codes in the ‘values’ menu in SPSS. There were certain questions with many sub questions. Such kinds of questions were computed to single variable in SPSS. For example question 9 was having 9 sub-questions. These were computed to make one question to measure the level of technology usage in health literacy. In the same manner question 8, 10, 11 and 12 were having more than one subsection. So they all were computed to a single main question, while using the ‘compute’ function of the SPSS.

3.15. Field Experience

In social sciences, conducting survey is full of knowledge about the attitudes and behaviors of people (Moser et al 1971). The researcher had to visit 16 public and private sector universities, located on the diverse locations in Lahore, Punjab. The response rate was good as the population was educated, but response rate was higher in private sector universities as compared to public ones. From gender point of view this response level was higher among female students as compared to male students. The researcher had to make the distance through local transport. The overall behavior of the students was good. Only those students refused to respond who were busy in their routine activities. Some students also gave valuable comments, which gave benefit to the researcher throughout the research. Many of the students asked about the significance of the topic and the situation of digital health literacy in Pakistan.

3.16. Validity of the Instrument

Validity means to what extent the instrument is measuring the exact thing, which it intended to measure (Neuman 2005). To measure the validity of the data collection tool, two types of validity were used, i.e. face validity and factor analysis. Face validity means to what extent it looks like to measure the desired thing. It is a one-sided opinion about the tool about its desired extent (Drost 2011). For this purpose, many teachers including supervisor, were consulted. After deleting and adding many things, it was declared as valid from its looking (face validity). Then, through SPSS, factor analysis was also done to measure the validity of different parts. Many questions were having their sub-questions. The validity of such sub-questions was measured through Principal Component Analysis (PCA) method. This method results into two kinds of answers, i.e. I components extraction and II components extraction. The former means that the components are valid, while the later means that the components are not valid(statistics.laerd.com). While measuring the components of this research, approximately all
components fall in the category of I component extraction. Only one question was not fulfilling the criteria of I component extraction. For that specific question, only face validity is used.

3.17. Reliability

For measuring, the reliability of the instrument, reliability analysis in SPSS was used. Value of Alpha is a good source to measure the reliability of different component of a question. If the value of Alpha is greater than 0.7, then the components are reliable (statistics.laerd.com). Reliability analysis measurement showed that alpha value was greater than 0.7, while applying to different components.

3.18. Quantitative Data Analysis

Quantitative data was analyzed through SPSS version 21. Both descriptive and inferential statistics were used to analyze the data. Descriptive statistics was used to measure the frequencies and percentages of different variables. While inferential statistics was used to test different hypothesis. In inferential statistics, test of Normality was performed which showed that there was Lilliefors Significance correction. This correction means that the data is not normal (“Normality”, 2016) (“Lilliefors”, 2016). Non-parametric tests are used in inferential statistics, when data is not normal (Hajian et al. 1997, Siegel, S. 1957). While keeping in mind the research objectives and different assumptions, Kruskal-Wallis H test was applied. It is used to measure the relationship between groups of two or more independent variables (Wallace 1959). It is used when independent variable has two or more categories and when dependent variable is continuous (Breslow 1970). In the present research different independent variables had two or more groups. For example education was an independent variable which had three groups i.e. B.S, M.S. and Ph.D. In the same manner variable of ‘gender’ had two groups, while university type, and daily time spent on computer had four groups each. Kruskal-Wallis H elaborates if there is any significant difference within the groups of independent variable during their effect on the dependent variable (Wallace 1959). For this test there should be no participant, which is already present in more than one group (Breslow 1970). The data of the mentioned research meets the criteria of all the above-mentioned assumptions of Kruskal-Wallis H test.

Then strength of difference between groups can also be calculated through Dunn test. It is performed by dividing chi-square value to $\sqrt{n}$ (under root of sample size) (Sheskin 2003). Its
value ranges from 0.1 to 0.5. The digit 0.1 means that there is a small size of effect, 0.3 shows medium size of effect and 0.5 shows larger size of effect of difference between groups of independent variable while their effect on the dependent variable (statistics.laerd.com). For example 0.5 means, in educational level (M.A., M.S., and PhD) that size of difference between effect of all three group i.e. M.A., M.S and PhD, is larger. There is a larger difference between three categories when they are in relationship with dependent variable.

Kruskal-Wallis H test has a limitation. It only tells that there is difference between groups and strength of difference (Wallace 1959). It does not tell which groups of independent variable are greatly affecting the dependent variable (Breslow 1970). For such kind of measurement, Post Hoc test is applied in parametric statistics while in non-parametric statistics Mann-Whitney U test is applied (McKnight 2010). Mann-Whitney U can tell the difference of independent variable with two groups (Sheskin 2003). When there are more than two groups, these all groups are individually tested with other group (“Mann-Whitney”, 2016), for example (1,2), (1,3), (1,4), (2,3), (2,4), (3,4). There are four group (1, 2, 3, 4), but Mann whiney U can compare two groups at a time, so above mentioned grouping method was adapted.

3.19. Qualitative Portion

After quantitative analysis, Focus Group Discussions (FGDs) and in-depth interviews were also conducted to get different ideas and opinions from different respondents. In quantitative analysis, answers are predetermined. Respondents were limited to tick any answer from the predetermined model, but FGDs and in-depth interviews provides chances to respondents to give their own opinion relating the topics (Neuman 2005).

Other qualitative techniques also allow the respondents to share their opinion, but FGD was used because comments of other group members stimulate the ideas of a respondent and people even find themselves changing their opinion and ideas because of the presence of the group etc. (Basch 1987).

3.19.1. Recruitment of Participants (FGD)

Eight FGDs were conducted in this research. As there were included four different types of institutions, so from every type of institution, twelve members (six males and six females) were selected from each type. From every type of institution one group was having female respondents and one group was having male respondents. Males and females were distributed in
separate groups to increase the homogeneity. Such homogeneity brings positive results (McLafferty 2004).

Only those participants were included, who were participant in our survey. The total number of those participants was 1513. During survey, all respondents were asked about their email addresses. Recruitment was random and volunteer. First of all 48 respondents were randomly selected including 24 males and 24 females, equally from each type of institution. Emails were sent to know about their consents to be the participant of the research. Out of 48 respondents, 39 were willing to be the participant of the FGD. Same procedure was also adopted to recruit remaining nine respondents. Each group was told about the time and place of the discussion. Just before two days of each FGD, researcher used to send reminder emails to the selected respondents. A confirmation letter was also sent to respondents, on which time, date and location was mentioned. Cell No. of researcher is also mentioned in the letter and respondents were advised to contact on that number in any kind of problem. Respondents were informed that discussion could take approximately two hours and they were also assured about their privacy.

3.19.2. Activities during FGDs

I. During all FGDs, respondents were given with consent forms for their participation.

II. Researcher introduced himself and his topic again.

III. Researcher documented the activities on note book. Tape recorder was also used to record the opinions of different participants. Respondents were aware that their views were being recorded.

IV. At the end of each discussion, researcher used to speak the date and time of that day, so that he could differentiate between different FGDs later. Only one FGD was conducted in one day.

V. At the end, respondents were served with light refreshment.

VI. Researcher himself performed the duties of facilitator, as researcher was much aware about the activities of a FGD facilitator, as he had read large amount of literature and had listened many online lectures relating it.
3.19.3. Justification for In-depth Interviews

In-depth interviews involve a small number of respondents and conducted whenever there is need of detailed information of an individual’s thoughts. This method of information collection provides a very relax atmosphere to the respondents (Boyce et al. 2006).

3.19.4. Activities during In-depth Interviews

First of all participants of in-depth interviews were identified. These were chosen from those respondents whom had already participated in survey. All participants were informed through emails. Total number of respondents was eight. Participation was completely voluntary. The selection method was simple random. From each type of institution, two respondents (one male, one female) were chosen.
4. Descriptive Analyses
This chapter is consisting of two parts:

I. Different socio-cultural characteristics of university students.
II. Opinion of students regarding different aspects of digital health literacy.

4.1. Socio-cultural characteristics
Different kinds of socio-economic, socio-cultural and socio-demographic factor were included to find out the challenges to digital health literacy. These factors included type of institution (e.g. Engineering, Health Sciences, Animal Sciences and General Universities); category of gender (i.e. Male and Female), education (i.e. BS, Ms or PhD), and availability of Personal Computer (PC) at home, time spent on computer and ICT skills etc. These characteristics were traced out by eight different questions in the questionnaire. These factors were directly or indirectly influencing the usage of technology in health literacy.

Table 4.1: Frequency and Percentage Distribution of the Respondents According to Different Socio-Cultural Characteristics

<table>
<thead>
<tr>
<th>Socio-Cultural Characteristics</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of Institution</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal Sciences Universities</td>
<td>51</td>
<td>3.4</td>
</tr>
<tr>
<td>General</td>
<td>1269</td>
<td>83.9</td>
</tr>
<tr>
<td>Engineering</td>
<td>158</td>
<td>10.4</td>
</tr>
<tr>
<td>Health Sciences</td>
<td>35</td>
<td>2.3</td>
</tr>
<tr>
<td>Total</td>
<td>1513</td>
<td>100</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>967</td>
<td>63.9</td>
</tr>
<tr>
<td>Female</td>
<td>546</td>
<td>36.1</td>
</tr>
<tr>
<td>Total</td>
<td>1513</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bs/Masters</td>
<td>730</td>
<td>48.2</td>
</tr>
<tr>
<td>Ms/Mphil</td>
<td>679</td>
<td>44.9</td>
</tr>
<tr>
<td>PhD</td>
<td>104</td>
<td>6.9</td>
</tr>
<tr>
<td>Total</td>
<td>1513</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-Cultural Characteristics</td>
<td>Frequency</td>
<td>Percentage</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>17-20</td>
<td>598</td>
<td>39.5</td>
</tr>
<tr>
<td>21-24</td>
<td>465</td>
<td>30.7</td>
</tr>
<tr>
<td>25-28</td>
<td>211</td>
<td>13.9</td>
</tr>
<tr>
<td>29=&gt;</td>
<td>239</td>
<td>15.8</td>
</tr>
<tr>
<td>Total</td>
<td>1513</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Availability of PC at Home

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>1206</td>
<td>79.7</td>
</tr>
<tr>
<td>NO</td>
<td>307</td>
<td>20.3</td>
</tr>
<tr>
<td>Total</td>
<td>1513</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Availability of Internet at Home

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>927</td>
<td>61.3</td>
</tr>
<tr>
<td>No</td>
<td>586</td>
<td>38.7</td>
</tr>
<tr>
<td>Total</td>
<td>1513</td>
<td>100.0</td>
</tr>
</tbody>
</table>

### Time Spent on Computer

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>28</td>
<td>1.9</td>
</tr>
<tr>
<td>2-3</td>
<td>468</td>
<td>30.9</td>
</tr>
<tr>
<td>4-5</td>
<td>658</td>
<td>43.5</td>
</tr>
<tr>
<td>6=&gt;</td>
<td>359</td>
<td>23.7</td>
</tr>
<tr>
<td>Total</td>
<td>1513</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Data in the table 4.1 is showing the distribution of respondents according to their affiliation with different institutions. Total number of the respondents was 1513. Out of the total respondents, 51 respondents were belonging to animal sciences universities in Lahore, while 1269 students were belonging to general universities. Number of respondents from engineering universities was 158, while 35 respondents were included from health sciences universities. Table 4.1 is showing that number of respondents form general universities was greater to larger extent from other types of universities, as it comprises 83.9 percent of the total population. The reason behind this larger number was that twelve out of sixteen universities in Lahore were general universities. That’s why number of respondents from General universities was greater.

The number of HEC recognized health sciences universities in Lahore was two. While there was only single engineering and one animal Sciences University was located in Lahore. The total number of respondents of 16 universities was 89664, while sample size was 1513.
Through the help of proportional allocation formula, every university was given with specific quota relating number of respondents from that particular university.

Data in the table 4.1 is also showing the frequency and percentage distribution of the respondents according to their gender. Data is showing that out of 1513 university students, 967 respondents were male, while 546 respondents were female. Male and female students were chosen randomly. The researcher used to stand at the main entrances of the universities and approached the respondents. So, during data collection 63.9 percent respondents were those who were male and 36.1 percent respondents were female. This may indicate that there was domination of males over females from the view point of number of students.

Data is showing frequency and percentage distribution of respondents according to their education. Only those university students were included who were in Bs, Ms/MPhil or PhD. Data is showing that out of 1513 students, 730 (48.2 percent) were those who were in their Bs or Masters class. The number of respondents was 679 (44.9 percent), who were in their Ms or MPhil Class, while 104 (6.9 percent) respondents were doing their PhD. Most of the universities (HEC recognized) were offering the classes from Bs to PhD. That’s why students below Bs/Masters were not included in the study.

Data in the table 4.1 is also showing frequency and percentage distribution of respondents, which are included in the study. Four categories were established of respondents from view point of their age. Number of students, having age between 17 to 20 years, was 598 (39.5 percent), while 465 (30.7 percent) respondents were those who were having age between 21 to24 years. From the total respondent 211 (13.9 percent) respondents were having age between 25 to 28 years, while number of respondents was 239 (15.8 percent) who were having age of 29 years or more than 29 years. Data is depicting that approximately 10 percent of the university students were having age between 17 to24 years. The lowest age limit was 17 years as lower than 17 cannot get admission in Bs level class. Data was showing that there was also trend of study among those having age 29 or more in Pakistan.

Data in the table is also showing the frequency and percentage distribution of the respondents according to the availability of personal computer at their homes. Out of total respondents, 1206 respondents (79.7 percent) had the availability of computer at home, while
307 (20.3 percent) respondents had no computer at home. Data is showing that majority of the students were having availability of personal computer at home.

Data in the table is also depicting frequency and percentage distribution of the respondents according to their availability of internet at home. Data is showing that 927 (61.3 percent) respondents were having access to internet at home, while 586 (38.7) respondents had no access of internet at home. The data was showing that every computer holder was not having internet access. As comparing to the data of previous table it will be evident that 1206 (79.7%) respondents had PC access but only 927 (61.3 percent) respondents were having internet access at home. Data in the table 4.1 is also elaborating percentage and frequency distribution of respondents according to their level of time spent on computer. Out of total respondents, 28 (1.9 percent) respondents were spending 0 to 1 hour daily on computer while 468 (30.9 percent) respondents were spending 2 to 3 hours daily on computer. A large number of 658 (43.5 percent) respondents was spending 4 to 5 hours daily on computer, while 359 (23.7) percent respondents were spending 6 or more hours on computer daily. Data is showing that approximately 75 percent of the respondents were spending 2 to 5 hours daily on computers.

4.2. Opinion of Students Regarding Different Aspects of Digital Health Literacy

This part of the chapter is elaborating the opinion of different students of different universities about their ICT skills, usages of digital health literacy, different technical challenges to it, different institutional barriers, and level of expertise in searching online health.

Table 4.2: Percentage Distribution of the Respondents According to Their ICT Skills

<table>
<thead>
<tr>
<th>No</th>
<th>Type of ICT</th>
<th>Excellent %</th>
<th>Good  %</th>
<th>Bad  %</th>
<th>Poor %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computer</td>
<td>2.0</td>
<td>1.9</td>
<td>47.3</td>
<td>48.8</td>
</tr>
<tr>
<td>2</td>
<td>Spreadsheet Program</td>
<td>0.5</td>
<td>8.0</td>
<td>65.8</td>
<td>25.6</td>
</tr>
<tr>
<td>3</td>
<td>Graphics</td>
<td>0</td>
<td>8.6</td>
<td>62.8</td>
<td>28.6</td>
</tr>
<tr>
<td>4</td>
<td>Word process</td>
<td>0.6</td>
<td>10.3</td>
<td>69.5</td>
<td>19.6</td>
</tr>
<tr>
<td>5</td>
<td>Desktop publishing</td>
<td>0.8</td>
<td>15.3</td>
<td>59.4</td>
<td>24.5</td>
</tr>
<tr>
<td>6</td>
<td>Presentation</td>
<td>1.1</td>
<td>17.4</td>
<td>59.1</td>
<td>22.4</td>
</tr>
<tr>
<td>7</td>
<td>Internet</td>
<td>1.1</td>
<td>12.4</td>
<td>60.5</td>
<td>26.0</td>
</tr>
<tr>
<td>8</td>
<td>Electronic mail</td>
<td>0.3</td>
<td>7.7</td>
<td>61.3</td>
<td>30.7</td>
</tr>
<tr>
<td>9</td>
<td>Authoring e-content</td>
<td>0.9</td>
<td>5.2</td>
<td>65.4</td>
<td>28.5</td>
</tr>
</tbody>
</table>
Data in the table 4.2 is showing the distribution of respondent according to their level of Information and Communication Technology (ICT) skills. Different indicators are formulated which can specify the ICT Skills of university students of Lahore.

First of all, students were asked about their general skills relating computer. Majority of the students were not having ‘good’ computer skills, as 48.8 percent student had ‘poor’ skills, while 47.3 percent students told that they were ‘bad’ in using computer. Only 2 percent students responded that they had ‘excellent’ skills relating to computer, while 1.9 percent students stated that they were ‘good’ in computer. The results are somehow astonishing as the whole population was educated and was university students, but they were lacking computer skills, perhaps students may had some specific definition of expertise in computer in their mind. Perhaps they were thinking that expertise in computer might be a person who was having master degree in computer. It was estimated by the other questions in which students responded that they were using computer in health literacy.

The students were asked about their skills in ‘Spreadsheet’ program to know about the level of ICT skills. Still majority of the students were not ‘good’ in this program as 65.8 percent of the respondents told that they were ‘bad’ in this program, while 25.6 percent respondent told that they were ‘poor’ in skills relating to spreadsheet program. Only 0.5 percent respondents responded that they were ‘excellent’ and 8 percent students stated that they were ‘good’ in using this program.

Then, students were also asked about their skills in ‘Graphics’ to know about their level of ICT skills. Majority of the students were not ‘good’ in skills relating ‘graphics’, as 62.8 percent students responded that they were having ‘bad’ skills in graphics, while 28.6 percent students stated that they were ‘poor’ in graphics. Not any single student was ‘excellent’ in graphic skills, while only 8.6 percent students were ‘good’ in using graphics.

In the same manner, students were also asked about their knowledge about word process. Students were also lacking skills relating word process as 69.5 percent students responded that they were ‘bad’ in this program, while 19.6 percent students stated that they were ‘poor’ in word
process. Only 0.6 percent students were ‘excellent’ in using word process, while 10.3 percent students were ‘good’ in this program.

To estimate the ranking of ICT skills among respondents, they were also asked about their capacity in using desktop publishing. Majority of the students were not ‘good’ in this kind of publishing as 59.4 percent respondents told that they were ‘bad’ in it, while 24.5 percent respondent told that they were ‘excellent’ in this program, while 15.3 percent respondents stated that they were ‘good’ in using desktop publishing.

Presentation skills on computer were also asked to guess the level of ICT skills of students. Most of the students were not ‘good’ in such skills as 59.1 percent students elaborated that they were ‘bad’ in electronic presentation skills, while 22.4 percent described that they were ‘poor’ in it. A small number of respondents (1.1 percent) were ‘excellent’ in presentation skills, while 17.4 percent respondents were ‘good’ in it.

Then, respondent were also asked about their level of knowledge about using internet to rank their skills in ICT. Data is showing that internet skills of students were not ‘good’ as 60.5 percent respondents described that they were ‘bad’ in internet usage, while 26 percent students responded as ‘poor’ skills in it. A small number of respondents i.e. 1.1 percent were having ‘excellent’ skills in using internet, while 12.4 percent students were ‘good’ in using internet. Then skills in using electronic mail were also used as an indicator to measure the level of ICT skills among students.

A large number of students (61.3 percent) were ‘bad’ in electronic mail skills, while 30.7 percent students were ‘poor’ in such skills. A small number of respondents stated that they were ‘excellent’ in using electronic mail.

Students were also asked about ‘authoring e-content’ skills. Data was showing that 65.4 percent students were ‘bad’ in such skills, while 28.5 percent students were ‘poor’ in such skills. A small number of respondents (0.9) were ‘excellent’ in authoring e-content, while 5.2 percent students were ‘good’ in it.
Table 4.3: Percentage Distribution of the Respondents According to Their Level of Usage of Digital Health Literacy

<table>
<thead>
<tr>
<th>No</th>
<th>Type of ICT</th>
<th>Very Often</th>
<th>Often</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To what extent do you seek health information through computer?</td>
<td>3.8</td>
<td>20.9</td>
<td>41.3</td>
<td>34.0</td>
</tr>
<tr>
<td>2</td>
<td>To what extent do you use computer to get knowledge about your illness?</td>
<td>5.0</td>
<td>16.4</td>
<td>43.1</td>
<td>35.5</td>
</tr>
<tr>
<td>3</td>
<td>To what extent do you use computer to get knowledge about your pain?</td>
<td>0.9</td>
<td>9.3</td>
<td>55.3</td>
<td>34.6</td>
</tr>
<tr>
<td>4</td>
<td>To what extent do you use computer to get access to a doctor?</td>
<td>7.5</td>
<td>21.5</td>
<td>40.9</td>
<td>30.1</td>
</tr>
<tr>
<td>5</td>
<td>To what extent do you use computer to know about the symptoms of different diseases?</td>
<td>1.5</td>
<td>9.5</td>
<td>47.7</td>
<td>41.4</td>
</tr>
<tr>
<td>6</td>
<td>To what extent do you use computers to get knowledge about self medication?</td>
<td>6.6</td>
<td>24.2</td>
<td>49.3</td>
<td>19.9</td>
</tr>
</tbody>
</table>

Scale: 1= Very Often, 2= Often, 3= Rarely, 4= Never

Data in the table 4.3 is showing percentage distribution of the respondents according to their level of usage of digital health literacy. Different indicators were developed to measure the level of usage of digital health literacy among university students. Students’ response was measured on likert scale.

To measure the level of usage, respondents were asked about their seeking behavior in health through computer. Data is showing that 41.3 percent students ‘rarely’ went to computer for health information, while 34 percent respondents were of the view that they ‘never’ searched health information through internet. From the total respondents 20.9 percent respondents used to get information through computer, while 3.8 percent respondents were those who were using computer ‘very often’ to seek health.

Respondents were also asked about the level of usage of ICTs to know about their illness. Data is showing that 35.5 percent respondent ‘never’ used computer to get knowledge about their illness, while 43.1 percent respondents ‘rarely’ used computer to get information about illness. A small number of respondents i.e. 5.0 percent were of the view that they used computer ‘very
often’ to know about their illness, while 16.4 percent respondent were of the view that they used computer ‘often’ for this purpose.

Respondents were also asked about their level of usage of computer in getting knowledge about their pain. Majority of the respondents were not using computer for this purpose as 34.6 percent respondents stated that they never went for information on computer to search about pain, while 55.3 percent respondents were those who ‘rarely’ used computer to get knowledge about their pain. A very small number of respondents i.e. 0.9 percent were using computer ‘very often’ for this purpose, while 9.3 percent respondents ‘often’ used computer to get knowledge about their pain.

Respondents were also asked about their behavior in accessing doctor through computer or internet. Data is showing that 7.5 percent respondents were accessing doctors through ICT ‘very often’, while 21.5 percent respondents ‘often’ used computer to get access to some doctor. The respondents who were ‘rarely’ using computer for this purpose were 40.9 percent of the total respondents, while 30.1 percent used computer to get access to some doctor.

Then, the respondents were asked about their level of usage of ICTs in getting knowledge about the symptoms of different diseases. A small number of respondents i.e. 1.5 percent were using computer ‘very often’ to get knowledge about the symptoms of different diseases, while 9.5 percent respondents used computer ‘often’ for this purpose. Data is showing that 47.7 percent respondents were those who ‘rarely’ used computer to get knowledge about the symptoms of some disease, while 41.4 percent respondents were those who ‘never’ used computer for this purpose.

Students were also asked about the level of usage of ICTs for self-medication. From the total respondents 6.6 percent were of the view that they used computer ‘very often’ for self-medication, while 24.2 percent respondents were those who used computer ‘often’ for this purpose. Data is also indicating that 19.9 percent respondents ‘never’ used computer for self-medication, while 49.3 percent respondents were rarely using computers for such purpose. The overall situation is depicting that students’ level of usage of digital health literacy was smaller to greater extent. There may be many reasons behind this lack of usage. Literature also suggested some reasons because of which there is lack of usage of ICTs in health literacy. Atkinson et al.
(2008) elaborated that lack of education and lack of access to internet resources are the main reasons, which are a great hurdle in the successful implementation of digital health literacy. Dickenson et al. (2004) pointed out that level of usage of digital health literacy is affected by ethnicity.

In short, different factors are affecting the level of usage of digital health literacy. So, next chapter will try to find out those factors.

**Table 4.4: Frequency Distribution of the Respondents According to Their Perception Regarding Technological Barriers in Digital Health Literacy**

<table>
<thead>
<tr>
<th>No</th>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I have lack of guidance in usage of ICT in health seeking.</td>
<td>48.6</td>
<td>47.1</td>
<td>3.3</td>
<td>0.9</td>
</tr>
<tr>
<td>2</td>
<td>I feel it difficult to get health related knowledge through computer.</td>
<td>19.8</td>
<td>59.9</td>
<td>15.1</td>
<td>5.1</td>
</tr>
<tr>
<td>3</td>
<td>The health related knowledge learned through computer is difficult to implement.</td>
<td>45.3</td>
<td>42.3</td>
<td>9.2</td>
<td>3.2</td>
</tr>
<tr>
<td>4</td>
<td>There is lack of ICT trainings relating to health literacy.</td>
<td>25.1</td>
<td>43.2</td>
<td>25.3</td>
<td>6.3</td>
</tr>
<tr>
<td>5</td>
<td>Performance of technology is ‘poor’ in health literacy.</td>
<td>65.7</td>
<td>28.9</td>
<td>5.4</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Using computers for health literacy is much expensive.</td>
<td>35.0</td>
<td>55.3</td>
<td>9.5</td>
<td>0.3</td>
</tr>
<tr>
<td>7</td>
<td>There is lack of new health information on computers.</td>
<td>75.0</td>
<td>24.2</td>
<td>0.5</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Scale: 1= Strongly Agree, 2= Agree, 3= Disagree, 4= Strongly Disagree

Data in the table 4.4 is showing the percentage distribution of the respondents according to their perception regarding technological barriers in successful implementation of digital healthy literacy. Different indicators were formulated to guess the opinion of students regarding the technological barriers. First of all, students were asked about the provision of guidance in ICTs. Data is showing that 48.6 percent respondents were ‘strongly agree’ with the statement that there was provision of guidance relating usage of ICT in health, while 47.1 percent respondents were ‘agree’ with this statement. A small number i.e. 0.9 percent were ‘strongly disagree’ while 3.3 percent were ‘disagree’ with the statement.
Then students were asked about their opinion about the statement if they felt it difficult to get health related knowledge through computer? Data is showing that 19.8 percent respondents were ‘strongly agree’ with the statement that they felt it difficult to get health related knowledge with the help of ICTs, while 59.9 percent respondents were ‘agree’ with this statement. Data is also depicting that 15.1 percent respondents were ‘disagree’ with the statement, while 5.1 percent respondents were ‘strongly disagree’ with the statement.

Respondents were also asked about their opinion about the statement that health related knowledge learned through computer was difficult to implement. Data is elaborating that 42.3 percent respondents were ‘agree’ with the statement that they were feeling it difficult to gain health related knowledge through technology, while 45.3 percent respondents were ‘strongly agree’ with the statement. A small number of respondent i.e. 9.2 percent were ‘disagree’, while only 3.2 percent respondents were ‘strongly disagree’ with the statement.

Opinion of the respondents was also gained about the statement that there was lack of ICT training relating health. A large number of respondents i.e. 43.2 percent were ‘agree’ with the statement, while about one fourth of the respondents i.e. 25 percent were ‘strongly agree’ with the statement that there was lack of ICT training relating digital health literacy. Data is also describing that 25.3 percent respondents were ‘disagree’ with the statement, while 6.3 percent respondents were ‘strongly disagree’ with the statement.

Then respondents were asked about the opinion regarding the statement that performance of technology was ‘poor’ relating digital health literacy. Data is depicting that 28.9 percent students were ‘agree’ while 65.7 percent respondents were ‘strongly agree’ with the statement and 5.4 percent respondents were ‘disagree’ with the statement.

Respondents were also asked about their opinion regarding the statement that usage of ICTs was much expensive for health literacy. About half of the respondents i.e. 55.3 percent were ‘agree’ while 35 percent respondents were ‘strongly agree’ with the statement. Data is also describing that 9.5 percent respondents were ‘disagree’ with the statement, while only 0.3 percent respondents were ‘strongly disagree’ with the statement.

Then students were also asked about their opinion regarding the statement that there was lack of availability of new health information on internet. About 99 percent respondents were
‘agree’ and ‘strongly agree’ with the statement; while about 1 percent respondents were ‘disagree’ and ‘strongly disagree’ with the statement. The overall situation is depicting that majority of the students were suffering from different kind of technological barriers e.g. lack of training in ICTs, lack of guidance, a large amount of expenses on technology, difficult process of getting information and lack of availability of new health information etc.

Different researchers had also pointed out different kinds of technological barrier relating digital health literacy. Pennbridge et al. (1999) pointed out that lack of internet access was a greater barrier because of which individual could not get benefit from health resources.

Esquill et al. (2006) pointed out that patients used to think internet information inaccurate because of which they hesitate to get health information through internet. Brower et al. (2005) pointed out that complex medical and internet terminology and vast illustrations of different topics relating health are the major barriers to the successful implementation of digital.

Table 4.5: Percentage Distributions of the Respondents According to Their Level of Expertise in Digital Health Literacy

<table>
<thead>
<tr>
<th>No</th>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I know what health resources are available on the Internet.</td>
<td>1.2</td>
<td>7.1</td>
<td>42.5</td>
<td>49.2</td>
</tr>
<tr>
<td>2</td>
<td>I know where to find health resources on the Internet.</td>
<td>0</td>
<td>6.0</td>
<td>53.8</td>
<td>40.2</td>
</tr>
<tr>
<td>3</td>
<td>I know how to find health resources on the Internet.</td>
<td>0.3</td>
<td>2.5</td>
<td>46.3</td>
<td>50.8</td>
</tr>
<tr>
<td>4</td>
<td>I know how to use the Internet to answer my questions about health.</td>
<td>0.7</td>
<td>4.6</td>
<td>43.3</td>
<td>51.5</td>
</tr>
<tr>
<td>5</td>
<td>I know how to use the health information I find on the Internet to help me.</td>
<td>5.6</td>
<td>13.9</td>
<td>42.8</td>
<td>37.6</td>
</tr>
<tr>
<td>6</td>
<td>I have the skills I need to evaluate the health resources I find on the Internet.</td>
<td>0</td>
<td>1.6</td>
<td>36.2</td>
<td>62.2</td>
</tr>
</tbody>
</table>
Scale: 1=Strongly Disagree, 2= Disagree, 3=Agree, 4=Strongly Agree.

Data in the table 4.5 is showing percentage distribution of the respondents according to their level of expertise in digital health literacy. Different indicators were formulated to estimate the level of expertise in digital health literacy. Likert scale was used to measure the opinion of the students.

First of all students were asked if they had knowledge about the available health resources on internet? A small number of respondent i.e. 7.1 percent were ‘disagree’ with the statement that they had knowledge about the available health resources online, while 1.2 percent respondents were ‘strongly disagree’ with the statement. Data is depicting that 42.5 percent respondents were ‘agree’ that they had knowledge about available health resources on internet, while 49.2 percent students were ‘strongly agree’ with the statement.

Then opinion of the respondents was asked about the statement, “I know where to find health sources on internet”. Only a small number of respondents i.e. 6.0 percent were ‘disagree’ with the statement, while 94 percent of the respondents were ‘agree’ and ‘strongly agree’ with the statement. Opinion of respondents was also collected relating the statement, “I know how to find health resources on the internet”. The results were showing that approximately 3 percent respondents were ‘disagree’ and ‘strongly disagree’ with the statement, while remaining 97 percent of respondents were ‘agree’ and ‘strongly agree’ with the statement.

Respondent were also asked about their knowledge to use the internet to answer their questions. Data is depicting that 4.6 percent respondents were ‘disagree’ with the idea that they had knowledge to use the internet to answer their questions about health, while a small number of respondents i.e. 0.7 percent were ‘strongly disagree’ with this idea. Approximately 95 percent of respondents were ‘agree’ and ‘strongly agree’ with this notion. Then respondents were also asked about their opinion relating the statement. “I know how to use the health information I find on the internet to help me”. About 19 percent respondents were ‘disagree’ and ‘strongly disagree’ with the statements, while the remaining respondents were ‘agree’ and ‘disagree’ with the statement. Opinion of the respondents was also collected relating the statement, “I have the skills I need to evaluate the health resource on the internet”. A small number of respondents i.e.
1.6 percent were ‘disagree’ with the statement, while 36.2 and 62.2 percent respondents were ‘agree’ and ‘strongly agree’ with the statement respectively.

The overall statement depicts that majority of the respondents had higher level of expertise in searching health through digital resources. Difference can be seen between level of usage and level of expertise in digital health literacy. Data in table 4.10 is showing that health literacy among university students was very low, while data in the table 4.11 is showing that level of expertise in searching digital health was very high. Both results were contradictory to each other. Level of usage was small, while level of expertise was high. According to a general view of logic ‘practice makes a man perfect’, but here even level of usage is low, but level of expertise in searching health is high. But it is possible in the sense that searching any kind of information on internet is much easy with the help of ‘Google’ and other search engines. A person knowing very basic skills of computer and English can search the desired information. So it is possible that a person may have low level of computer usage, but he might know to search out the desired information.

Table 4.6: Percentage Distributions of the Respondents According to Their Opinion about Institutional Challenges Relating Digital Health Literacy

<table>
<thead>
<tr>
<th>No</th>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>There is availability of ICT (Information &amp; Communication Technology) resources in our institution.</td>
<td>4.4</td>
<td>12.8</td>
<td>39.4</td>
<td>43.4</td>
</tr>
<tr>
<td>2</td>
<td>I have access to ICT (Information &amp; Communication Technology) resources in our institution.</td>
<td>10.9</td>
<td>36.2</td>
<td>28.0</td>
<td>24.9</td>
</tr>
<tr>
<td>3</td>
<td>I can get technical support from my institution relating ICT (Information &amp; Communication Technology).</td>
<td>4.6</td>
<td>12.8</td>
<td>49.7</td>
<td>33.0</td>
</tr>
<tr>
<td>4</td>
<td>The university computer lab is much efficient.</td>
<td>4.6</td>
<td>15.3</td>
<td>37.7</td>
<td>42.4</td>
</tr>
<tr>
<td>5</td>
<td>There are enough financial resources in our institution relating to ICT (Information &amp; Communication Technology).</td>
<td>17.4</td>
<td>38.6</td>
<td>28.6</td>
<td>15.4</td>
</tr>
<tr>
<td>6</td>
<td>We can avail every kind of administrative support from our institution relating to ICT (Information &amp; Communication Technology).</td>
<td>2.4</td>
<td>13.9</td>
<td>48.3</td>
<td>35.4</td>
</tr>
</tbody>
</table>
Scales: 1= Strongly Disagree, 2= Disagree, 3= Agree, 4= Strongly Agree.

Data is the table 4.6 is depicting the percentage distribution of the respondents according to their opinion regarding the institutional challenges in digital health literacy. Different indicators had been developed, to measure the opinions of respondents regarding institutional barriers. Likert scale was used to measure the opinion of respondents.

First of all, students were asked about their opinion regarding the statement that there was availability of ICTs in their institution. Data is elaborating that 12.8 percent respondents were ‘disagree’ with the notion that there was availability of ICTs, while 4.4 percent respondents were strongly ‘disagree’ with this idea. On the other hand 39.4 percent respondents were ‘agreeing’ with the statement that there was availability of ICTs in their institution, while 43.3 percent respondents were ‘strongly agree’ with the statement.

Then students were also asked about their opinion relating the statement, “I have access to ICTs in my institution”. From the total respondents 36.2 percent respondents were ‘disagree’ with the statement, while 10.9 percent respondents were ‘strongly disagree’ with the statement. On the other hand 28 percent respondents were ‘agree’ with the idea that they had access to ICTs in their institution, while 24.9 percent respondents were ‘strongly agree’ with this idea.

Respondent were also asked about their opinion relating the statement, “I can get technical support relating ICT from my institution”. Data is showing that 12.8 percent respondents were ‘disagree’, while 4.6 percent respondents were ‘strongly disagree’ with the statement. On the other hand, 49.7 percent respondents were ‘agree’ with the notion that they could get technical support from their institute, while 33 percent respondents were ‘strongly agree’ with this idea. Opinion is also gained regarding the statement, “The university computer lab is much efficient”. Data is depicting that 15.3 percent respondents were ‘disagree’ with the statement, while 4.6 percent respondents were ‘strongly disagree’ with it. On the other hand 37.7 percent respondents were those who were ‘agree’ while 42.3 percent respondents were ‘strongly agree’ with the statement.

Then students were also asked about their opinion relating the statement, “There are enough financial resources in our institution relating ICTs”. Data is showing that 38.6 percent respondents were ‘disagree’ with the statement, while 17.4 percent respondents were ‘strongly
disagree’. On the other hand 28.6 percent respondents were ‘agree’ while 15.4 percent respondents were ‘strongly agree’ with the idea that their institution had enough financial resources relating ICTs.

Opinion is also collected from the respondents relating the statement, “I can avail every kind of administrative support from my institution relating ICTs”. Results are describing that 13.9 percent respondents were ‘disagree’ with the statement, while 2.4 percent were ‘strongly disagree’. On the other hand 48.3 percent respondents were ‘agree’ with the idea that they can avail every kind of administrative support from their institution relating ICTs, while 35.4 percent respondents were ‘strongly agree’ with this statement.

The overall situation is depicting that institutional barriers were not big hurdle in the successful implementation of digital health literacy among university students, yet there were certain institution which were having lack of availability, accessibility financial resources and labs etc.

4.3. Findings of Descriptive Analysis
The main findings of this chapter are as follows:

I. About 84 percent of the students were getting education in General universities in Lahore, while remaining 16 percent were enrolled in Animal Sciences Universities, Health sciences and Engineering universities.

II. About 80 percent university students were having availability of personal computer at their homes.

III. About 62 percent university students of Lahore were enjoying internet facility at home.

IV. About 75 percent university students used to spend 2 to 5 hours daily on computer.

V. University students were not much efficient in ICT skills.

VI. Level of usage of digital health literacy was much low among university students.

VII. University students were suffering different kind of technological barriers relating digital health literacy e.g. lack of guidance, lack of technical support, lack of training and lack of resources etc.

VIII. Level of expertise in digital health literacy was higher among university students as they knew where and how to find pertinent and authentic information.
IX. University students were getting much support relating ICTs from their institutions as they have availability, accessibility, and administrative support from their institutions.

4.4. Summary and Discussion
This chapter described frequency and percentage distributions of the respondents according to their level of usage and expertise in ICTs. Different socio-cultural characteristics of university students and opinion of students regarding different aspects of digital health literacy was included. Total sample size was 1513. First of all frequency and percentage distribution of different socio-demographic factors was measured. Socio-demographic factors were including type of institution, category of gender, level of time spent on computer, availability of PC and internet at home, level of education and level of age.

There were four different types of institutions including general universities, engineering universities, health sciences and animal sciences universities. Majority of the respondents i.e. 83.9 percent were belonging to General universities, while other 16 percent were belonging from remaining three types of institutions. This selection of respondents was made through the help of proportional allocation formula. Majority of the respondents were male, comprising about 64 percent of the total sample size. Males and females were randomly selected.

Only those students were included who were studying in HEC recognized universities. Students from Bs level to PhD level were included. About half of the respondents were doing their Bs/Masters, while remaining students were belonging from MPhil and PhD classes. No special formula was used to choose the students according to their educational level. About 70 percent of the students were from 17 to 24 years old, while remaining 30 percent were having age more than 24 years.

Descriptive analysis depicted that majority of students i.e. 79.7 percent respondents were having availability of computers at home. A person having access to technology can only be expected to use it in health literacy (Pennbridge et al. 1999). Then about 62 percent of the respondents were having internet facility at their home. Data also depicted that about 75 percent respondents were spending 2 to 5 hours daily on computer.

Then students were also asked about their ICT skills. Likert scale was used to measure it. Different indicators (e.g. knowledge of computer, word process, internet and desktop publishing
etc.) were developed to measure the level of expertise in ICTs of students. The results were demonstrating that majority of the university students were not ‘good’ in ICT skills.

Then students were also asked about their level of usage of digital health literacy. It was measured with the help of different indicators. Results showed that level of usage of digital health literacy was much low. Then majority of the students were facing technological barriers in successful implementation of digital health literacy e.g. lack of technical support, training and guidance etc.

Students were having higher level of expertise in digital health literacy. They also responded that they were having support from their institution i.e. availability, accessibility and administrative support. Descriptive analysis depicted that university students had good access and availability of ICT resources. Level of health literacy was not good. Their institutions were also supporting them in this regard; still their level of usage was poor. This chapter only described socio-demographic factors and other factors relating digital health literacy. Next chapter is going to elaborate, which factors are affecting level of usage of digital health literacy, level of technological barriers, level of expertise in digital health literacy and level of institutional barrier in digital health literacy.
5. Analysis Inferential Statistics

As mentioned in ‘Methodology’ chapter, Inferential Statistics was used to test different hypothesis. Test of Normality was applied which showed that there was Lilliefors Significance correction. This correction means that the data was not normally distributed (“Normality”, 2016), (“Lilliefors”, 2016). Non-parametric tests are used in inferential statistics, when data is not normal (Hajian et al. 1997, Siegel, S. 1957).

While keeping in mind the research objectives and different assumption following tests were used:

a) Kruskal-Wallis H test (Non parametric)
b) Dunn test (Non parametric)
c) Mann-Whitney U test (Non parametric)

When independent variables have two or more than two categories, Kruskal-Wallis H test is applied. It is used to measure the relationship between groups of two or more independent variables while affecting the dependent variable (Wallace 1959). Assumptions for using Kruskal-Wallis H test are as follows:

I. It is used when independent variable has two or more categories and when dependent variable is continuous (Breslow 1970).

II. Kruskal-Wallis H elaborates if there is any significant difference within the groups of independent variable during their effect on the dependent variable (Wallace 1959).

III. For this test there should be no participant which is already present in more than one group (Breslow 1970).

IV. Forth assumption needs SPSS. For this, groups (two or above) of independent variable and dependent variable (continuous) were together explored for normality plots through histograms. If the shapes of histograms of different groups of independent variable (while effecting dependent variable) are same, then Kruskal Wallis H test compares median ranks. If the shapes of histograms of different groups of independent variables are different, then Kruskal-Wallis H test is used to compare mean ranks (Campbell 2006) (statistics.laerd.com). In the present research the histograms for different groups of independent variables (while effecting dependent variable) were different in shapes. So in this research Kruskal-Wallis H test was used to compare mean ranks.

V. In the same manner if the shapes of histograms of groups (In case of only two categories of independent variable) of independent variables (while effecting dependent variable)
are different, then Mann-Whitney U test is used to compare mean ranks (Campbell 2006). In the present research shapes of histograms for the groups of independent variable were not identical, so Mann-Whitney U test was applied to compare means.

Kruskal-Wallis H test alone cannot elaborate the strength of relationship. Strength of difference between groups can be calculated by Dunn test. This test is performed by dividing chi-square value to \( \sqrt{n} \) (under root of sample size) (statistics.laerd.com) (Sheskin 2003). Values of the outcome of Dunn test range from 0.1 to 0.5. If the value is near 0.1, it means that there is a small size of effect, value near 0.3 shows medium size of effect and value near 0.5 shows larger size of effect of difference between groups of independent variable while their effect on the dependent variable (statistics.laerd.com).

Kruskal-Wallis H test has also a limitation. It only tells that there is difference between groups and strength of difference (Wallace 1959). It does not tell which groups of independent variable are greatly affecting the dependent variable (Breslow 1970). For such kind of measurement, Post Hoc test is applied in parametric statistics while in non-parametric statistics Mann-Whitney U test is applied (McKnight 2010). Mann-Whitney U test can tell the difference of two groups at single time (Sheskin 2003). When there are more than two groups, these all groups are individually tested with other group (statistics.laerd.com), for example (1,2), (1,3), (1,4), (2,3), (2,4), (3,4). There are four group (1, 2, 3, 4), but Mann whiney U can compare two groups at single time (McKnight 2010), so above mentioned grouping method is adapted.

Statements for null and alternative hypothesis for Kruskal-Wallis H test are written in following manner:

A. Null Hypothesis (Ho): Different groups of independent variable have same distribution for independent group (Siegel et al. 1989).

B. Alternative Hypothesis (H1): Different groups of independent variable have different distribution for independent group (Siegel et al. 1989).

Statements for null and alternative hypothesis for Mann-Whitney U test are written in following manner:

A. Null Hypothesis (Ho): The ranks of groups of independent variable are same for dependent variable (“Mann-Whitney”, 2016).
B. Alternative Hypothesis (H1): The ranks of groups of independent variable are different for dependent variable (“Mann-Whitney”, 2016).

5.1. Hypothesis: 1

H0:
The four different types of institutions have the same distribution for level of usage in digital health literacy

H1:
The four different types of institutions have different distribution for level of usage in digital health literacy

Research question

Do the ranks change in level of usage in digital health literacy among those who belong to different types of institutions?

Table 5.1: Relationship between Type of Institution and Level of Usage of Digital Health Literacy

<table>
<thead>
<tr>
<th>Level of Usage of DHL</th>
<th>Type of Institution</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Sciences</td>
<td>631.21</td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>765.09</td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>774.27</td>
<td></td>
</tr>
<tr>
<td>Health Sciences</td>
<td>568.96</td>
<td></td>
</tr>
</tbody>
</table>

Test Statistics: Chi-Square: 11.517, df: 3, P. value: .009

Analysis

Data in table 5.1 is showing the difference of mean ranks of type of institution for level of usage of digital health literacy. Difference of mean was ranging from 568 to 765. It meant that students belonging to different types of institutions (i.e. Animal Sciences, General, Engineering and Health Sciences) had difference in level of usage of digital health literacy. Then P value (.009) also depicted same kinds of results. P-value was smaller than .05 (confidence interval).
This P. value rejected the null hypothesis, which showed that belonging to different types of universities result into difference of usage of digital health literacy.

Only applying Kruskal-Wallis H test cannot interpret the size of effect by different groups of independent variable on the dependent variable. For this purpose Dunn test was applied. The values of Dunn test ranged from 0.1 to 0.5. Value 0.1 means small size of effect, 0.3 means medium size of effect and 0.5 means large size of effect by the categories of independent variable on the dependent variable. Dunn test was applied manually. For Dunn test chi-square value was divided by under-root sample size (\(\sqrt{n}\)). Our chi-square value was 11.517, as shown in the table, while our sample size was 1513. After taking under-root this value of sample size decreased to 38.89. The answer after applying Dunn test was 0.3, which meant that there was a medium size of effect by the independent variable on the dependent variable.

Then, Kruskal-Wallis H test cannot explain which group of independent variable is significantly different from other group. It only tells that different groups of independent variable are differently affecting dependent variable. To measure the significant difference among different categories of independent variable, Mann-Whitney U test was applied. This test can measure the difference between two groups at a time. The independent variable of this hypothesis had four categories. So, all categories of IV were analyzed pair-wise e.g. (Animal Sciences and Engineering), (Animal Sciences and Health Sciences) etc. Through this process different pair wise categories were made and Mann-Whitney U test was applied.

Table 5.2: Mann-Whitney U Test for Types of Institution and Level of Usage of Digital Health Literacy

<table>
<thead>
<tr>
<th>Level of Usage of DHL</th>
<th>Type of Institution</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Science – General</td>
<td>.032</td>
<td></td>
</tr>
<tr>
<td>Animal Sciences – Engineering</td>
<td>.032</td>
<td></td>
</tr>
<tr>
<td>General – Engineering</td>
<td>.809</td>
<td></td>
</tr>
<tr>
<td>General – Health sciences</td>
<td>.008</td>
<td></td>
</tr>
<tr>
<td>Engineering – Health sciences</td>
<td>.010</td>
<td></td>
</tr>
</tbody>
</table>
Data in the table 5.2 is showing different types of institutions and P-Values calculated through Mann-Whitney U. There were four values which were significant and depicted the groups which were significantly different from each other from the viewpoint of using digital health literacy. The values depicted that level of usage of digital health literacy was significantly different among the students of Animal Sciences Universities as compared to the students of General and Engineering universities. In the same manner, there was significant difference among students of Health sciences universities and students of Engineering and General University students from viewpoint of level of usage of digital health literacy. All such results verified our alternative hypothesis that different groups of independent variable were differently affecting the dependent variable.

Literature also confirmed the results which were mentioned above. Such kind of research was made by Escoffery et al. (2005). But this research was at college level. The purpose of that research was to measure the level of usage of internet for health literacy among students belonging to different types of colleges. The study pointed out that belonging to different types of colleges affects the level of usage of internet in searching health, while the present study also depicted same kind of results.

5.2. **Hypothesis: 2**

**Ho:**

The four different types of institutions have the same distribution for level of expertise in digital health literacy.

**H1:**

The four different types of institutions have different distribution for level of expertise in digital health literacy.

**Research Question:**

Do the rank change in level of expertise in digital health literacy among those who belong to different types of institution?
Table 5.3: Relationship between Type of Institution and Level of Expertise in Digital Health Literacy

<table>
<thead>
<tr>
<th>Type of Institution</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Sciences</td>
<td>1019.62</td>
</tr>
<tr>
<td>General</td>
<td>753.16</td>
</tr>
<tr>
<td>Engineering</td>
<td>732.60</td>
</tr>
<tr>
<td>Health Sciences</td>
<td>623.87</td>
</tr>
</tbody>
</table>

Test Statistics: Chi-Square: 22.657, df: 3, P. value: .000

Analysis:

Data in the table 5.3 illustrated independent variable (Type of institution) and dependent variable (Level of expertise). Independent variable had four different categories, while dependent variable was continuous. The purpose was to observe the effect of different categories of independent variable on the dependent variable. The gap in the mean rank showed that different groups of IV were differently affecting the DV. The mean rank was ranging from 623 to 1017. P. Value (.000) was also smaller to the level of significance (.05), which meant that null hypothesis was rejected while alternative hypothesis was accepted. It showed that students belonging to different types of institutions had different level of expertise relating health literacy among students. There was difference of expertise level among groups of IV.

To estimate the size of effect by different groups of IV on DV, Dunn test was applied. For Dunn test chi-square value was divided by under-root sample size ($\sqrt{n}$). Chi-square value was 22.65, while ($\sqrt{n}$) was 38.98. The results of Dunn test achieved the value of 0.5, which means that IV had large size of effect on the DV. To observe which groups of IV were significantly differently affecting the DV Mann-Whitney U test was applied.

A pair-wise list of different groups of independent variables was made. Mann-Whitney U test was applied.
Table 5.4: Mann-Whitney U Test for Types of Institution and Level of Expertise in Digital Health Literacy

<table>
<thead>
<tr>
<th>Level of Expertise in DHL</th>
<th>Type of institution</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Science – General</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Animal Sciences – Health Science</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>General – Engineering</td>
<td>.577</td>
<td></td>
</tr>
<tr>
<td>General – Health sciences</td>
<td>.091</td>
<td></td>
</tr>
<tr>
<td>Engineering – Health sciences</td>
<td>.162</td>
<td></td>
</tr>
</tbody>
</table>

The table is depicting different pair-wise groups of independent variable. Three pair-wise groups had P. value smaller than level of significance (.05), which means that these groups were significantly differently affecting the dependent variable. Data in the table depicted that level of expertise in digital health literacy among students of Animal Sciences Universities was significantly different as compare to General, Engineering and Health Sciences Universities which depicted that the null hypothesis was rejected and the alternative hypothesis was accepted. So it can be answered that means change in level of expertise in digital health literacy among those who belong to different type of institutions.

There might be bundle of reasons behind it as Yee et al. (2008) explained the factors following ineffective digital health literacy among some institutions. They pointed out that the liability was with the supremacy of hierarchy of different institution. They consider ‘Y’ generation could change the attitude towards eHealth literacy. ‘Y’ generation included those people who born after 1978. They had first-class experience of using technologies, so in the same mode they can do something to execute technology into heath. In opposition, in chain of command of some institutions, seniors were those who born before 1978, who had less exposure towards using latest and new ICT technologies. Therefore, some institutions were different in their level of expertise in digital health literacy.
5.3. Hypothesis: 3

Ho:

The four different types of institutions have the same distribution for level of technological barriers relating digital health literacy.

H1:

The four different types of institutions have different distribution for level of technological barriers relating digital health literacy.

Research question

Do the ranks change in level of technological barriers relating digital health literacy among those who belong to different types of institution?

Table 5.5: Relationship between Type of Institution and Level of Technological Barriers to Digital Health Literacy

<table>
<thead>
<tr>
<th>Type of Institution</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Sciences</td>
<td>826.15</td>
</tr>
<tr>
<td>General</td>
<td>748.45</td>
</tr>
<tr>
<td>Engineering</td>
<td>803.09</td>
</tr>
<tr>
<td>Health Sciences</td>
<td>758.23</td>
</tr>
</tbody>
</table>

Test Statistics: Chi-Square: 3.577, df: 3, P. value: .311

Analysis:

Data in the table 5.5 is depicting the effect of different groups of independent variable (Types of Institutions) on dependent variable (Level of technological barriers). Independent variable had different kind of groups. The purpose was to observe whether different groups of Independent variable had different kinds of effects on technological barriers relating digital health literacy or not? Results from Kruskal-Wallis H test showed that the mean rank of different institution type was ranging from 748 to 826. There was difference of means among different groups, but this difference was not looking much significant. Significance can also be measured through P. Value which was .311. This value is greater than the level of significance (.05), which means here that our null hypothesis was accepted and alternative hypothesis was rejected. It showed that belonging to different kinds of institution had no effect on the technological barriers relating digital health literacy. Students belonging to different types of institutions suffered from same kind of technological barriers. There was no difference among these barriers. Size of effect
of Independent variable on dependent variable was also calculated by dividing chi-square value to $\sqrt{n}$ (Under root sample size), which was smaller than 0.1, which showed that there was approximately no effect of Independent variable on dependent variable.

5.4. **Hypothesis: 4**

**Ho:**

The four different types of institutions have the same distribution for level of institutional barriers relating digital health literacy.

**H1:**

The four different types of institutions have different distribution for level of institutional barriers relating digital health literacy.

Research question:

Do the ranks change in level of institutional barriers relating digital health among those who belong to different types of institutions?

**Table 5.6: Relationship between Type of Institution and Level of Institutional Barriers to Digital Health Literacy**

<table>
<thead>
<tr>
<th>Institutional Barriers to DHL</th>
<th>Type of institution</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Sciences</td>
<td>851.24</td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>753.83</td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>786.25</td>
<td></td>
</tr>
<tr>
<td>Health Sciences</td>
<td>602.54</td>
<td></td>
</tr>
</tbody>
</table>

**Test Statistics:** Chi- Square: 7.587, df: 3, P. value: .055

**Analysis:-**

Data in the table is depicting the effect of independent variable (Type of institution) on the dependent variable (level of institutional barriers relating digital health literacy). Gap was observed in mean ranks among different groups of independent variables, which depicted that students belonging to different institutions were facing different levels of institutional barriers relating digital health literacy. The mean rank was ranging from 602 to 851. P. value (.05) was also significant, which meant that different institution types were significantly different in their
effect on the dependent variable. Students belonging to different types of universities were facing different levels of institutional barriers relating digital health literacy.

To measure the size of effect of independent variable on the dependent variable, Chi-square value (7.587) was divided by \( \sqrt{n} \) (Under root sample size (38.89)). The answer was 0.19. The value showed that independent variable made small size effect on the dependent variable.

To answer which groups of independent variable were significantly different from each other in their effect on the dependent variable, Mann-Whitney U test was applied. Different groups of independent variable were categorized pair-wise, because Mann-Whitney U test can only analyze two groups of independent variable at a single time. The results were as follows.

Table 5.7: Mann-Whitney U Test for Types of Institution and Level of Institutional Barriers in Digital Health Literacy

<table>
<thead>
<tr>
<th>Institutional Barriers to DHL</th>
<th>Type of institution</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Science – General</td>
<td>.114</td>
<td></td>
</tr>
<tr>
<td>Animal Sciences – Engineering</td>
<td>.405</td>
<td></td>
</tr>
<tr>
<td>Animal Sciences Health sciences</td>
<td>.008</td>
<td></td>
</tr>
<tr>
<td>General – Engineering</td>
<td>.378</td>
<td></td>
</tr>
<tr>
<td>General – Health sciences</td>
<td>.042</td>
<td></td>
</tr>
<tr>
<td>Engineering – Health sciences</td>
<td>.030</td>
<td></td>
</tr>
</tbody>
</table>

Data in the table 5.7 is showing that three different pair-wise groups had significant value (smaller than 0.05). This meant that each university in each pair was significantly differently affecting the dependent variables as compare to other university in that pair. For example, students belonging to Health Sciences Universities were facing different levels of institutional barriers as compare to the students of Engineering, General and Animal Sciences Universities. The null hypothesis was rejected which made prediction that mean rank for different types of institutions was same for level of institutional barriers relating digital health literacy. The alternative hypothesis was accepted which forecasted that means of different types of institution were different for institutional barriers relating digital health literacy.
Literature made suggestions that there might be various reasons behind difference of institutional barriers among different types of institutions. Ash et al. (2004) pointed out that transfer of control from the supremacy may result as a fence to eHealth literacy. This shift effects different organizations differently. That’s why institutional policies change from time to time and institution to institution. Winthereik et al. (2005) elaborated their point in a different method. They were of the view that technology adaptation into health had shaped gap between the coordinations of different health practitioners at diverse levels in different institutions.

5.5. Hypothesis: 5
Ho:

The three different levels of education have the same distribution for level of usage of digital health literacy.

H1:

The three different levels of education have different distribution for level of usage of digital health literacy.

Research question:

Do the ranks change in level of usage of digital health literacy among those who are having different levels of education?

Table: 5.8 Relationship between Level of Education and Level of Usage of Digital Health Literacy.

<table>
<thead>
<tr>
<th>Level of Usage Of DHL</th>
<th>Education</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bs/Masters</td>
<td>763.09</td>
</tr>
<tr>
<td></td>
<td>Ms/Mphil,</td>
<td>771.22</td>
</tr>
<tr>
<td></td>
<td>PhD</td>
<td>621.37</td>
</tr>
</tbody>
</table>

Test Statistics: Chi- Square: 11.003, df: 2, P. value: .004

Analysis

Data in the table 5.8 is depicting the effect of Level of education(independent variable) on Level of usage of digital health literacy (dependent variable). The independent variable was
categorical. It was having three different categories (M.A, MPhil. and PhD), while dependent variable was continuous. The aim to study was whether changing the level of education had an effect on the level of usage of digital health literacy among universities students or not? For this purpose, Kruskal-Wallis H test was used as all its assumptions and desired criteria was being fulfilled. Data in the table showed that mean ranks for different categories of independent variable were varying. They ranged from 621 to 771 mean ranks, which further strengthened the argument that means of different levels of education were different for level of using digital health literacy. Another indicator P. value (.004) was also smaller than level of significance, which meant that the null hypothesis was rejected and the alternative hypothesis was accepted. All the three measures clearly concluded that the students belonging to different classes had different level in using digital health literacy. Level of using digital health literacy was not same for all students studying in different universities.

Size of effect of independent variable on the dependent variable was measured by dividing chi-square value (11.003) by √n (Under root sample size). The answer was 0.28. According to non parametric statistical rules, through this value it can be estimated that size of effect was medium.

After analyzing the size of effect it was a target of the study to assess which categories of independent variable were significantly different from each other during their effect on the dependent variable. For measuring such kind of difference statistician suggest to use Mann-Whitney U test. Mann-Whitney U test can only analyze two categories of independent variable in a single calculation, while independent variable was having more than two categories. To manage these categories pair-wise grouping was constructed of the categories of independent variable and then their effect was analyzed on the dependent variable separately in pair form.

Table: 5.9 Mann-Whitney U Tests for Level of Education and Level of Usage of Digital Health Literacy

<table>
<thead>
<tr>
<th>Level of Education</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Usage of DHL</td>
<td></td>
</tr>
<tr>
<td>BS / Master – MS / MPhil.</td>
<td>.695</td>
</tr>
<tr>
<td>BS / Masters – PhD</td>
<td>.001</td>
</tr>
<tr>
<td>MS / MPhil</td>
<td>.002</td>
</tr>
</tbody>
</table>
Details of table 5.9 are depicting that two pair-wise categories of independent variable were significantly differently affecting the dependent variable. As the students of PhD and BS/Masters level were significantly different from each other in usage of DHL. Similarly PhD level students were also significantly different from MS / MPhil level students for usage of DHL.

Here it is concluded that level of usage of DHL was different among students of different levels. Literature also suggested same kind of results. According to Wangberg et al. (2008) usage of online health resources was affected by level of education.

5.6. Hypothesis: 6

Ho:

The three different levels of education have the same distribution for level of expertise in digital health literacy.

H1:

The three different levels of education have different distribution for level of expertise in digital health literacy.

Research question

Do the ranks change in level of expertise in digital health literacy among those, having different level of education?

**Table: 5.10 Relationships between Level of Education and Level of Expertise in Digital Health Literacy**

<table>
<thead>
<tr>
<th>Level of Expertise in DHL</th>
<th>Education</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bs/Masters</td>
<td>743.48</td>
<td></td>
</tr>
<tr>
<td>Ms/Mphil</td>
<td>782.98</td>
<td></td>
</tr>
<tr>
<td>PhD</td>
<td>682.26</td>
<td></td>
</tr>
</tbody>
</table>

Test Statistics: Chi-Square: 6.250, df: 2, P. value: .044
Analysis

Table 5.10 is depicting the effect of Level of education (independent variable) on the Level of expertise in digital health literacy (dependent variable). The independent variable was having three categories. The study objective was to trace whether changing the level of education had an effect on level of expertise in DHL or not? Kruskal-Wallis H. test was employed for this purpose. The analysis depicted that means for different categories of independent variable were varying during their effect on the dependent variable. The mean rank was ranging from 104 to 730, which meant that changing the level of education had no effect on level of expertise in DHL.

To measure the size of effect of independent variable on the dependent variable, Chi-square value (6.250) was divided by \( \sqrt{n} \) (Under root sample size). The outcome of this process was 0.1. It statistically meant that the size of effect independent variable on dependent variable was smaller. It meant that level of expertise was affected by level of education, but not at a significant level. P. value was (0.04) which was smaller than level of significance (0.05). It resulted into the rejection of null hypothesis and acceptance of alternative hypothesis.

To analyze, which categories of Independent variable were more differently significantly affecting the dependent variable, Mann-Whitney U test was applied. For this purpose, categories of Independent variables were categorized pair-wise. Then each pair’s effect was analyzed against the dependent variable.

Table: 5.11 Mann-Whitney U Test for Level of Education and Level of Expertise in DHL

<table>
<thead>
<tr>
<th>Level of Education in DHL</th>
<th>Level of Education</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS/ Masters – MS / MPhil</td>
<td>.088</td>
<td></td>
</tr>
<tr>
<td>BS / Masters – PhD</td>
<td>.180</td>
<td></td>
</tr>
<tr>
<td>MS / MPhil – PhD</td>
<td>.026</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.11 is showing that level of education (Independent variable) had three different categories. The analysis is depicting that there was difference of effect of two categories of independent variable on the dependent variable. MS/MPhil and PhD students were significantly different from each other for their level of expertise in DHL. It again approved that the null
hypothesis was rejected and the alternative hypothesis was accepted. So here it can be added that changing the level of education has an effect on the level of expertise in DHL. Same findings were previously depicted by Birru et al. (2004), who included 8 less literate respondent in the study and concluded that low literate people had no skills of searching health through technology. Gustafson et al. (2002) made review of different reports of comprehensive Health Enhancement Support System (CHESS) and concluded that higher level of education was required to get benefit from DHL. Greenbalgh et al. (2008) also told same kind of association between education and level of expertise in searching health.

5.7. Hypothesis: 7

Ho:

The three different levels of age have the same distribution for level of usage of DHL.

H1:

The three different levels of age have different distribution for level of usage of DHL.

Research question:

Do the ranks change in level of usage of DHL among those who are having different level of ages?

Table: 5.12 Relationship between Level of Age and Level of Usage of DHL

<table>
<thead>
<tr>
<th>Level of Usage of DHL</th>
<th>Age</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17-20</td>
<td>775.66</td>
</tr>
<tr>
<td></td>
<td>21-24</td>
<td>784.97</td>
</tr>
<tr>
<td></td>
<td>25-28</td>
<td>667.79</td>
</tr>
<tr>
<td></td>
<td>29=&gt;</td>
<td>734.65</td>
</tr>
</tbody>
</table>

Test Statistics: Chi-Square: 12.554, df: 3, P. value: .006

Analysis:

Table 5.12 is showing the effect of independent variable (Level of age) on the dependent variable (Level of usage of DHL). The independent variable was categorical having four different
categories, while the dependent variable was continuous. The aim was to analyze whether different categories of independent variable were differently affecting the dependent variable or not? Kruskal-Wallis H test was used to observe the difference of effect of different level of ages on the level of usage of DHL. The mean rank for different categories of independent variable was different. It was ranging from 667 to 784. Then P. value (.006) was also smaller than the level of significance, which meant that the null hypothesis was rejected. So it can be said that students belonging to different categories of age had different level of usage of DHL.

To assess the size of effect of independent variable on the dependent variable, chi-square value (12.554) was divided by $\sqrt{n}$ (Under root sample size (38.89). The answer was 0.3, which meant that the size of effect of independent variable on the dependent variable was medium. This also argued that different levels of age categories had different level of usage of DHL.

To assess, which group of age was different from other age group in its effect on the dependent variable. Mann whiney U test was applied. This test can compare two categories of independent variable against the continuous dependent variable. The pair-wise grouping of the independent variable was categorized in the following manner:

Table: 5.13 Mann-Whitney U Test for Level of Age and Level of Usage of DHL.

<table>
<thead>
<tr>
<th>Level of Usage of DHL</th>
<th>Level of Age</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>17 to 20 – 21-24</td>
<td>.691</td>
<td></td>
</tr>
<tr>
<td>17 to 20 – 25-28</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>17 to 20 – 29=&gt;</td>
<td>.238</td>
<td></td>
</tr>
<tr>
<td>21 to 24 – 25 – 28</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>21 to 24 – 29=&gt;</td>
<td>.155</td>
<td></td>
</tr>
<tr>
<td>25-28 – 29=&gt;</td>
<td>.148</td>
<td></td>
</tr>
</tbody>
</table>

Table 5.13 is depicting the difference of effect by the different categories of independent variable on the dependent variable. Data is showing that students belonging to 17-20 years of age were significantly different from those who were having 25-28 years of age, in their level of usage of DHL. Similarly students having age between 21 to 24 years were significantly different as compare to those who were having 25-28 years of age while their effect on dependent
variable. And students having age between 21 to 24 years also were significantly differently affecting the dependent variable as compare to those who were having age between 25 to 28 years. These results depicted that belonging to different categories of age; differently affect the level of usage of DHL.

Gray et al. (2005) also made same kind of conclusion while stating that student belonging to low age categories were less brilliant to use technology in searching health.

5.8. *Hypothesis: 8*

**Ho:**

The three different levels of age have the same distribution for level of expertise in DHL.

**H1:**

The three different levels of age have different distribution for level of expertise in digital health literacy.

Research question:

Do the ranks change in level of expertise in digital health literacy among those who are having different level of ages?

| Table: 5.14 Relationship between Level of Age and Level of Expertise in DHL |
|---------------------------------|-----------------|-----------------|
| **Level of Expertise in DHL**   | **Age**         | **Mean Rank**   |
| 17-20                            | 736.50          |
| 21-24                            | 734.36          |
| 25-28                            | 752.30          |
| 29⇒                              | 856.50          |

Test Statistics: Chi-Square: 15.247, df: 3, P. value: .002
Analysis:

Table 5.14 is showing the effect of Level of age (independent variable) on the Level of expertise in DHL (dependent variable). Independent variable was categorical, while the dependent variable was continuous. The objective was to search out whether students belonging to different age categories were having different levels of expertise in DHL or not? For this purpose Kruskal-Wallis H test was used. The results of this test showed that different age categories differently affected the dependent variable, as mean rank for each age group was different for dependent variable. These mean ranks were ranging from 738 to 858. P. value (.002) was also significant, which was lower than level of significance (.05). It meant that the null hypothesis was rejected and the alternative hypothesis was accepted. So it can be said that changing the level of age affects the level of expertise in DHL. Then, to assess the size of effect of the independent variable on the dependent variable, chi-square value (15.247) was divided by \( \sqrt{n} \) (Under root sample size). The answer was 0.4, which meant that size of effect by Independent variable on dependent variable was medium. To observe, which categories of independent variable were significantly differently affecting the dependent variable, Mann-Whitney U test was applied. This test can estimate the difference of two categories, while their effect on the dependent variable. The pair-wise structure of the categories of age was as follows.

**Table: 5.15 Mann-Whitney U Test for Level of Age and Level of Expertise in Digital Health Literacy**

<table>
<thead>
<tr>
<th>Level of Expertise in DHL</th>
<th>Level of Age</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17 to 20 – 21-24</td>
<td>.989</td>
</tr>
<tr>
<td></td>
<td>17 to 20 – 25-28</td>
<td>.858</td>
</tr>
<tr>
<td></td>
<td>17 to 20 – 29=&gt;</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>21 to 24 – 25 – 28</td>
<td>.455</td>
</tr>
<tr>
<td></td>
<td>21 to 24 – 29=&gt;</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>25-28 – 29=&gt;</td>
<td>.017</td>
</tr>
</tbody>
</table>
Table 5.15 is showing difference of affect of different categories of independent variable on the dependent variable. Data in table elaborated that students belonging from 17 to 20 years of age were significantly different in level of expertise in DHL, from those students who were having 29 years of age or above. Similarly level of expertise in DHL was significantly different among those who were having age group of 17 to 20 and 29 years of age and above. And the students who were 25 to 28 years old were significantly different from those who were having age of 29 years or above, from view point of level of expertise in DHL. All the results once again approved that the null hypothesis was rejected and the alternative hypothesis was accepted.

Brenner (2003) made same kind of conclusion which pointed out that the association between age and level of expertise in searching health information relating gynecological problem. There was a significant different between the perception of people who were in their twenties and who were in their fifties. Gray et al. (2005) also concluded that there was an association between level of age and level of expertise in searching health.

5.9. **Hypothesis: 9**

**Ho:**

The four different levels of time spent on computer have the same distribution for level of usage of DHL.

**H1:**

The four different levels of time spent on computer have different distribution for level of usage of DHL.

Research question:

Do the ranks change in level of usage of DHL among those who spent different levels of time on computer?
Table: 5.16 Relationship between Levels of Time Spent on Computer and Level of Usage of DHL

<table>
<thead>
<tr>
<th>Level of Usage of DHL</th>
<th>Time spent</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>947.30</td>
<td></td>
</tr>
<tr>
<td>2-3</td>
<td>734.44</td>
<td></td>
</tr>
<tr>
<td>4-5</td>
<td>737.96</td>
<td></td>
</tr>
<tr>
<td>6=&gt;</td>
<td>806.46</td>
<td></td>
</tr>
</tbody>
</table>

Test Statistics: Chi-Square: 11.517, df: 3, P. value: .009

Analysis:

Data in the table 5.16 is showing the effect of independent variable (Level of time spent on computer) on the dependent variable (Level of usage of DHL). Independent variable had four different kinds of categories from view point of time spent on computer. Dependent variable was continuous. The aim was to assess whether different levels of time spent on computer, differently affect the level of usage of DHL or not? Kruskal-Wallis H test was used to measure which categories were significantly differently affecting the dependent variable. Data in the table showed that mean rank was different for each category of the dependent variable. Mean ranks were ranging from 734 to 947. P. value (.006) was also smaller than the level of significance (.05), which meant that our null hypothesis was rejected and alternative hypothesis was accepted. Through the help of these results, it can be concluded that the students, who spent different levels of time on computer, had different level of usage of DHL. To estimate the size of effect by independent variable on the dependent variable, chi-square value (12.544) was divided by $\sqrt{n}$ (Under root sample size). The answer was (0.3), which meant that size of effect was medium. Then to observe, which categories of independent variables were significantly different from each other while effecting the dependent variable, Mann-Whitney U test was applied. For this purpose independent variable categories were structured into pair-wise form, which is mentioned in below situation.
Data in the table 5.17 is depicting that different pair-wise categories of independent variable were significantly differently from each other while their effect on the dependent variable. For example, the students who spent 0-1 hours daily on computer were significantly different as comparing to those students who used computer 2-3 hours daily on computer, from the view point of their level of usage of DHL. In the same manner students spending 0-1 hour on computer had significant different level of usage of digital health, as compare to those who spent 4-5 hours daily on computer. Level of usage was also different between those who spent 2-3 hours and those who spent 6 hours or above on computer. Then students spending 4-5 hours daily on computer had different level of usage as compare to those who spend 6 or above hours on computer. So, it can be concluded that changing the level of spending time, results into changing in level of usage of digital health literacy among students. The results rejected the null hypothesis and accepted the alternative hypothesis. Literature also suggested that level of time spent on computer affects the level of usage and expertise in digital health literacy (Cotten 2004).

5.10. **Hypothesis: 10**

Ho:

The four different levels of time spent on computer have the same distribution for level of expertise in digital health literacy.
H1:

The four different levels of time spent on computer have different distribution for level of expertise in digital health literacy.

Research question:-

Do the ranks change in level of expertise in digital health literacy among those who spend different levels of time on computer?

Table: 5.18 Relationship between Level of Time Spent on Computer and Level of Expertise in Digital Health Literacy

<table>
<thead>
<tr>
<th>Level of Expertise in DHL</th>
<th>0-1</th>
<th>2-3</th>
<th>4-5</th>
<th>6=&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Spent</td>
<td>844.30</td>
<td>777.88</td>
<td>704.57</td>
<td>819.06</td>
</tr>
</tbody>
</table>

Test Statistics: Chi-Square: 19.238, df: 3, P. value: .000

Analysis:-

Data in the table 5.18 is elaborating the effect of independent variable (Level of time) on the dependent variable (Level of expertise in digital health literacy). Independent variable had four different kinds of categories, while dependent variable was continuous. The purpose was to assess whether different groups of independent variable were differently affecting the dependent variable or not? For this purpose Kruskal-Wallis H test was used. The results of the test were showing that means for each group of independent variable were varying, during their effect on the dependent variable, which proved that students had different level of expertise in digital health literacy among those who used to spend different level of time on computer. P. value (.000) was also smaller than the level of significance (0.05), which meant that the null hypothesis was rejected and the alternative hypothesis was accepted.
To calculate the size of effect by the independent variable on the dependent variable, chi-square value (19.238) was divided by \(\sqrt{n}\) (Under root sample size). The answer was 0.5 which means that size of effect by independent variable on dependent variable was large.

Then Mann-Whitney U test was applied to observe which groups of independent variable were significantly different from one another in their effect on the dependent variable. For Mann-Whitney U, pair wise categories were constructed of independent variables which were as follows:

Table: 5.19 Mann-Whitney U Test for Level of Time Spent and Level of Expertise in Digital Health Literacy.

<table>
<thead>
<tr>
<th>Level of Time Spent</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Expertise in DHL</td>
<td></td>
</tr>
<tr>
<td>0-1 to 2-3</td>
<td>.376</td>
</tr>
<tr>
<td>0-1 to 4-5</td>
<td>.07</td>
</tr>
<tr>
<td>0-1 to 6=&gt;</td>
<td>.998</td>
</tr>
<tr>
<td>2-3 to 4-5</td>
<td>.004</td>
</tr>
<tr>
<td>2-3 to 6=&gt;</td>
<td>.148</td>
</tr>
<tr>
<td>4-5 to 6=&gt;</td>
<td>.000</td>
</tr>
</tbody>
</table>

Data in the table 5.19 is showing that some groups of independent variable were differently affecting the dependent variable. Data depicted that level of expertise in digital health literacy was different among those who spend 2 to 3 hours daily on computer as compare to those who spend 4 to 5 hours daily. In the same manner there was significant difference between students who spend 4 to 5 hours and who spend 6 or more hours, from view point of their level of expertise in digital health literacy. This again proved that our null hypothesis was rejected and alternative hypothesis was accepted. Here once again it can be mentioned that rank of time used up on computer had an effect on the level of usage and expertise in digital health literacy (Cotten 2004).

5.11. **Hypothesis: 11**

Ho:

The ranks of gender are same for level of usage of digital health literacy.
H1:

The ranks of gender are different for level of usage of digital health literacy.

**Table: 5.20 Relationship between Gender of Students and Level of Usage of Digital Health Literacy**

<table>
<thead>
<tr>
<th>Level of Usage in DHL</th>
<th>Gender</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>763.41</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>745.65</td>
</tr>
</tbody>
</table>

Test Statistics: P. value: .445

**Analysis:**

Data in the table 5.20 is showing the effect of independent variable (Category of gender) on the dependent variable (Level of usage of digital health literacy). The independent variable was having two categories (Male and Female), while the dependent variable was continuous. The purpose was to observe, whether changing the category of gender had an effect on the level of usage of digital health literacy or not? For this purpose Mann-Whitney U test was used. P. Value (.445) was greater than level of significance (0.05), which proved that the null hypothesis was accepted and the alternative hypothesis was rejected. It showed that male and female students had no difference in their level of usage of digital health literacy.

Redmond (2007) also pointed out same kind of results while stating that males and females had no difference from view point of level of usage digital health literacy.

5.12. **Hypothesis: 12**

**Ho:**

The ranks of gender are same for level of expertise in digital health literacy.

**H1:**

The ranks of gender are different for level of expertise in digital health literacy.
Table: 5.21 Relationships between Gender of Students and Level of Expertise in Digital Health Literacy

<table>
<thead>
<tr>
<th>Expertise Level in DHL</th>
<th>Gender</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>777.00</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>721.58</td>
<td></td>
</tr>
</tbody>
</table>

Test Statistics: P. value: .017

Analysis:-

Data in table 5.21 is showing the effect of independent variable (Category of gender) on the dependent variable (Level of expertise in digital health literacy). Independent variable had two categories (Male and Female), while dependent variable was continuous. The purpose was to observe whether there was difference in level of expertise in digital health literacy among male and female students? P. value (.017) was smaller than level of significance (0.05), which proved that the null hypothesis was rejected, while the alternative hypothesis was accepted. It showed that level of expertise in digital health literacy was significantly different among males and females. Literature also depicted that students and common civic of society could be classified as the recipients of the online health resources. Usage of these online health resources was affected by gender (Atkinson et al. 2009)

5.13. Summary

The study included twelve different kinds of hypotheses. In all hypotheses, independent variables had two or more than two groups, while dependent variables in every hypothesis were continuous. There were five different kinds of independent variable i.e. types of institution, category of gender, level of education, level of age, and level of time spent on computer. There were four dependent variables i.e. barriers to digital health literacy, institutional barriers to digital health literacy, level of expertise in digital health literacy and level of usage of digital health literacy. The purpose was to observe whether the dependent variable was differently affected by the different categories of independent variable or not? Every hypothesis was evaluated in three stages. Firstly it was observed, do the means of each group of independent variable change while affecting the dependent variable or not? For this purpose, Kruskal-Wallis H test was used. It can easily estimate the difference of effect of different groups through P.
value and mean rank. If P. value is smaller than (0.05), then null hypothesis is rejected and alternative hypothesis is accepted.

Secondly, size of effect of independent variable on the dependent variable was observed by dividing the chi-square value (Kruskal-Wallis H test outcome) with $\sqrt{n}$ (under-root sample size). Thirdly, significant difference between each category of independent variable is observed with the help of Mann-Whitney U test.

Results showed that level of usage of digital health literacy was changed with the changing in type of institution. General universities and Engineering universities were significantly different from Animal Sciences Universities from view point of their level of usage of digital health literacy, and Health Science Universities were also significantly different from Engineering and General Universities, in their level of usage of digital health literacy. Same kind of results were also concluded by Escoffery et al. (2005), who pointed out that the ranks of handling of eHealth literacy in 3 diverse colleges of the USA was different. The students were asked; to what extent they had used the internet for searching health in the previous day, week or month. Students belonging to different categories of college were having difference in level of usage of digital health literacy.

From the view point of level of expertise in digital health literacy Animal Sciences Universities were significantly different from General, Engineering and Health Sciences Universities. Some students felt their level of expertise in ICTs ‘poor’, while some students perceived their abilities ‘good’. Literature also suggested same kind of results. Ivanitskaya et al. (2010) attempted to guess how college students price their eHealth literacy abilities, their perceived level of searching relevant information and their perceived level of differentiation between authentic and unauthentic information. From 306 students, 258 (84%) college students supposed their capabilities as ‘excellent’, ‘best’ and ‘good’. While other 16 percent students titled their professed aptitude as ‘poor’ and ‘very poor’.

It was estimated in the study that changing the types of institution had no effect on the technological barriers relating digital health literacy. The reason may be that almost all HEC recognized universities in Pakistan were having availability of technological components. So students, belonging to different types of institutions, were not facing technological barriers.
Pennbridge et al. (1999) made a quantitative study to assess the approach of the respondents, who had internet access. In this study 1007 respondents from California were incorporated. It was a questionnaire supported survey investigation which done that access of internet had a positive connection with level of technology practice in seeking health.

From the view point of institutional barriers Health Sciences Universities were significantly different from General and Engineering Universities. As there was availability and accessibility of ICT resources in all universities, but there was gap in the provision of technical support, guidance, and financial support in different institutions. Provision of institutional facilities was not equal, that’s why students belonging to different universities were suffering different types of institutional barriers. Same kinds of results were also pointed out by Meade et al. (2009) whom specified in their study at Ireland that hurdles to health literacy can be classified. They ordered the “Shortage of time” as crown of the list fence, while “lack of trainings from institutions” was the second more manipulating barrier to HIT. In the same manner Macfarlane et al. (2006) also made a study at Ireland and also ordered groups of the different obstacles to the execution of HIT. At first they put lack of trainings and skill growth workshops from the organizations for lack of eHealth literacy.

The study also concluded that the students belonging to different levels of education had different level of usage and different level of expertise in digital health literacy. Usage of online health resources was affected by education (Wangberg et al. 2008). Dickerson et al. (2004) also pointed out the affiliation of education of patients with fitness looking for behavior on internet. He categorized the patients in two categories, those who attended the college and those who did not attend the college at all. He made the end that the patients who attended college in their life had higher use of technology in looking for health as compare to those who did not attended the college. Same kind of results may be seen in Fogel et al. (2002) study whom made their view that rank of education was linked with use of computer and internet at home. Flynn et al. (2006) made a study to find out the connection between education and health seeking attitude via internet. It was completed that the respondents with higher years of education had a positive involvement with probing health related information online. James et al. (2007) also stated same kind of affiliation between education and health literacy.
Results of the study depicted that different levels of ages had different level of usage and different level of expertise in digital health literacy. In the same manner, changing the level of time spent on computer had an effect on level of usage and expertise of digital health literacy. Meade et al. (2009) indicated in their research at Ireland that fences to health literacy can be categorized. They ranked the “Lack of time” as top of the list barrier to HIT.

It is also found that changing the category of gender had no effect on level of usage of digital health literacy; which means that males and females had equal level of usage of digital health literacy. But level of expertise in digital health literacy was different among males and female. It was also suggested by (Atkinson et al. 2009) that expertise in using digital health literacy was affected by gender.

To conclude, this chapter elaborated that different groups of independent variables were differently affecting the dependent variables.

5.14. Discussion

Quantitative portion was intended to answer three different research questions. The first objective of quantitative portion was to trace institutional challenges and their relation with digital health literacy. Quantitative portion depicted the relationship between institutional challenges and digital health literacy. Results showed that belonging to different types of institutions resulted into different levels of usage of digital health literacy. Students in some universities were better in digital health literacy from those who belong to other types of institutions. This meant that institutions had some relation with digital health literacy. Every institution had different level of ICT resources and difference in guidance, so belonging to different types of institutions resulted into different level of digital health literacy. Literature also confirmed the results which were mentioned above. Such kind of research was made by Escoffery et al. (2005) on college level students. The purpose of that research was to measure the level of usage of internet for health literacy among students belonging to different types of colleges. The study pointed out that belonging to different types of colleges affects the level of usage of internet in searching health, while the present study also depicted same kind of results. From the quantitative analysis and literature review it can be generalized that belonging to different types of institutions results into different levels of using digital health literacy.
Second objective of the research was to trace socio-cultural limitations in digital health literacy among university students. Quantitative portion depicted the relationship between socio-cultural challenges and level of usage of digital health literacy. Quantitative results showed that different socio-cultural characteristics (e.g. Level of age, category of gender, and level of education) differently affect the level of usage of digital health literacy. Previous researches also depicted same kind of findings. For example people belonging to different levels of age (Brenner 2003, Gray et al. 2005, Mancini et al. 2010) have different level of usage of digital health literacy. In the same manner it was suggested that people having different levels of education (Fogel et al. 2002, Flynn et al. 2006, James et al. 2007, Greenhalgh et al. 2008) had difference in usage of digital health literacy. Here it can be concluded that there are different socio-cultural challenges (Age, education, ICT skills, difficult terminology) relating digital health literacy and people belonging to different socio-cultural characteristics had difference in level of usage of digital health literacy.

Third objective tried to probe the technological barriers related to digital health literacy among university students. It was observed that technological barriers decrease the usage level of digital health literacy. The previous findings were also depicting that there were different kinds of technological barriers e.g. lack of availability and accessibility of ICT resources (Pennbridge et al. 1999, Helft et al. 2005), lack of efficient labs (Blackburn et al. 2005, Ibrahim et al. 2006), lack of guidance and training (Dart 2008), and lack of technical and administrative support (Pennbridge et al. 1999, Boukhors et al. 2003, Anhoj et al. 2004). Students were of the view that technological barriers decrease the chances of using electronic sources in searching health. So it is concluded that technological challenges had an effect on digital health literacy.

Technology Acceptance Model (TAM) by Fred Davis (1989) was used as theoretical support for the study which made the view that technology usage is affected by Perceived Ease of Use (PEU) and Perceived Usefulness (PU). Literature depicted that different researchers used different indicators to measure PEU and PU. The quantitative portion used predetermined themes to measure PEU (easy to operate, easy to perform desired work, applications are softer, applications are flexible) and PU (Increase health information, Increase performance, Increase effectiveness of health). The results are depicting that PU and PEU are directly linked to the usage of digital health literacy. To summarize the discussion it can be concluded that TAM model is quite pertinent to the present quantitative findings.
6. Qualitative Analysis

This chapter is containing the results of FGDs and in-depth interviews. Eight main FGDs and eight in-depth interviews were conducted. Two FGDs were conducted from each type of institution i.e. General universities, Health sciences universities, Engineering universities and Animal sciences universities. From every type of institution one group of males and one group of females was selected. Number of respondents in each FGD was six. In the same manner for in-depth interviews, two respondents (one male, one female) were selected from each type of institution.

FGDs and in-depth interviews adopted interviewing technique. Participants of FGDs were homogeneous in characteristics, who were asked about many predetermined and situational questions. Participants were allowed to hear the opinion of other members in the group and were allowed to make their own opinion. The aim was to collect maximum data relating three objectives of qualitative research. Group interaction helped the researcher to greater extent to explore new ideas, concepts, variables and themes relating research topic.

There were three main objectives on which opinions were taken from different respondents in different FGDs and in-depth interviews, and a large amount of themes was collected relating our objectives. The main objectives of FGDs were as follows.

I. To trace out different sources of health information.
II. To explore why people are not using digital health literacy?
III. To explore some suggestions from the respondents to improve digital health literacy.

There were only three main objectives of FGDs and in-depth interviews, but number of different questions was raised to search out the answers of these objectives. First of all respondents were briefly guided about the concept ‘Digital Health Literacy’ and they were also told about the importance of the topic. They were directed to be focused on the topic.

6.1. Objective: 1 what are different sources of health information?
Following themes were induced about the above mentioned objective from university students through the help of FGDs and in-depth interviews. Themes were as follows.
6.1.1. Role of Health Practitioners in Promotion of Health Information

During treatment physicians and doctors share much information relating the disease. Doctors, most of the time tells causes and preventions of that disease. They suggest different medicines as well. They also make their opinion about health tips, whenever they are asked. Sometimes, they tell when and how much medicine should be used (Schoen et al. 2012). Laboratory attendants also share their view point regarding X-rays and ultra sounds etc. Visiting a doctor, surgeon or some health professional is also a good source of getting health related information (Ishengoma et al. 2009). Patients suffering from different kinds of diseases consult some doctors, who tell them about the causes, effects and treatment of that disease (Ajuwon 2015). Traditional quacks also spread knowledge about the advantages of different herbs (Agarwal, V. et al. 2014)

One of the female students during FGD depicted that:

“I immediately consult doctors, physicians or other health professional after appearance of some symptoms of any disease. Physicians not only perform the treatment, but also guide about the basic health information relating that particular disease.”

During in-depth interviews one male student made his point of view that laboratory technicians were a great source of health information. He was of the view that

“Whenever I under-go some X-ray or ultrasound, laboratory attendants also guide me about the results of these X-rays etc. which enhances basic health knowledge”

A male student during in-depth interview elaborated his view point that

“Hakims (Quacks) are there with different kinds of herbal medicines. It is believed in my culture that medicines prescribed by ‘Hakims’ have no kind of side effect. My friends advised me to consult such ‘Hakims’ for sexual health.”

It is gathered from the above discussion and annotations that doctors, physicians, health practitioners, laboratory attendants and other paramedical staff were a great source of health
information for university students. They provided much guidance relating symptoms of diseases and their solution.

6.1.2. Television/Radio and Health Information

Television is a good and authentic source of health information (Gray et al. 2005). There are different programs on television which guide about health, different diseases, different exercises and different diets. Different doctors, physicians, surgeons, gynecologists and other health professionals are invited on different TV channels in different programs, who inculcate reliable health information to their viewers (Caraher et al. 2000). Such doctors and physicians are most of the time, specialist in their fields. Their recommendations and prescriptions are very fruitful for the patients as well as for general public of society (Gray et al. 2014).

Different programs can be listened on radio relating health information, where different doctors guide people about different diseases and their preventions (Farr et al. 2005). Some traditional quacks also give their opinion to improve health (Rowe et al. 2005). Importance of different exercises is also told on different radio stations (Austin et al. 2014). Different radio stations are providing the facilities of different health professionals in their programs. Doctors are asked about different questions from different patients. Such questions are received through mail, email or telephone (Zare Mehrjerdi, Y. 2011). Traditional quakes are also invited in such kind of programs. They tell about the advantages of different diseases. They are listened by the majority of population, as Pakistani population has a bent towards herbal medication (Ali et al. 2009).

One male student during FGD elaborated that

“I often use to listen to different kinds of health related programs which are frequently played on radio, in which different kind of health professionals and experts are invited. Their opinion is much useful and authentic.”

One female student during in-depth interview pointed out that a channel named as ‘Health TV’ is playing a great role in spreading health related information. She illustrated that

“There are different kinds of health related programs on Television. Such kinds of health related programs are full of health information. Health TV is a channel, which transmits
its programs throughout the day relating health. Different kinds of health professionals are invited in different programs. They discuss different diseases and their solutions”.

A female student told that

“"I often use to ask health related question from live TV programs. Some programs are telecasted live, during these kinds of programs; viewers are given with some telephone numbers, so that they can discuss their health problem with the doctors.”

One of the male students during FGD elaborated that

“"Some TV advertisements include health information. These advertisements tell the advantages of milk, advantages of some shampoo, advantage of some medicine, advantage of some soaps etc. which result into health information.”

The above data and remarks show that different channels on TV and radio present different kinds of opinions of health professionals e.g. doctors, surgeons and physicians etc. They share health information to general audience. They also conduct some question-answer sessions, in which different patients ask about their diseases. This creates much information for lay men.

6.1.3. Internet and Health Information

Internet is playing a vital role in the promotion of health information. Views of national and international doctors, physicians and surgeons can be found on internet (Chu et al. 2009). A person suffering from pain, illness, tension, depression or some kind of other disorder can get guidance about his problem from internet (Diaz et al. 2005). Internet is also used for telemedicine and e-prescribing. Search engines can provide a lot of information in response to some composed words (Sharma et al. 2009). certain kinds of websites are there which are only promoting health information. Different kind of health related websites are there to guide the doctors as well as patients (Cohen et al. 2011). Search engines and different encyclopedias have made the searching activity very easy. By putting some word in the search box will result into great information relating that specific topic (Lawrentschuk et al. 2012).
Different websites have much material to guide about health. Online sources are providing large amount of health information. Internet provides the facility of telemedicine and online appointment with doctor (Kashem et al. 2008). Different diseases, their symptoms, causes and their prevention can be searched by using different kind of search engines and encyclopedias etc. (Ziebland 2013). Positive and negative effects of medicines can also be searched on the internet (Ammenwerth et al. 2008). Online advice can also be taken from some national or international doctor, who is doing online practice. Different dieting and exercises plans are also available on internet, which also promote health information (Cohen et al. 2011).

A female student during in-depth interview shared her view point that advice can be taken from national and international doctor through the help of internet. She was of the view that

“I often use different health related websites. Such websites provide the facility of online doctors, where I use to discuss my problem with some national or international doctor.”

During FGDs a male student suggested that through different discussion blogs on internet, one can get knowledge, as different patients shares their personal experiences relating some disease. He made his view point that

“I get benefit from different discussion blogs as there are different kinds of discussion blogs on internet. In such kind of blogs there are different kinds of doctors, patients and general members of society. They share their opinions about some disease and its treatment. Most of people share their personal experiences relating some disease.”

During in-depth interview a male student described that there was also presence of health related literature in Urdu on internet. He told that

“I do not feel easy with English language. In Pakistan, Urdu is the language of majority of the population. There is health related information in Urdu on different websites, like Dr. Noor clinic is providing information in Urdu on internet about different psychological diseases.”

A female student during FGD elaborated that getting health information is much easy with the help of internet. She pointed out that
“I often use to visit Medpk.com. This is a website, which is guiding the patients about different diseases, their symptoms, their treatment and they also guide about different medicines, their usages and their side effects. This is a very easy source of getting health information for me.”

The above themes are depicting that internet is a great source of health information. One can put the name of one’s disease on any search engine to know the details about some disease. Search engines, encyclopedias, different blogs, websites and other sources help the patient to know about the symptoms of diseases, cause of disease, and medication of diseases etc.

6.1.4. Leaflets and Labels of Medicines

Labels of different medicines are a good source of health information (Colby et al. 2010). Such labels are enriched with the advantages and side effects of some disease. Labels also guide the usage quantity of medicine, which is different for different age groups (Tong et al. 2014). Labels also guide about the ingredients which are found in medicines. These all result into broader information relating health (Colby et al. 2010).

During in-depth interview a student pointed out that leaflets of medicines are a good source of health information. She exemplify that

“Labels of different medicines create knowledge about the functions of that medicine. These labels also guide about the side effects of the medicines.”

During in-depth interview another student pointed out that

“Labels and leaflets of different medicines create good knowledge about different diseases, their solutions, different medical formulas, different ingredients of some medicines and different precautions. These labels and leaflets are always full of health information.”

Hence, it is observed and gathered from the above information that labels and leaflets wrapped over the medicines guide much about functions of medicines, its usages, its ingredients and different medical formulas etc., which ultimately results into broader information regarding health.
6.1.5. Family Members/Peer Patients and Health Knowledge

Sometimes friends and family members are enriched with health information. They are mostly consulted, whenever there is need of health information (Rees et al. 2000).

Peer patient is also another source of gaining health information. Peer patients are those patients whom have same kind of diseases (Heisler 2009). Every patient has different kind of experiences relating their disease. So sharing their experiences with others who have same disease, increases knowledge among the patients (Maertzdorf, J. et al. 2012).

Story sharing by peer patients, results into enhancement of health information relating different diseases, their causes and remedies. Interaction with the people who are suffering from different diseases creates a good knowledge relating health (Ziebland et al. 2012). A person, who is suffering from some chronic disease, may have a good knowledge of that disease (Vance et al. 2009). Patients use to tell about their diseases, physicians and medicines, in response other patients also share their views, which ultimately results into promotion of health knowledge (Ziebland et al. 2012).

A male student during in-depth interview elaborated that sharing health related problems with others who are suffering from same kind of disease also enhances the information level about that disease. He pointed out that

“Two of my friends were suffering from diabetes. They guided me about the adversity of disease and sent me to a pertinent doctor. They also guided me about the instruments through which diabetes level can be measured.”

During FGD a female student expressed her view point that

“Some diseases are inherited. I am suffering from diabetes and my father is also suffering from this disease. In case of this disease, my father shares his view point and experiences with me, which results into increase in knowledge.”

It is well established from the above remarks that family members and persons suffering from chronological diseases share their personal experiences with one another. This results into good health information for patients.
6.1.6. Print Media/Books and Health Information

Literature from different newspapers, magazines, journals, articles, labels of medicines and different health related books is a great source of knowledge about different diseases and their treatment (Marcus et al. 1998). Newspapers guide much about balance diets and exercises. Advantages of different fruits and vegetables are occasionally mentioned in newspapers (Rains 2007). Different newspapers publish interview of some specialized doctor or surgeon once in a week. Different health tips and medicines can be found in newspapers, for example how to reduce belly, how to stop falling hair and how to get rid of cough etc. (Bodemer et al. 2012).

A female student made her viewpoint during FGD that

“Mid-week, weekly and monthly magazines are containing health information. They include opinion of health professionals, doctors and physicians etc.”

During FGD a student was of the view that books relating health were a great source of health information. Students of medical sciences get a large amount of information through these books. A student made his argument that

“Being a student of MBBS I feel that Syllabus books are a great source of health information. Books relating medicines, diseases, biological functions, herbs, surgeries, physiology, pathology, pharmacology and anatomy etc. provide a large amount of health related information.”

The above stances and remarks are very straightforward but comprehensive and elaborating that syllabus books of health sciences students are a great source of health information for them. In the same manner articles, journals and news of print media inculcate much knowledge relating health among general members of society.

6.1.7. Role of BHUs, LHV's, RHCs and other Health related Institutions in Promotion of Health Information

Basic Health units (BHUs) are there in every union council in every province of Pakistan (Ullah et al. 2009). Through these units different kind of health information can be collected. It is easy way of getting health information, because such kinds of BHUs are available in every union council. So, woman had no need to travel much to get health information (Bhutta et al. 2009). Basic health units provide information relating reproductive health, maternal and child health,
and pre-natal and post-natal care. They also guide about the family planning (Majrooh et al. 2015).

Lady health visitors (LHVs) are great sources of health information among females, especially these LHVs are giving benefit to those women, who are less educated and cannot travel long distance for health (Jehan et al. 2009). These LHVs go door to door and mobilize the woman towards healthy life. They give basic health related information. They also guide about reproductive health of female. They deliver different reproductive medicines without any charges (Akram et al. 2015).

Rural Health Centers (RHCs) are there which are promoting health information among rural areas of Pakistan. They are giving benefits to poor females, who cannot afford expensive medical services (Hassan et al. 2012).

There are different kinds of health related institutions in Pakistan e.g. Institution of Family Planning, population welfare, Ministry of health, Tehsil Head Quarters (THQs) hospitals, District Head Quarters (DHQs) hospitals, and social security hospitals etc. (Ahmad 2012). Such kind of hospitals and institutions are promoting health information through different ways. They are having expert physicians and health professionals who not only focus to combat different diseases but also create awareness among general population about different diseases (Naeem et al. 2013).

During in-depth interview a female student was of the view that

“BHUs are greatly facilitating the mothers about baby-mother health care. I used to take pre-natal and post natal information and services through BHUs. Females have no need to travel long distances for basic health facilities”

During in-depth interview a female student made her argument that

“I had never gone to anywhere for polio drops and vaccination for my baby girl because of the very appropriate services of LHVs. Role of LHVs is much important for female for their reproductive health. This is a door to door service. Medication is also free in cost.”

A female student during in-depth interview elaborated that
“I am unlucky that no RHC is located near my home as these RHCs are not available in every union council, yet I managed to get access some far reaching RHC for some gynecological service. These not only provide consultation and medication but also perform activities to enhance basic health information especially relating reproductive health of females.”

One of the female respondents was of the view that

“My husband is working in a local food factory because of which I can get services from social security hospital. I often use to consult this hospital whenever there is some health related issue.”

It is gathered from the above discussion and commentaries that BHUs, RHCs, LHV’s and other health related institutions are providing services and information about reproductive health and mother and child care etc. through different ways and methods.

6.1.8. Role of NGOs in Promotion of Health Knowledge

Different NGOs have become a source of health information (Lucas 2008). Different NGOs spread health information through their advertisement, different banners, flags, and brochures etc. They also organize different kinds of walks relating health information. They conduct different kinds of seminars and conference to enhance the health information about some specific or general diseases (Bebbington et al. 2008). They also sponsor different BHUs and RHCs and perform different activities with their co-ordination (Ejaz et al. 2011).

A female respondent told that she got health information through an NGO. She expressed that

“Different kinds of NGOs are there which are working for health. I used to get health information through an NGO named as Health Oriented Preventive Education (HOPE) which provided me with basic health knowledge during seminars in my university.”

The above stance and comment is very simple but comprehensive. It is elaborating that role of NGOs is much important in promotion of health information among general members of society.

6.1.9. Class Activities/Practical Works and Promotion of Health Information

Class activities for health sciences students are a great source of health information (Goyal et al. 2010). During course work, lectures of variety of teachers on different health related
topics are included which tell about different kinds of diseases, their causes, their effects and their treatment. Historical developments of some disease and their treatments are also focused upon (Goyal et al. 2010).

House job and other practical works with patients also give much more information relating health (Cave et al. 2009). Different patients are having different kinds of diseases. Every new disease motivates to search out health information relating that disease. This ultimately results into new health information. Practical work is also included with the course work. Students are required to perform a lot of practical work during their degree. Through which they get load of knowledge about health (Cave et al. 2009). Students are often asked to dissect the bodies of different animals, birds and other animates. They are guided about the functions of different organs. Students practically operate different organs, because of which they get a lot of health related knowledge (McCray, A. T. 2005).

A female student during in-depth interview pointed out that course work of health sciences subjects is full of health related knowledge. She explained that

“Different syllabus books are a great source of getting health information. From last three years I am student of MBBS. During these years I had read different books relating different diseases and their treatments.”

A female student during in-depth interview elaborated the importance of class work and guidance from seniors. She made her point that

“I ever got guidance relating health from senior doctors, practitioners, physicians and surgeons etc. during class work or during practice.”

A male student during in-depth interview pointed out the importance of house job in promotion of health information. He was of the view that

“House job is another source of getting health related information. In Pakistan, students of health sciences have to perform house job after the completion of their course work. They have to work in a hospital or health related institution for six month or one year. During this activity they get interaction with bundle of senior doctors and thousands of
patients of different diseases. Such kind of interaction with doctors and patients results into a great knowledge relating health.”

The above data and remarks show that class activities of health sciences’ students enhance their level of knowledge regarding health. Whenever they go for a practical work or do house job, this activity inculcates good knowledge about health.

6.1.10. Special organized Conferences, ‘Walks’ and Celebration of Health Days

On different occasions ‘Walks’ are arranged to promote health information among common members of society (Yasmeen et al. 2015). People participating in such kind of walks are having different kind of banners, flags or ribbons, on which health related information is printed, which creates awareness about the importance of health. Celebration of health days e.g. hepatitis day or cancer day brings the concentration of people towards that specific disease (Scandurra, I.2008).

Different kinds of seminars relating health information are frequently conducted by NGOs, government agencies, and different Universities. These kinds of seminars inculcate larger amount of health related information and tell about new advancements in health and medicine (Scandurra, I.2008).

A female student during FGD made her argument that seminars provided the opportunities to know the view points of different national and international health professionals. She illustrated that

“In Health Sciences universities, there are usually arranged different kinds of seminars and international conferences. During last three years I got chance to attend many seminars arranged by my university. Such kind of seminars and international conferences include different researches of national and international researchers.”

A male student during FGD elaborated that different health related conferences create knowledge about different transferable diseases. He pointed out that

“Different kinds of seminars, arranged by different health sciences institutes, NGOs, or government agencies also promote health information. I got much more details relating Dengue and Tuberculosis in a seminar recently organized by my university.”
One of the female students during FGD elaborated her viewpoint that

“Occasionally there are organized different kinds of walks on some special days. Being the participant of different walks throughout the year on different health days e.g. cancer day, hepatitis day etc., I got much awareness about these diseases.”

The above stance and comment is very simple but comprehensive. It is elaborating that different kinds of health related conferences, celebration of health days and specially organized ‘Walks’ relating health motivate people towards healthy life.

6.1.11. Active and Passive Sources of Health Information

Active and passive sources of health information bring a lot of information to the general members of society (Staszewski et al. 2009). Active sources are those, which have special aim to spread health information e.g. health sciences universities, medical Journals, articles relating health, online medical sources and medical books etc. (Fox 2011). Passive sources are also a great source of obtaining health information. Passive sources are those, which are spreading health information, but they are not intentionally established to promote health information. For example newspapers, television, radio, magazines etc. spread health information, but their original purpose is not to promote health information (Marrie, R. A. et al. 2013)

A female student categorized health information sources as active and passive sources. She further elaborated that

“I think that health information sources can be categorized into active and passive sources. Active sources like medical books, journals, articles and syllabus of MBBS etc. are a great source of health related information. These sources are intended to spread health information. There are certain kinds of other sources (passive) which are latently spreading health information. They include TV, radio, newspapers and magazines etc. ”

In above mentioned comment the respondent had categorized the health information resources i.e. active sources and passive sources. Both sources are much functional for the information of health.
6.1.12. Role of Social Media/Mobile Apps in Promotion of Health Information

Social media is a good source of getting health information (Jones et al. 2009). There are Facebook, Twitter, WhatsApp, and other social webs, on which people share their view with other people (Chouet al. 2009). There are different health and medicine related pages on Facebook, through which a lay man can get guidance. Then, through these social webs a person can share his experiences relating his disease, which will become a source of health information for other patients (Korda, H. 2013).

There are also certain kinds of apps in smart mobile phones, which guide the users about dieting and exercises plans (Ventola 2014). Some application helps to measure sugar level and (Blood Pressure) B.P. level of the patients. Like internet and computers, mobile phones are also assisting in the promotion of health related knowledge (Klasnja et al. 2012). There are different kinds of applications is smart mobile phones, which have different diseases calculation charts, through which a patient can calculate the intensity of his diseases. There are also applications, which demonstrate different kinds of exercises (Ventola 2014).

A male student during in-depth interview strongly recommended the usage of mobile apps to increase knowledge about health. He made his argument that

“For me mobile apps are more fruitful than computer apps as the mobile apps guide me about the sugar level and B.P indexes. Different kind of exercises can also be learned from such kind of apps.”

A female student during FGD made her argument that

“I had joined three different health related pages on Facebook. Through these pages I keep myself modernized relating different health topics. Through these pages I can ask different questions relating health from the whole group which are the member of that specific page.”

The above themes are elaborating that there is presence of different health related pages on social networking websites which are inculcating good health information among their users. In the same manner there are different android applications of smart mobile phones which are providing health knowledge.
6.1.13. To Summarize

The above mentioned state of affairs is depicting the results of different FGDs and in-depth interviews, conducted in four different types of institutions i.e. General universities, Health Sciences universities, Engineering universities and Animal Sciences universities. The objective was to trace different health information sources of students in different types of institutions. FGD is an inductive process, so different kinds of themes were induced from the study. Students were getting health information through different channels. Some were getting information from print and electronic media, while some were getting information through doctors, physicians and different practitioners etc. Health information was also generated by different seminars, walks, conferences and lectures etc. on health issues. Some students were of the view that computer and mobile apps were guiding them relating health. In short different themes come in front of us during FGDs and in-depth interviews.

6.2.: Objective: 2 To explore why students are not using digital health literacy?

Focus group discussions and in-depth interviews were conducted on different students of four different types of institutions. The objective was to trace why students were not using digital health literacy or what kind of hurdles they were facing in the implementation of digital health literacy? Their opinions are as follows.

6.2.1. Complexity of Language and Procedures of Internet

Language of internet is difficult to understand (Eisenstein 2013). While on some health related websites, there is load of medical terms which are too complex to understand. Names of different medicines, diseases and different medicine formulas are much difficult to understand (Berland et al. 2001). Without understanding any information, it is impossible to implement that information. There are lot of health websites, health journals and articles relating health, available on internet. But the information present in them is too difficult to understand. Students of medicine can only understand the terminologies relating health topics (Walsh et al. 2008).

Understanding the complex medical terminology is a major issue, which hinders the student to get health information through internet (Wilson et al. 2010). Online health information is difficult to understand and implement (Craig et al. 2008). Different kinds of diseases have different kind of precaution. A person can read many precautions of different diseases. As a
matter of fact, a person can suffer any kind of disease at any stage of life, but how it will be possible for him to adopt all kind of precautions of all diseases (Berland et al. 2001).

Health related websites, Journals and magazines are full of complex medical terminologies, which are not easy to understand (Wilson et al. 2010). A person, who went to read it, had to consult dictionary again and again. It looks like that this information is not for patients or lay men, but it is for health professionals only. To understand the language of such website, one must be a doctor or physician (Craig et al. 2008).

Consulting an online doctor is a multifaceted course of action (Umefjord et al. 2003). First of all it is much difficult to communicate with a doctor having different language than the patient. Then paying online is also a difficult procedure. Such kind of payment needs some credit card. So they avoid consulting some online doctors (Umefjord et al. 2003).

Opening health information is difficult as compare to opening amusement websites (Hilt et al. 2004). If a person writes the name of some disease in the search box, there will be opened a cluster of information in front of him. A number of websites will be there on the screen (Kim et al. 1999). It will be difficult for a person to open the pertinent website. After wasting a great amount of time he may start up with some website, but he will feel difficult, when this information will not match with the information of some other website, because most of the time there is contradiction of ideas among different websites (Borzekowski et al. 2001). A male respondent made his argument that

“Opening health information is difficult as compare to the opening of music, movies, videos and games. By putting the name of some song, movie or game, pertinent information is quickly present on computer screen. But searching about health takes much time and great pain.”

A female student pointed out that language of health related websites is too difficult to understand. She was of the view that

“There is load of complex languages and difficult medical terminology on health related websites. I am not a student of health sciences, while language used in different websites can only be understood by students of medicine etc.”
During in-depth interview a male student pointed out that health information on internet is only understandable for health professionals. He added that

“I think that information present on internet is only to guide the doctors, physicians and surgeons etc., as the names of different medicines, vitamins, chemicals and formulas can only be understood by some health professional.”

A male respondent made his view point that

“I most of the time think to consult some online doctor but I am not sure that my online payment will be safe transaction and there is no fraud behind it. Procedure of online payment to doctors is once again a difficult procedure.”

A female respondent during FGD explained that

“Language and terminology of health related topics disturb me. There are much complex medical terms, which are not understandable for a lay man. Names of different diseases, different treatments and different medicines are much complex. It looks like such kind of online health information is only for doctors, physicians, surgeons and other health professionals.”

It is gathered from the above discussion and commentaries that there were different kinds of procedural, language and terminological complexities in online searching health information which hinder people from using online health information resources.

6.2.2. Lack of ICT Skills and Dependency Level of Students

Lack of ICT skills is a great hurdle in searching pertinent health information on internet. Some websites have quite difficult procedures for searching information (Samuel et al. 2004). They often require making some User ID. Most of the time passwords are forgotten. Less knowledge of using different health websites is also a great hindrance (Arief et al. 2013).

ICT skills are required to get health related information through computer and internet. Lack of ICT skills becomes a hurdle to search health related information through internet (Smith et al. 2009). People have basic knowledge about the usage of computer, but locating authentic and pertinent information sometimes becomes a problem (Devanbu et al. 2003).
Using computer and other ICT resources sometimes, increase the dependency level of students and teachers. Most of the times, they are not expert in usage of ICT resources. Sometimes, they need guidance, so they have to consult some senior. Students feel hesitation in taking such kind of guidance again and again (Mioduser et al. 2003).

During FGD a male respondent elaborated that

“Our Seniors including teachers, professors and other educated persons in university have fewer tendencies to guide about the advantages of using digital health literacy. They only teach and focus on their own subject. Some seniors are even unaware of using ICTs.”

A female student pointed out that lack of ICT skills was a great hurdle in successful implementation of digital health literacy. She added that

“I have poor composing skills, because of which I cannot chat to some online doctor or Para-medical staff and hence cannot convey my problem.”

A female student made her argument that

“I hesitate to get health information through internet because I have lack of ICT skills. I most of the times need to consult some senior for help regarding ICT. Because of such kind of dependency I do not prefer to use digital information sources”

The above data and remarks show that students had lack of skills in using ICTs. They had less knowledge to search and locate the pertinent and authentic information. Many websites were there which were guiding about different aspects of health. They had differences in opinions and ideas about different diseases. A lay man could not understand what kind of information was pertinent to him and what kind of information was authentic.

6.2.3. Suspected Reliability of Different Websites

There are no defined criteria to measure the reliability of some website or information present on internet. There is abandon of false and fake information on internet (Nassiri et al. 2014). Then cheating and frauds are also a great hindrance in the way of digital literacy (Schneier et al. 2011). Individuals, who are interested to buy some medicine or medical
equipment online are, first of all, unaware of the difficult procedure of online purchasing. Then they also hesitate to pay amount to some unknown dealer (Glendinning et al. 2000).

During in-depth interview a female respondent elaborated that

“Most of the time I felt information present on interest is less reliable as most of the websites are editable. Different bloggers and opinion makers put their views on internet without any authority. Most of the times, such kinds of information are false, which may be a great danger to health.”

It is well established from the above remarks that reliability of different websites was suspected because of which students did not prefer to get online health services.

6.2.4. Load Shedding of Electricity

Load shedding is also a great hindrance in using digital health information. Most of the time electricity is not available, while during the presence of electricity students use computer and internet to cover their syllabus activities (Abbas et al. 2014). There is not enough time for students to use ICTs to get health related information. Load shedding in Pakistan is great problem because of which all kinds of electric resources cannot function well (Haq et al. 2008). Absence of light is major factor which is becoming a hurdle in the successful implementation of digital health literacy. In absence of light, computers cannot function, while computer labs of universities are rarely having laptops or other rechargeable resources. Because of which a great amount of time of students is wasted (Abbas et al. 2014). In the presence of electricity, there is crowd of students in the computer labs so they only try to complete their class work rather than searching information on general topics. So it may be a reason that students cannot arrange enough time to use ICT resources, because of load shedding of electricity (Chowdhry et al. 2012).

Absence of electricity affects the level of usage of computer into searching health. Pakistan is a country, which is suffering from load shedding of electricity. When there is no electricity there will be no usage of computer. Computer is an electronic device, which needs electricity. But absence of light, reduce the level of usage of computer (Abbas et al. 2014).
During in-depth interview a female student made her argument that absence of electricity decreases the level of usage of digital resources. She described that

“Absence of electricity is a major issue of Pakistan. Load shedding is there from 12 to 14 hours daily. All sorts of ICT components need electricity. Electricity is available for a small interval of time, which results into small level of usage of ICT resources. And level of usage of ICT resources determines the level of digital health literacy.”

Another female student during in-depth interview made her viewpoint that students had lack of rechargeable resources. She pointed out that

“Load shedding of electricity in Pakistan is a great hurdle, because of which students have fewer tendencies towards searching health online. Most of the student use computers which needs electricity to function. Only small number of students has laptops or iPads, which have charging aptitude.”

A male student pointed out that in absence of electricity people can use laptops and other rechargeable resources but there is no alternative for internet connection. He added that

“I have no wireless internet connection. I use Digital subscriber line (DSL) for internet connection, which only function in the presence of electricity. Without availability of internet, I cannot open different websites on internet.”

A male student pointed out the severity of load shedding of electricity while saying that

“I feel much frustrated whenever there is absence of electricity. Then again and again it gets on and off. This decreases my work functionality, and hinders me to use ICT resources.”

The above themes show that ICT components need electricity and absence of electricity becomes a great hurdle in the successful implementation of digital health literacy. It increases level of frustration and decreases the level of functionality of students.

6.2.5. **Burden of Activities/Stressful Activity**

Using internet is a stressful activity (Montag et al. 2015). Different rays of light come out from the screen of computer, which effect human eyes. It also results into fatigue. Because of
which people prefer to use computer to complete only their compulsory work (Montag et al. 2015). As students have to perform bundle of activities for their class work which make them tired. So they preferred to get rid of computer after completion of class work (Haq et al. 2008). Some students also prefer to make long sittings on computer, but most of the time, their focus of internet is to use entertainment websites or social media. Using computer and internet is a stressful activity. It makes the individuals tired (Haq et al. 2008). Students are already much tired because of extra-ordinary reading and load of class activities. So they try to get rid of computer in their free time (Tang et al. 2014). Students at University level, have to perform load of activities like listening lectures, delivering presentation, preparing assignments and taking exams etc. (Haq et al. 2008).

During FGD a female student made her argument that increased level of usage of digital resources result into tiredness. She was of the view that

“Using computer is a stressful activity for me, which make me tired. I have to perform bundle of activities relating class work. After such kind of activities, I feel much tiredness and I avoid myself from further use of computer for any other purpose.”

During in-depth interview a female respondent argued that excessive use of computer results into pain in both eyes and mind. She described that

“Getting information from internet is a stressful activity as it involves both mind and eyes. I am already suffering from eyesight problem. While concentrating more on computer I feel headache and pain in eyes. So, most of the times, I avoid myself reading vast illustration on internet relating health.”

A female student during FGD pointed out that

“I have to perform load of class activities e.g. listening lectures, preparing assignments, demonstrating presentations and taking exams etc. So I cannot arrange enough time to use digital resources for searching health information.”

The above stances and remarks are comprehensively elaborating that students have to surf many hours on internet to complete their class assignments which is a stressful activity. load of activities hinders students from digital health literacy.
6.2.6. Absence of Attraction/Less Caring Attitude

Students have tendency to use the websites which attract their interest. For example they use Facebook, WhatsApp and Twitter etc., because these webs attract their interest. Students feel it boring to involve themselves in complex medical terminology and vast illustrations (Wilson et al. 2010). Sometimes people have careless attitude towards their health (Lahdenpera et al. 2001), which also hinders them to use online health information.

A female respondent made her argument that

“Health related websites never attracted my concentration. There are other amusing and entertainment websites which attract my attention.”

A female student during FGD pointed out that

“Some people have less caring attitude toward their health, so they don’t bother to search health information online.”

Hence, it is observed and gathered from the above information that health websites are lacking attractive techniques and some students do not care much about their health which is also a hurdle in getting health information.

6.2.7. Speed of Access of Internet

Almost in all universities of Pakistan, there is access of ICT resources in computer labs (Qadir et al. 2009). There is also availability of internet, but the problems are with the speed of access. Low speed of internet makes the usage boring, because of which students feel frustration, so they try to avoid using computer for extra-activities (Qadir et al. 2009).

During FGD a male respondent made his view point that lack of speed of internet creates irritation among students. He added that

“There is no problem relating the access to ICT resources in my university but speed of access creates problems, which irritate me to use the internet, so I only try to quickly finish my class work.”

During FGD a female student made her argument that low speed of internet makes the searching procedure very boring. She expressed her views that
“Speed of access to internet is a problem. Slow speed of internet make the searching procedure boring. So I avoid searching general topics because of low speed of internet.”

6.2.8. Lack of Availability of Computer and Internet at Home

Lack of availability of computer and internet at home is also a hurdle. Students can only use computer at Universities. They cannot use internet at home because of no availability. So they can get small interval of time to use internet. So they only focus on the syllabus activities (Woessmann et al. 2004). Lack of availability of personal computer and internet at home also decrease the level of getting health information through internet. A student not having personal computer at home, can only use computer in the lab, where he could only arrange a small interval of time (Kuhlemeier et al. 2007).

During FGD a female respondent pointed out that

“No availability of personal computer at home results as a barrier; as I cannot arrange enough time to search health information in university computer lab.”

A male student during in-depth interview illustrated that

“I have no personal computer at home and I am totally dependent upon the computer labs of the university. But computer labs have also shortage of computers and increased number of users. So I could get only small time to use computer.”

The above themes show that lack of availability of personal computer and internet at home results into lack of time spent on internet, and low level of time spent on computer results into low level of technology usage in searching health.

6.2.9. Lack of Training in ICTs

Lack of training to students regarding digital health literacy also decreases the chances of searching health online. Students are not much aware about the advantages of online health information and they are not much trained to get pertinent and accurate health information through online resources (Childs et al. 2005).

Institution may be blamed in sense that the level of trainings relating ICT knowledge, are very low (Pelgrum 2001). Students are not told about where these ICT resources can be utilized. Students must be trained about the usage of digital health literacy.
One male student during in-depth interview elaborated that

“Lack of seminars and training regarding the importance of digital health literacy is a great barrier. There is a lot of health information on internet. Students are unaware about how to use it and what are its advantages?”

One male student was of the view that lack of motivation from teachers was also a barrier to eHealth literacy. He added that

“Lack of guidance from seniors also affects the level of usage of computer in searching health. Teachers only focus to complete the course-work. They never use to motivate the students to use computer for other purposes.”

During in-depth interview a female respondent shared her viewpoint that training was compulsory to successfully implement digital health literacy. She made her point that

“There is no kind of training among institutions to guide and train the students to properly use the ICTs for searching and implementing health information which is present on the internet.”

Hence, it is observed and gathered from the above information that there is availability and accessibility in institutions of ICT resources, but students have less concentration towards using digital health literacy as they have no training regarding digital health literacy.

6.2.10. Lack of Efficiency of Computer Labs

Computer labs are not much efficient in universities in a country like Pakistan. Most of the labs have greater restrictions. They do not allow students to open websites which are not pertinent to studies (Shaikh 2009). Then there is lack of speed of internet (Qadir et al. 2009). Most of the time there is no availability of electricity. Labs have no alternative for load shedding (Abbas et al. 2014). Number of students in labs is usually greater than the number of computers. Maintenance of computer is often delayed. Because of such kind of reasons students remain disturb and their surfing capacity on internet also decreases, which ultimately results into lower level of internet usage (Mahmood 2003).

A male respondent during in-depth interview added that
“There is lack of efficient labs in my university. There are computer labs, but there is shortage of computers. Number of student is higher as compare to number of computers. Most of the time, students have to waste much time in waiting to get their turn to use computers.”

A female respondent further continued the discussion and described that

“My university computer labs are not much efficient. They are lacking ICT equipment, proper instructors, much space and alternative to load shedding. Speed of access is also another issue in some labs.”

A female respondent during FGD added that

“Maintenance is not done after any kind of damage to computer or other ICT resources. A damaged computer may not be treated for several months.”

The above data and remarks show that computer labs of universities are not much efficient. Maintenance is not done after any kind of damage to computer or other ICT resources. A damaged computer may not be treated for several months. Already there is load of overpopulation. This carelessness in maintenance results into shortage of computers. This decreases the level of usage of computer, which ultimately results into low level of digital health literacy.

6.2.11. Lack of Financial Resources

Lack of financial resources also hinders people to get health information through internet (Choi et al. 2013). Access to different kinds of journal and articles is also affiliated with the financial resources. To get information from certain journal, access is conditional with payment. Researchers are asked to pay for some online journals relating health (Blumenthal 2009). During FGD a female respondent made her view point that

“Lack of financial resources is a great hindrance in the successful implementation of digital health literacy. Much health related journals, articles and books are not freely accessible on internet. I, on my own behalf, cannot pay for such kind of expenses. So I could not get access to health information on internet.”
It is well established from the above remarks that there are certain kinds of health related journals and articles, which demand money for their access. Students are already under load of fees and expenses of transportation etc., so it becomes difficult to pay to such kind of journals. So they skip such kind of information. Students have not enough financial resources to do such kind of payment. Institutions also refuse to pay on behalf of the students.

**6.2.12. Threat to Privacy**

Some students do not consult health information which is available online because they consider it a threat for their privacy. Different websites force individuals to make User ID. To make such kind of IDs, one has to tell one’s name, father name, email address, postal address and cell number etc. (Malhotra et al. 2004). Using technology to get health related information is most of the time threat to privacy. Whenever a person asks about his diseases while putting it on some blog, it may result into threat to his privacy. As the information is viewable to general users so the people don’t use digital health literacy to secure their privacy (Bansal et al. 2010).

A female respondent was of the view that

“Using internet may be a threat to the privacy. Many websites demand to submit basic information of patients for ‘logging in’ to the website. These websites usually ask about names, email address and cell No. etc.”

A female respondent made her argument that X-rays and ultra sounds are a great threat to privacy. She elaborated that

“Using digital health sometime has some ethical concerns. I feel it difficult to go for ultrasound of sensitive parts of body. As ultrasound and different X-rays may become a cause of damage to privacy.”

A male respondent during in-depth interview elaborated that people feel embarrassment to share information about socially sensitive diseases. He added that

“Searching online health is a threat to privacy. Persons suffering from socially sensitive diseases may not login to some website, as they are required to submit some personal details. So people hesitate to make some User ID on health related websites.”
It is gathered from the above discussion and commentaries that different websites ask very private information from user to ‘Login’ into some website; this may be a serious threat to privacy. Such kind of personal information hinders the students to consult online health resources.

**6.2.13. Contradiction of Opinions and Irrelevant Websites**

Whenever searching a specific health issue, there are many websites opened. It is difficult to judge, which website is pertinent and accurate (Childs et al. 2005). Some time asking some question from internet results into many answers. Some answers are even contradictory to each other. It is difficult for the patient to decide, which information he should use and which information he should skip (Devanbu et al. 2003).

There is contradiction of opinion about the causes, symptoms and solutions of different diseases, among different websites, journals, article and blogs etc. (Borzekowski et al. 2001). Patients are not much expert to choose the proper and pertinent information from these contradictions. So, they reject to get benefit from such kind of information (Gray et al. 2005).

Some students may have some kind of negative experience relating digital health literacy in past. Such students don’t prefer to use online health information.

A female respondent elaborated that

“I used internet for searching different information but could not reach at pertinent information, so internet was not my favorite source of information collection”

A male respondent during FGD made his view point that

“Internet is full of vast illustrations. It becomes too much difficult for me to go through such kind of vast discussions. Then it is too difficult to judge which information and website is pertinent.”

A female respondent during in-depth interview made her view point that

“On discussion blogs patients can get benefit relating health. But most of the times I am confused when I observe contradiction of opinions among different health professionals. I get confused that which information I should use?”

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The above stances and remarks are elaborating that there is presence of huge amount of material on internet. It becomes much difficult for a person to reach at the pertinent information. Then it also becomes difficult for a person to differentiate between different opinions on the same topic.

6.2.14. Lack of New Health Information on Internet

There is lack of new information available on internet. There are many journals and articles, which have latest researches and studies relating health, but their access is not always opened. One has to pay to get such kind of information (Benigeri et al. 2003). Free access journals and articles are most of the time, not having the latest information relating health (Benigeri et al. 2003).

A female respondent continued her viewpoint that internet was lacking latest health information. She added that

“Health information is present on internet, but such information is not new. Websites demand money in response to provide new health information, which is unaffordable for me. So I cannot get access to new advancement in the field of health.”

It is gathered from the above discussion and commentaries that there is lack of new health information on internet. With new advancement is Science, Medicine and other spheres of life, new kinds of health research are being done. But on internet such kind of new information are rarely modernized.

6.2.15. Adversity of Self Medication

Using health information without the prior permission of some physician or doctor may cause some danger, as it is observed that patients of same kind of disease use different kinds of medicines (Rotton et al. 1996). So, self medication while using internet can effect negatively on health. Directly searching health through online resources, without the prior permission of some health professional may cause some danger (Miller et al. 2002).

According to doctors, every kind of information should not be shared with the patient to escape him from frustration. A patient directly searching health information may go to depression whenever he will come to know about the dangers of that disease (Sawalha 2008).
Reading the symptoms and signs of different diseases, sometimes, results into frustration. Most of the symptoms of different diseases are common. Some persons are over sensitive. They think that they are suffering from some other disease, which results into depression (Vanderschuren et al. 2004). A male student during FGD elaborated that it was not good practice to share all kinds of information with patients. He added that

“Prior knowledge of some disease increases the frustration level of the patient. Different kinds of diseases have some symptoms in common. An individual may think that he is suffering from many diseases. So searching online health without any guidance may result into damage.”

It is well established from the above remarks that damages of self-medication and self-treatment hinder the students to search online health information. Internet informs the person about all kinds of information relating some disease. For example, a person suffering from cough may think that he is suffering from Tuberculosis (TB) after reading the symptoms of T.B. Such kind of fears of being depressed also hinders the people to use online health information.

6.2.16. Vast Illustrations on Internet

There are much vast illustrations present on internet relating health. Patients open the information pages which are full of illustrations (Devanbu et al. 2003). Such kind of huge and vast illustrations may give benefit to doctors or health professional, but they are not specifically the need of patients.

Whenever, opening some website or searching some disease with the help of some search engine or encyclopedia, many websites and information bars are opened. It becomes difficult for a person to find the pertinent information as there are opened vast illustrations (Devanbu et al. 2003). There is presence of some bogus and false information on internet (Nassiri et al. 2014). It becomes difficult for an individual to find out the authentic information. Only searching health on internet does not solve the problem. Problem will be solved when a person could reach pertinent and authentic information about health. As opening unauthentic health information may cause danger to health (Nassiri et al. 2014).

A female respondent made her argument that
“There are vast illustrations of health related topics on internet. I feel boring while studying such kind of lengthy illustrations. This also results into wastage of time. Patients expect specific and pertinent information.”

The above data and remarks show that patients feel illustrative explanations much boring. So they avoid themselves to read much illustrative topics relating health.

6.2.17. Ban on YouTube in Pakistan

Getting health related information becomes easy, whenever it is in form of lectures and videos. But there is ban on YouTube on which there are hundreds of videos and lectures relating health. Using YouTube is much easy. A person can only put the name of his diseases in the search bar, related videos will be opened. He can listen to any lecture of his own choice (Vance et al. 2009).

A male student during FGD illustrated that

“A few months ago I used to visit YouTube for some video lectures. Many times I got touch with health related websites, but unluckily this website is now banned in Pakistan.”

The above stance and comment is very simple but comprehensive which is showing that there is ban on YouTube in Pakistan. Because of such kind of ban in Pakistan many persons, indented to get health information through internet, cannot find their pertinent information.

6.2.18. Summing up

The above mentioned situation is depicting the views of different students from four different types of institutions, while using the Focus Group Discussion (FGD) method and in-depth interviews. The main objective was to trace out the barriers, hurdles and challenges in the implementation of digital health literacy. Students from different kinds of institutions stated different kinds of views. Some views were same in nature. For example almost all students depicted that less availability of electricity was negatively affecting the level of usage of ICTs.

They also elaborated that lack of training and guidance, institutional support, financial support, interest and lack of time were main factors which were negatively affecting digital health literacy. Students were also of the view that irrelevant information, vast illustrations
privacy threat, bad experience of past, stress, careless attitude towards health, less reliable information, language problem also decreased their level of ICT usage in health literacy.

Lack of availability and accessibility, and lack of ICT skills were main hurdles, which hinders the students from searching health information on internet. All the themes were derived from the focus group discussion and in-depth interviews. If we look at the last two FGDs and in-depth interviews, it seemed that no new information was being withdrawn. So, it can be said that saturation point was also achieved as no new information was coming from respondents.

6.3. Objective: 3
To explore some suggestions to improve digital health literacy

In this part student belonging to four different types of institutions were asked about their suggestions to improve digital health literacy among students. Such suggestions once again pointed out the hurdles in digital health literacy and elaborated different strategies to improve it. Students were asked how digital health literacy can be improved. Students belonging to four different types of institution explored different kinds of themes.

6.3.1. Avoiding Unnecessary Illustrations and Complex Languages
Health related websites, journal, articles, magazines, blogs and brochures should avoid unnecessary illustrations. These vast illustrations affect the concentration levels of the readers and also waste their time (Devanbu et al. 2003).

Websites and other health information sources should avoid complex language, group jargons and difficult terminologies (Eisenstein 2013), so that students can understand health information. Level of usage is determined by level of understanding (Berland et al. 2001). If people are able to grasp the information, it will be easy for them to implement that health information to solve some medical problem (Walsh et al. 2008).

A male respondent during FGD elaborated that

"Internet should use simple language so that a lay man could understand the information preset on internet, as the patients feel it difficult to understand complex medical terminology."

A female respondent during FGD made her viewpoint that
“Websites relating health information should avoid vast illustrations of irrelevant concepts. Information relating health should be specific and pertinent, so that student could get their desired information quickly, without any wastage of time.”

It is gathered from the above discussion and commentaries that internet is full of vast illustrations and complex terminologies of about every kind of topic. Whenever a person put some word in the search box of some search engine or some encyclopedia, flood of information appears on screen. This is not only much lengthy but also much difficult to understand. Because of which students hesitate to use it in health literacy. It is suggested that this information should be specific and simple.

6.3.2. Conduction of Trainings
Most of the time students are unaware about the advantages of digital health literacy (Dee et al. 2005). Even they don’t know how to collect health information on internet. Institutions should arrange different trainings which should inculcate good skills among students relating the search of health information. They should also tell the benefits of using online health information. Such kind of activities will give rise to the level of usage among university students (Dee et al. 2005).

Trainings should be there to improve the ICT skills of students. Students of every kind of subject should be taught basic computer skills, so that they become able to search information available on internet (Galanouli et al. 2004).

A female respondent during FGD elaborated that

“Proper training of students should be arranged in which they should be guided about the techniques to search health by using internet and other electronic resources. They should also be told about the advantages of digital health literacy so that they may get motivation to seek health through online resources.”

A male respondent described that trainings should be arranged to polish ICT skills of students. He added that
“Basic computer skills should be taught to students of every subject. If the students have not good computer skills, they cannot be expected to use it in health literacy. So, the primary focus should be to improve the ICT skills of students.”

A male student was of the view that students should be motivated by telling them the advantages of using ICTs. He elaborated that

“**Institutions should conduct trainings for students regarding the usage of ICT resources. Seniors have less tendency to guide the students, even teacher only try to complete the course work. Teachers should also try to motivate the students regarding usage of digital health literacy.**”

The above mentioned situation is telling that students of all subjects should be taught basic computer skills. Without computer skills they cannot open health information on internet. Skills in computer will increase the chances of increased level of usage which will ultimately result in increased level of digital health literacy.

6.3.3. **Arrangement of Different Seminars and Conferences**

The whole world is making advancement in almost every field as well as in health services. To get access to the knowledge of these advancements, universities should organize international conferences (Scandurra, I.2008). In such kind of conferences, scholars and researcher from different parts of the world should be invited, so that students can get touch with the latest development in the field of health. This activity will motivate them to search their health problem, through the help of ICT resources (Davis et al. 1999).

There should be arrangement of different seminars and conferences on the importance of health. When student will come to know about the importance of health, they will try to search health information through different sources. They will also consult internet for this purpose as well (Scandurra, I.2008).

A male respondent during FGD made his view point that

“**Universities should organize seminars and conferences relating digital health literacy. In such kind of conference national and international scholars should be invited. Such**
kind of scholars will introduce students with the latest advancement in field of ICT and health.”

A female respondent further continued the argument that

“Students should be told how to get pertinent and authentic information on internet. Different kinds of information are fake and false on internet, so students should be given with the names of reliable websites relating health.”

A male respondent elaborated that

“Seminars and conferences should be arranged to inculcate the importance of digital health literacy among students.”

From the above remarks it can be evaluated that conduction of different seminars relating health will increase greater knowledge about its advantages and usages. This will ultimately motivate the students to go for online health information.

6.3.4. Availability and Accessibility of ICT Resources

There should be availability and accessibility of ICT resources among university students. Most of the time it is observed that number of students is more as compare to computers and ICT resources in the computer labs of universities (Qadir et al. 2009). There should be provision of efficient computers labs, which should be well equipped with ICT resources, instructors and electricity. Most of the time shortage of computer in the labs of universities is there, because of which students cannot even complete their class work, so how they can think about using computer in other fields? Sufficient provision of ICT resources to student can improve the level of digital health literacy among them (Kimaro et al. 2006).

A male respondent made his argument that

“There should be availability of computer, internet and other ICT resources to university students so that they can get benefit of online health material.”

A female respondent made focus on the availability of electricity without load shedding in computer labs. She discussed that
“There should be provision of efficient labs, which should be enriched with electricity, computers, internet and computer instructors.”

Above themes are illustrating that ICT resources are not being provided properly according to the number of students. And most of the students are usually dependent upon the university computer labs, as they are not having computers and internet at their homes. So to increase the level of digital health literacy, steps should be taken to improve the condition of availability and accessibility of ICT resources in universities.

**6.3.5. Financial Support**

Most of the time absence of financial resources becomes a greater hurdle in the access to digital health information (Choi et al. 2013). Most of the journals and articles demand a larger amount of money for access to their material. Students are lacking financial resources. So they cannot get health information through these resources (Blumenthal 2009). Institutions should invest to get access to such kind of journals and articles. When students will get free access to these information resources, there will be increased chances of usage of this health information (Choi et al. 2013).

Students have to pay to get access to such kind of information sources. Students also have to pay fees and other expenses to universities. Students are usually out of job. In such kind of circumstances, it becomes difficult for them to pay to online journals. In this regards universities should arrange access to high impact factor journals, so that students can get access to new and authentic health information. This wills also increase the level of usage of digital health literacy (Blumenthal 2009).

A male respondent was of the view that

“Universities should make arrangement to provide out of cost access to different national and international health related journals and articles. Most of the students are jobless and they also have to pay for their educational expenses. It is out of their reach to purchase online information.”

From above discussion it can be estimated that to access some online resources, like journals, articles, books and other literature, is much expensive. Students cannot afford such
kind of expensive access to literature. It is mostly observed that old literature and low impact journals are freely accessible on internet, but new and high impact factor journals and articles are not freely accessible. Financial supervision from institutions may result into fruitful changing.

6.3.6. Categorization of Authentic and Unauthentic Websites

Most of the people as well as the students hesitate to use internet information, as there is presence of a lot of false, fake and bogus information on internet. Same is the situation with searching health information. Students are well aware that fake information can be a great danger to their health (Nassiri et al. 2014). There is no mechanism to differentiate between authentic and unauthentic website. Government and different institutions should try to map out some authentic website, so people can use such websites without any hesitation (Glendinning et al. 2000). In the same manner, health departments should make list of those websites which are authentic, so that students and general members of society could get information with greater level of satisfaction. Getting information from such kind of sources will also increase the tendency of people to implement such information to improve their health (Nassiri et al. 2014). Policies should be made to make online health related search easy. Different songs and videos are much easy to search on internet, but searching health is much difficult matter (Montag et al. 2015).

A male respondent continued his discussion by saying that

“Health related websites should be made user friendly. The process of searching pertinent information should me made easy.”

A male respondent during FGD illustrated that

“Irrelevant information relating health should be abolished from internet. So that the users can save time and get pertinent information.”

A female respondent further continued that

“Fake information on internet can cause damage to health instead of improving it. Secondly, most of the times there is contradiction of ideas about the same topic on internet. Students are confused which information they should follow. So to minimize the
effect of such kind of problems, steps should be taken to point out the authentic websites."

Keeping in mind the above scenario, it is suggested that government, NGOs, and health departments should make a list of authentic and reliable list of authentic and reliable health websites, on which there is no presence of fake and false information and there are no chances of fraud to the information user. Then government and non-government agencies should also define the websites, through which one can purchase medicines, medical equipments and other related things without the fear of fraud. This struggle will ultimately result into the increased level of usage of digital health literacy among students.

6.3.7. Decreasing the Level of Load Shedding of Electricity

Because of load shedding, level of usage of ICT resources has decreased, because ICT resources need electricity, but there is absence of electricity in Pakistan from 14 to 16 hours daily (Abbas et al. 2014). Most of the computer labs have no alternative to electricity, so most of the time computers, internet and other electronic components remain turned off. This absence decreases the level of usage of computers and internet, which ultimately result into lower level of usage of digital health literacy (Kessides et al. 2013). There should be some mechanism to control this load shedding or students should be provided with laptops and other rechargeable components, so that in absence of light, they could get benefit from these resources, without wasting their time (Haq et al. 2008). Decreasing the level of load shedding and improving the condition of electricity will make the students to spend more time on internet. Long interval of time of availability of electricity will provide a chance to surf more time on computer, which will ultimately improve digital health literacy (Chowdhry et al. 2012).

A female respondent illustrated that electricity situation should be improved in the country. She added that

“Condition of electricity in Pakistan should be improved. Without electricity, we cannot expect from any person to use computer and other ICT resources in different fields.”

A male respondent was of the view that there is inverse relationship between load shedding and internet usage. He elaborated that
“Presence of electricity will increase the level of usage of internet, which can ultimately result into increased level of digital health literacy among students.”

A female respondent made suggestions to government and universities and stated that

“Universities should look for some alternatives to load shedding of electricity like rechargeable ICT resources, so that they can be utilized in the absence of light.”

The above data and remarks are suggesting that if there is no quick solution to load shedding, then students should be given with laptops or other rechargeable ICT equipments, so that they can utilize their time, even in the absence of electricity. Institutions and government should ensure the availability of electricity especially among educational institutions.

6.3.8. Arrangement of Special Walks/Special Days

In universities there should be arrangement of special walks, in which teachers, students and other non-teaching staff should participate (Bebbington et al. 2008). Such kind of activity will create much awareness among people about the advantages of digital health literacy (Ejaz et al. 2011). Once, people will come to know that it is a fruitful activity; their level of usage of digital health literacy will automatically be increased (Yasmeen et al. 2015). Special days should be observed relating the usages of digital health literacy (Tonelli, M. et al. 2014). Other special days are observed all over the world to create awareness about the rights of labors, awareness about cancer, sugar and hepatitis etc. In the same manner day for digital health literacy should also be observed (Ejaz et al. 2011). This activity will attract the attention of general members of society as well as of students. They will bother to get advantage from this online information (Yasmeen et al. 2015).

A female student stated that

“I Internationally different kinds of health days are observed on different ‘disease days’. Such days should be observed in Pakistan so that the general public of society could get exposure with health information.”

A male student stated that
“There should be made special arrangements of special walks on different health days. Through such kind of walks, importance of being healthy should be depicted”

The above themes show that it is the need of the hour to arrange different kinds of ‘Walks’ and special days should be observed to promote the importance of digital health literacy.

6.3.9. Using Simple Terminology

Websites should avoid complex terms and difficult languages (Walsh et al. 2008). Local languages should also be preferred by different websites, so that common people of society can grasp the health related information and can get benefit of the information (Berland et al. 2001). Information of such kind of website is easily understandable by the majority of the people. Using simple easy and local language will increase the level of digital health literacy among students (Walsh et al. 2008). Language of health relating websites should be made easy to greater extent so that a lay man can understand the material written on different websites (Berland et al. 2001).

Students hesitate to communicate with a doctor belonging to different ethnic, social, age, and gender group. His discussion is difficult to understand, as he may speak different jargons, different ascent and different medical terms (Morahan-Martin 2004). These may be difficult to grasp in a small interval of time (Walsh et al. 2008). There should be some arrangement to ensure the online availability of local doctors so that patients can discuss their health problem in a comfortable manner (Morahan-Martin 2004).

During in-depth interview a male respondent described that

“There should be establishment of a mechanism in which local doctors should be motivated to provide online services to Pakistani people. If there is availability of local doctors on internet, communication problem will be solved.”

A male respondent illustrated that

“For making online health equally beneficial for all kinds of students, steps should be taken to simplify the language of health related websites.”

Another male respondent further continued the argument that simple language would improve the level of usage of digital health literacy. He stated that
“Website relating health should make efforts to make the language simple and easy, so that lay men could understand the information. This activity will improve the level of digital health literacy.”

Students belonging to health Sciences institutes may understand complex medical terms of health related topics, but it is not easy to understand for students belonging to other different subjects. In such kind of situation, students avoid themselves to use such websites. So efforts should be made to increase the understanding aptitude of students’ through making the language simple.

6.3.10. Graphical and Pictorial Presentation of the Health Related Information

There should be graphical and pictorial presentation of the health related information, so that students could get rid of vast illustrations. It will make easy to understand the health related information and will also result into saving of time (Hawley et al. 2008).

Vast illustrations should be replaced with graphical and pictorial presentations. Such presentations will make it easy to understand the health related topics. This will not let the health related topics to become lengthy. This will not let the patients to be bore. This will make the searching activity interesting (Devanbu et al. 2003). Health information could only give benefit to patients, when it is understandable to the patients. When they will understand the information they will implement such knowledge to solve their health problem. So using graphs and pictures in different concepts will make the learning activity simple, easy and understandable for the patients as well as for common individuals (Hawley et al. 2008).

A female respondent was of the view that

“ Websites should convey their view point with graphs and pictorial presentation rather than vast illustrations. Such improvement will attract the interest of students and they will involve them to get benefit from health related websites.”

It is well established from the above remarks that making the illustrations specific and pictorial presentation of text will make the learning process easy and will increase the level of digital health literacy among students.
6.3.11. Videos Relating Health Information

To avoid vast illustrations of health information, one should consult the videos relating health information (Vance et al. 2009). Different kinds of lectures relating different diseases, medicines, X-Rays, ultra sounds and other health related issues are present on it. One can view these lectures only by entering the name of disease or medicine in the search box (Keelan et al. 2007). This also saves the time of patients and is not a boring activity. Introducing different video websites may result into the increased level of digital health literacy (Vance et al. 2009).

A female respondent during in-depth interview stated that

“There is ban on YouTube in Pakistan and it cannot be opened. Some proxies are there to open, but they affect the speed of access. YouTube is full of different kinds of videos including health related videos. Uplifting the ban will result into the opening of these lectures and videos relating health.”

During in-depth interview a male respondent stated that videos on YouTube are pertinent and specific. He added that

“Videos on YouTube and Dailymotion (a video web) also contain different kinds of documentaries relating health. Videos are most of the time pertinent and specific and they avoid unnecessary illustrations.”

A female respondent illustrated that videos on internet had made information seeking very interested, so ban should be uplifted from YouTube in Pakistan. She added that

“Documentaries and videos on YouTube have made the information system very interesting and easy. People don’t feel boring, and they can avoid themselves from vast illustrations.”

Hence, it is observed and gathered from the above information that in Pakistan, there is ban on YouTube, which is a great source of every kind of videos. Different kinds of video websites should be designed, in which there should inclusion of health related information in form of videos, lectures, and presentation. Ban should be uplifted from YouTube in Pakistan on which there is availability of many health related topics in form of lectures and documentaries. Such videos will increase the interest level of information seekers.
6.3.12. Assurance of Privacy

Different patients should be given with the assurance of their privacy. Some websites use to get personal information from the users to get ‘login’. Patients feel it threat for their privacy (Bansa et al. 2010). So, such websites should only spread health information rather than collecting the personal information (Malhotra et al. 2004). People suffering socially sensitive and transmittable diseases hesitate to share their problem and they don’t ask about some health problem through online sources (Bansal et al. 2010). So, there should be anonymity of the information seekers, So that people can seek health information without feeling any kind of hesitation (Malhotra et al. 2004).

A female respondent made her argument that health related websites should not ask about personal information. She suggested that

“Health related websites should not ask personal information e.g. name, email address and contact number etc. Such kind of activities hinder students to get health related information from internet, as they consider it threat for their privacy.”

A male respondent was of the view that there should be a mechanism in which patients could ask sensitive questions without any hesitation. He was of the view that

“There should be assurance of privacy on health related websites so that people could ask sensitive questions without any hesitation. There should be anonymity of the health seeker persons and different bloggers.”

The above themes show that websites should establish such kind of mechanism in which the privacy of users should be secured. This will also motivate the patients to consult internet for health.

6.3.13. Interactive Websites

There should be some kind of interactive website, on which patients of different diseases can discuss and share their experiences relating their diseases (Cohen et al. 2011). This will provide chances to individuals to get interaction with the patients who are suffering from same kind of disease (Borzekowski et al. 2001). Because of this interaction among patients of same diseases will make them able to guide each other about the pertinent medicine, physician and hospital etc. (Gray et al. 2005).
During FGD a male respondent made his argument that

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“Web designers should establish some interactive websites on which people suffering from different diseases can share their personal stories about their disease, medicine, and doctor etc. This activity will involve general members of society in health seeking behaviors.”
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The above stance and comment is very simple but comprehensive. It suggests that there should be some interactive websites on the internet relating health. Such kind of websites will become a source of interaction between doctors and patients, between doctors and other health professional and between patients of different diseases. All of them will share their knowledge and experiences through such kind of interactive websites. Such kind of activity will increase the knowledge and interest level of health information seekers.

**6.3.14. Role of Televisions and Radio**

Televisions and radio channels can also improve the level of digital health literacy among patients by telecasting health related programs in peak hours (Gray et al. 2005). There should be live programs with doctors and physicians in which general public should be allowed to make questions through emails or telephone calls.

Television and radio should also play their role to promote the general awareness among mass population relating the advantages of health (Farr et al. 2005). On different channels and stations of T.V and radio, different doctors, physicians and health professionals should be invited, who should guide the viewers and audience about health (Gray et al. 2005).

A male respondent suggested that

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“Televisions and radios should present health related programs on daily basis in the peak hours, while inviting some expert health professional in their program.”
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The above theme is depicting that health related programs should be telecasted in the peak hours, so that maximum people could get benefit of such kind of information.

**6.3.15. Assurance of e-Access to Health Information**

Universities should ensure the access to e-books, journals, articles, magazines, e-libraries and other online resources of health information. These should be out of cost. When such kind of
information will be easy to obtain, students will prefer to use such kind of information (Choi et al. 2013).

A female respondent made her viewpoint that

“Universities should assure their students the access of online information resources, so that they can get pertinent information through easy process.”

The above theme is depicting that free access to different health-related journals will motivate the students to search online health information.

6.4. Summary

Different FGDs and in-depth interviews were conducted in different types of institutions. There are four different types of institutions which are the focus of FGDs i.e. General universities, Health Sciences universities, Engineering universities, and Animal Science universities. The purpose was to induce different new themes from our research population. Quantitative portion was having close ended questions, in which respondents were limited in their responses. FGDs and in-depth interviews were preferred in this research over other qualitative techniques as the presence of group member stimulates the respondents to explore new ideas.

Recruitment of the respondents was performed through a simple procedure. Only those students were focused which were already participant in quantitative research. Sample size of quantitative research was 1513. Stratified sampling was used to make four different categories on the basis of type of institutions. From each type of institution two groups of students were selected for FGDs and Two for in-depth interview. There were six members in each group of FGD. The participation was voluntary. Students were asked about their consent through emails.

Researcher himself performed the duties of facilitator as he had good knowledge about the duties of facilitator, which he learned through class work, through the help of research supervisor and by studying the pertinent literature.

There were three main objectives of the FGDs and in-depth interviews. These were including; to trace different health information sources, barriers to digital health literacy and techniques to improve the level of digital health literacy among university students. To explore
these three objectives, many questions were asked from each group. These questions were in form of headings, hints, ideas and concepts, which guided the researcher throughout the activity.

Students elaborated different kinds of sources, which they were using for health information. They used to get information through interment TV, radio, books, newspapers, magazines, doctors, health related pamphlets or broachers, health related conferences and health related seminars etc. They were also of the view that labels and leaflets of medicines were also a great source of health information. They were also getting information through extra sources of health information e.g. guidance from LHV's, BHUs, RHCs etc.

Male and female student of different types of institutions also depicted different kind of hurdles, challenges and barriers to digital health literacy. Load shedding or absence of electricity was pointed out as the main barrier by all students. Then lack of availability of ICT resources, accessibility, knowledge, efficient labs, guidance, technical knowledge, technical and administrative support, financial resources, interest, reliability, new health information, time, and lack of trainings relating digital health literacy were becoming the main hurdles in the successful implementation of digital health literacy. Then there were vast illustrations on health related websites, complex language, chances of fraud, irrelevant information and complex procedures to search health information, which hinder the individual to consult health information on internet.

While asking the suggestions to improve digital health literacy, students responded that there should be availability and accessibility to ICT resources, Youtube, electricity, trainings, and financial resources. They also focused to make language of information simple, avoid vast illustrations and irrelevant information.

Another thing was observed that students were ready to get health information through internet if they had perceived Ease of Use (PEOU). Davis (1989) elaborated that usage of technology is affected by perceived Ease of Use (PEOU) and perceived usefulness (PU). Students were of the view that if there was simple language of health relating websites, financial support, pertinent information, reliable information and easy access to ICT resources, then they will search health information through internet. These above mentioned themes depicted that students wanted ease of use of technology.
6.5. Discussion


The third objective of qualitative portion was to explore some suggestions from the respondents to improve digital health literacy. The study explored different suggestionse.g. avoiding unnecessary illustrations and complex languages on internet (Walsh et al. 2008, Eisenstein 2013), conduction of trainings in ICTs (Galanouli et al. 2004, Dee et al. 2005), arrangement of different health seminars and conferences (Scandurra, I. 2008), availability and accessibility of ICT resources (Kimaro et al. 2006, Qadir et al. 2009), categorization of authentic and unauthentic websites (Choi et al. 2013), decreasing the level of load shedding of electricity, celebration of health days (Tonelli, M. et al. 2014, Yasmeen et al. 2015), assuring privacy of patients (Malhotra et al. 2004, Bansa et al. 2010), and designing doctor-patients interactive webs (Cohen et al. 2011).

Technology Acceptance Model (TAM) by Fred Davis (1989) can also be validated by the findings of qualitative portion. TAM model argues that Perceived Ease of Use (PEU) and Perceived Usefulness (PU) about technology can increase the usage level of technology. Literature depicted that different researchers used different indicators to measure PEU and PU, while the Focus Group Discussions (FGDs) and In-depth interviews brought new emergent themes relating PEU (ICT skills, increased speed of access to internet, availability of computer and internet at home, efficient computer labs, trainings in ICTs, categorization of authentic and unauthentic websites, and doctor-patients interactive webs), and PU (reliable information, assurance of privacy, authentic information). To summarize the discussion it can be concluded that TAM model is quite pertinent to the present study, as the results are depicting that PU and PEU are directly linked to the usage level of digital health literacy.
7. Summary, Findings and Recommendations

7.1. Summary

Digital health literacy means to find, search, understand, implement some health information by using some electronic resources e.g. computer, internet, mobile phones or TV etc. Norman and Skinner (2006) pointed out six basic literacy skills (i.e. Traditional, information, media, health, scientific, and computer literacy) to differentiate between primary and secondary sources of information, pertinent and irrelevant information and authentic and unauthentic information sources on internet. As a matter of fact there is enough bogus, irrelevant and fake information on internet(Flanagan et al. 2000), so these competencies are needed to get advantage of digital health literacy. In developed countries, situation of digital health literacy is boosting up as there is good level of education, accessibility and availability of information and communication technology (ICT) resources, while developing countries are some step back in digital health literacy(Kozma et al. 2014), because there is low level of education and low level of availability of ICT resources. Digital health literacy is providing different kinds of functions e.g. telemedicine, eHealth, Electronics Health Resources Records (EHR), and Electronic Health Management (EHM) etc. (Baudendistel et al. 2015).

University student are the focus of the present research, as they have accessibility, availability and administrant support relating ICTs, and they also meet the criteria of six competencies, depicted by Norman et al. (2006). Heuberger (2011) depicted that internet is a favorite source of information among university students as they have ample access and knowledge of ICTs. Then university students belong to youth segment. In America 10 percent individuals are using internet. Out of these 10 percent, about 7 percent belong to youth segment (“Using Internet”, 2016). That’s why university students were preferred as respondents for this research. According to Ministry of Youth Affairs, (MOYA), Pakistan (2013), youth had become the 35 percent of total population (“Youth Ministry”, 2015). In Pakistan, there is dire need to integrate ICTs into health, but there are certain kinds of institutional, technical and socio-culture challenges to digital health literacy.

Pakistan being a lower middle country only spent 2.9 percent of GDP on health (WHO 2009), while 11.3 percent population is using internet. Pakistan is facing serious issues in the successful implementation of digital health literacy. Lack of budget, lack of
ICT resources and large size of population are the main challenges to digital health literacy. The major activity performed related to the digital health literacy in Pakistan was the creation of digital health association of Pakistan (e-HAP), which focused to make co-ordinations with different stake holders of health and created awareness among mass population about major health issues (“e-HAP”, 2015).

Significance of digital health literacy cannot be falsified as it gives benefit to both General members of society (Patient and health seekers etc), as well as to health professionals. Health professionals use it for eHealth records, eprescribing and computerized order entries etc. (Hack et al. 2014). Patients and health seekers also get benefit as it is easy and cheaper system. Koh et al. (2012) Suggested that a society can save 73 billion USD annually with the help of digital health literacy.

Technology Acceptance Model (TAM) by Fred Davis (1985) was used as the theoretical frame work. TAM model elaborates that usage of technology is affected by perceived Ease of use (PEOU) and perceived usefulness (PU). In this research this view point was taken as grounded theory in the sense that if there was perceived Ease of use and usefulness of technology among students, they would use it in searching health. Different kinds of indicators were used to measure PEOU e.g. level of availability and accessibility of ICTs, efficiency of computer labs, provision of financial and administrative support. Perceived Usefulness (PU) was measured with the help of different indicators e.g. access to information, illness awareness and knowledge about dieting plan etc. The research aim was to trace different cultural, technical and institutional challenge to digital health literacy. Presence of these challenges minimizes the PEOU and PU.

Different kinds of indicators were also drawn from literature review. The main objective of the literature review was to trace different kinds of socio-cultural, institutional and technical challenges to digital health literacy, elaborated by different researches in the past. Then it was also observed what kind of challenges students were facing related to digital health literacy, according to different researches? The rationale of the literature review was to indicate the gaps of methodologies in different previous researches, to create knowledge about the present situation of topic, to create guidance
for health policy makers, to compare and contrast the views and reviews of different researches and to guide researchers to avoid themselves from duplication of researches. Peer-reviewed journals, HEC recognized local journals of Pakistan, data from different presentation and conferences and different online sources were used for literature review.

Literature review depicted different kinds of socio-culture challenge to digital health literacy. Different kinds of researches in literature review chapter depicted that level of age, education, literacy, ICT skills, perceive ease of use (PEOU), interest, annual income, availability of computer and internet, and perceived usefulness were associated with level of usage of digital health literacy.

Literature review also depicted different kinds of technical challenges to digital health literacy. The review depicted that even 42 percent population of USA was not using computer at all. There were different kinds of technical challenges to digital health literacy, for example lack of access to ICT resources (Pennbridge et al. 1999), lack of availability (Ibrahim et al. 2006), speed of connection of internet (Anhoj et al. 2004), vast illustrations, deviation from topic and difficult language (Brower et al. 2005) and access to accurate information (Esquivel et al. 2006) were some technical aspects which were effecting the level of usage of digital health literacy.

In the same manner literature review also depicted some institutional challenges to digital health literacy. For example less experience of seniors in hierarchy, less availability of co-operation and team work, non friendly policies related to health, and lack of training and support from organizations etc. were different institutional barriers to digital health literacy. Mutual co-ordination among different health stake holders (Ludwick 2009), individual and macro level efforts relating health (Al-Qirim 2007), training of end users of health (Shekelle 2006) and skills development workshops arranged by different institutions (Macfarlance et al. 2006) were positively associated with usage of digital health literacy.

Literature review also depicted the situation of digital health literacy among students. For example lack of interest in using technology, unwillingness to use health literacy (Nsuangani 2006), lack of health searching skills on internet (Escoffery et al.
2005), less critical aptitude of college students (Ivanitskaya 2010), and less vision to differentiate between primary and secondary sources of information (Redmond 2007), were being faced by the students of colleges and universities. Literature review also depicted the situation of Pakistan related to the digital health literacy. Literature depicted different kinds of challenges according to the view point of different researches. For example lack of access to doctors, transportation, and hospitals in rural areas (Saleem 2010), less availability of medical facilities in rural Sindh (province of Pakistan) and lack of medical equipment (Durrani et al. 2012), lack of technological integration among health institutions (Malik et al. 2008), lack of training related to health (Bhutto et al.), fake and false data related to health in Pakistan on internet (Qazi et al. 2004), issue of reliability and authenticity (Bhutto et al. 2010), and lack of interest of health stakeholders to change the health system were some major challenges to digital health literacy in Pakistan. Literature review illustrated that previous researches were small in size and were lacking in explanation of relative effects of different independent variables on the dependent variables. The present study tried to fill these gaps.

The research was conducted in Pakistan, while the studying province was Punjab. Lahore was the capital city and the biggest city of Punjab province. So, Lahore was selected as the city where the study was accomplished. It is culturally diverse and students from the whole world were studying in different universities of Lahore. According to Higher Education Commission (HEC), Pakistan, there were seventeen different public and private sector universities in Lahore.

This study used mixed method research, which means that both quantitative and qualitative methods were used in this research. This mixed method allows getting in-depth knowledge of some phenomenon. For quantitative portion, survey method has been used as it is relatively inexpensive, takes less time, and sample is taken from whole population. For qualitative portion, data was collected through Focus Group Discussion (FGDs). Cross sectional design was used for quantitative data collection, while structured questionnaire was used as the data collection tool. Out of 17 HEC recognized universities, 16 universities were included in the research. One university (virtual University) was not included as it had online students. It was a difficult matter to approach online students for data collection. Stratified sampling has been used, which allows the researcher to make
subsets on the basis of similar characteristics which the whole population does not share. There were four types of universities i.e. General, Health sciences, Engineering and Animal sciences. Stratified sampling is used when population is known. Population of our research was 89664. Sample size was drawn with the help of Research Advisor Table 2006. Calculated sample size was 1513. Proportional allocation formula was used to locate the number of chosen students from each university. This formula guided the researcher about the exact number of students, on which he had to make study.

For quantitative portion, structured questionnaire was used as data collection tool. Pretesting was performed on 20 respondents to estimate the workability and accuracy of the instrument. Some questions were added, deleted and improved after pretesting. Quickly after data collection, editing of data was started by using SPSS. After collection of data from every 15 respondents, researcher used to enter the data in SPSS. Likert scale was used to measure the extent of liking or disliking of some statement.

When all data was entered into SPSS, different variables were defined i.e. nominal, ordinal or scale. There were some immeasurable concepts for which different indicators were used to make them measureable. Some questions were having many sub-questions. These sub questions were computed to single main variable with the help of SPSS. Validity and reliability of the instrument was also measured through SPSS.

Quantitative data was analyzed in two portions i.e. descriptive analysis and inferential statistics. Descriptive statistics elaborated mean, median, mode, and standard deviation etc. For inferential statistics, first of all normality test was applied, which showed that data was not normal, so non parametric tests were applied. Different kinds of tests like 2 independent samples, k independent samples, Mann-Whitney U, Kruskal-Wallis H and Dunn test were used in inferential statistics.

Focus Group Discussions (FGDs) and in-depth interviews were used to collect qualitative data. In quantitative research, answers were predetermined in which respondents could not elaborate their opinion, while in FGD, opinions and ideas from respondents were welcomed. Only those participants were recruited for FGDs, who were previously participants of survey. Four strata were developed i.e. General universities, Health sciences universities, Engineering universities and Animal sciences universities. From each stratum six respondents were selected. This selection was done randomly.
There were three main objectives of the FGDs and in-depth interviews. Researcher himself performed the duties of facilitator. Results of FGDs induced many themes relating the challenges to digital health literacy among students.

Chapter four described the percentage and frequency distribution of respondents according to different kinds of socio-demographic factors e.g. age, education, gender and ICT skills etc. The frequency and percentage distribution was measured from the view point of both independent and dependent variables. Majority of the respondents i.e. 83.9 percent belonged to General universities, while remaining 16.1 percent respondents belonged to remaining three types of universities. Descriptive analysis showed that males were in majority in number i.e. 84 percent of the total sample size.

Students of BS/MSc, Ms/Mphil and PhD were included. From the view point of age, 70 percent respondents had age between 17 to 24 years, while 30 percent of the respondents had age more than 24 years. Descriptive analysis also showed that majority of the respondents i.e. 79.7 percent had the availability of personal computers at home, while 62 percent respondents had internet facility at home. Descriptive data also depicted that 75 percent of respondents were spending 2 to 5 hours daily on computer. Results showed that majority of the university students were not good in ICT skills. Results depicted that level of digital health literacy among university students was much low, but level of expertise in digital health literacy was higher. The reason behind it may be that university students have good knowledge and they can use search engines and encyclopedias for different purposes, but they may get little time to search health information on internet. That’s why, level of usage of digital health was low, but level of expertise in digital health literacy was high.

Chapter 5 dealt with inferential statistics. After entering the data into SPSS, normality test was applied, which showed that data was not normal. That’s why non-parametric tests were used. Kruskal-Wallis H test and Mann-Whitney U test were applied to measure the difference of effect of different group of independent variable on the dependent variable. Twelve different kinds of hypothesis were formulated. In which every dependent variable was having two or more than two groups, while all dependent variables were continuous. There were five independent and four dependent variables. Purpose was to measure whether different groups of independent variable were
differently affecting the dependent variable or not? Every hypothesis was processed through three stages. First of all, it was observed, “do the groups of independent variable change while affecting the dependent variable”? Kruskal-Wallis H was applied for this purpose. Secondly it was estimated, what was the size of effect of independent variable on the dependent variable? It is calculated by dividing chi-square value by√n. Thirdly Mann-Whitney U was applied to measure significance of difference between the groups of independent variable while their effect on the dependent variable.

Results depicted that changing the types of institutions (independent variable) resulted into changing in the level of usage of digital health literacy (dependent variable). In the same manner Animal sciences universities were significantly different from remaining three types of institution from the view point of their level of expertise in digital health literacy. From the view point of institutional barriers to digital health literacy, Health Sciences Universities were significantly different from General and Engineering universities. Results elaborated that students belonging to different age groups and different levels of education were having different levels of expertise and different levels of usage of digital health literacy. In the same manner level of time spent on computer, affected the level of usage and expertise in digital health literacy. Results depicted that males and females had equal level of usage of digital health literacy, but they had difference in level of expertise in digital health literacy. Fourth and fifth chapter of the dissertation answered the first three objectives of the research.

Chapter six depicted the results from eight different FGDs and in-depth interviews from four different types of institutions. These FGDs and in-depth interviews were conducted to induce new themes relating the challenges to digital health literacy among the students of universities. There were three main objectives of these FGDs and in-depth interviews i.e. exploring the sources of health information, exploring different challenges, and exploring the ways to improve digital health literacy among university students.

Results from different FGDs and in-depth interviews depicted different kinds of health information sources from the view point of students, belonging to different kinds of institutions. Results showed that students were getting health information through books, radio, T.V., magazines, doctors, newspapers, and health related conferences and
seminars. According to them different labels of medicines were also great source of health information. FGDs also depicted different kinds of challenges to digital health literacy. Students were of the view that lack of accessibility and availability of ICTs, lack of guidance and training, lack of technical and administrative support, chances of fraud, irrelevant information and complex terminology were some major barriers to the digital health literacy. Students were of the view that there should be trainings, seminars, financial support, availability and accessibility, simple language and short illustration to improve the level of digital health literacy.

7.2. Findings

• Students belonging to different types of institutions had different level of usage of digital health literacy. Students of Animal sciences universities were significantly different from General and Engineering universities students in level of usage, while Health Sciences students were also significantly different from the students of General and Engineering universities from the view point of their level of usage of digital health literacy.

• From the view point of level of expertise, students of Animal sciences universities were significantly different from the remaining three types of institutions.

• Means of different types of institutions were same for level of technological barriers relating digital health literacy.

• Students belonging to different types of institutions were suffering from different kinds of institutional barriers related to digital health literacy. In this regard Health Sciences universities were significantly different from remaining three types of institutions (Engineering, Animal sciences, General) from the view point of institutional barriers.

• Students belonging to different levels of education had different level of usage of digital health literacy. Students of PhD were significantly different from students of Bs/Masters and Ms/Mphil in their level of usage of digital health literacy.

• Students belonging to different levels of education had different level of expertise in digital health literacy. PhD students were significantly different from Ms/Mphil students in their level of expertise in digital health literacy.
• Students belonging to different age groups had different level of usage of digital health literacy. Students having the age between 25-28 years have different level of usage of digital health literacy as compared to those who have 17 to 20 years, and 21 to 24 years of age.

• Students having different levels of age had different levels of expertise in digital health literacy. Students having age of 29 years or above were significantly different in their level of expertise in digital health literacy as compared to those who had the age between 17 to 20 years, 21 to 24 year and 25 to 28 years.

• Students spending different levels of time had different levels of usage of digital health literacy. Students spending 0 to 1 hour daily on computer were significantly different from those who were spending 2 to 3 hours and 4 to 5 hours daily on computer from the viewpoint of their level of usage of digital health literacy. In the same manner students spending 6 or more hours daily on computer were different from those who spent 2 to 3 hours and 4 to 5 hours daily on computer.

• Students spending different levels of time on computer had different levels of expertise in digital health literacy. Students spending 4 to 5 hours daily on computer were significantly different in their levels of expertise as compared to those who used to spend 0-1 hours, 2-3 hours and 6 or more hours daily on computer.

• Students belonging to different categories of gender had no difference in their level of usage of digital health literacy.

• Students belonging to different categories of gender had different levels of expertise in digital health literacy.

• Books, radio, TV, Newspaper, Magazines, doctors and other health professionals, health related pamphlets and seminars were a good source of health information, according to the viewpoint of students, belonging to different types of institutions.

• Students of different types of institutions depicted different kinds of challenges to digital health literacy e.g. lack of availability and accessibility of ICT resources, lack of efficient labs, lack of guidance and training, lack of technical and administrative support, lack of
financial support, irrelevant and unauthentic information, complex terminology and frauds on internet etc.

- Training and guidance, technical and administrative support, financial support, provision of pertinent and authentic information, easy language, availability and accessibility, specific illustrations and availability of electricity can improve the level of digital health literacy among university students.

7.3. Conclusion

The thesis started with six different kinds of objectives. Some objectives were answered in quantitative portion while some were answered in qualitative portion and some objectives were answered in both qualitative and quantitative analysis.

The first objective was to trace institutional challenges and their relation with digital health literacy. First of all, qualitative analysis depicted different institutional challenges e.g. lack of accessibility and availability of ICTs in institutions, lack of guidance and training from the institutions, and lack of technical and administrative support from the institutions etc. Then quantitative portion depicted the relationship between institutional challenges and digital health literacy. Results showed that belonging to different types of institutions resulted into different levels of usage of digital health literacy. Students in some universities were better in digital health literacy from those who belong to other types of institutions. This meant that institutions had some relation with digital health literacy. Every institution had different level of ICT resources and difference in guidance, so belonging to different types of institutions resulted into different level of digital health literacy. Literature also confirmed the results which were mentioned above. Such kind of research was made by Escoffery et al. (2005) on college level students. The purpose of that research was to measure the level of usage of internet for health literacy among students belonging to different types of colleges. The study pointed out that belonging to different types of colleges affects the level of usage of internet in searching health, while the present study also depicted same kind of results. From the quantitative analysis and literature review it can be generalized that belonging to different types of institutions results into different levels of using digital health literacy. While qualitative portion is depicting that different institutions have difference in level of accessibility, availability and technical support of ICT resources. According to Ludwick (2009) accessibility and availability of ICT resources from
institutions was needed for the successful implementation of ICT into health seeking behavior. So, here it can be concluded that different institutions had different institutional barriers relating digital health literacy, and institutional barriers are inversely proportional to usage of digital health literacy among university students.

Second objective of the research was to trace socio-cultural limitations in digital health literacy among university students. Qualitative portion elaborated different socio-cultural limitations e.g. chances of fraud on internet, irrelevant information on internet and complex terminology usage in different languages on internet. Literature was also supporting the argument, as internet frauds (Birru et al. 2004), and difficult language of ICTs as well as health relating websites (Helft et al. 2005) were the major barriers to digital health literacy. Then, quantitative portion depicted the relationship between socio-cultural challenges and level of usage of digital health literacy. Quantitative results showed that different socio-cultural characteristics (e.g. Level of age, category of gender, and level of education) differently affect the level of usage of digital health literacy. Previous researches also depicted same kind of findings. For example people belonging to different levels of age (Brenner 2003, Gray et al. 2005, Mancini et al. 2010) have different levels of usage of digital health literacy. In the same manner it was suggested that people having different levels of education (Fogel et al. 2002, Flynn et al. 2006, James et al. 2007, Greenhalgh et al. 2008) had difference in usage of digital health literacy. Here it can be concluded that there are different socio-cultural challenges (Age, education, ICT skills, difficult terminology) relating digital health literacy and people belonging to different socio-cultural characteristics had difference in level of usage of digital health literacy.

Third objective tried to probe the technological barriers related to digital health literacy among university students. The qualitative portion depicted new themes through inductive process. Such kinds of themes were also depicted by other researchers on the same topic. The findings are depicting that there were different kinds of technological barriers e.g. lack of availability and accessibility of ICT resources (Pennbridge et al. 1999, Helft et al. 2005), lack of efficient labs (Blackburn et al. 2005, Ibrahim et al. 2006), lack of guidance and training (Dart 2008), and lack of technical and administrative support (Pennbridge et al. 1999, Boukhors et al. 2003, Anhoj et al. 2004). Students were of the view that technological barriers decrease the chances of using electronic sources in searching health. According to Wangberg et al. (2008) and
Yee et al. (2008) increased level of technological challenges results into decreased usage of digital health literacy and vice versa. So it is concluded that technological challenges had an effect on digital health literacy.


The fifth objective of the study was to trace different perceived barriers to digital health literacy. Such kinds of barriers were traced by using qualitative method. This method helped out to trace barriers to digital health literacy. Previous researches and the present research came to the conclusion that there are different barriers to digital health literacy e.g. procedural and language complexity of health websites (Craig et al. 2008, Wilson et al. 2010, Eisenstein 2013), lack of ICT skills (Devanbu et al. 2003, Arief et al. 2013), suspected reliability of different websites (Schneier et al. 2011, Nassiri et al. 2014), load shedding of electricity (Chowdhry et al. 2012, Abbas et al. 2014), stressful activity of net surfing (Tang et al. 2014, Montag et al. 2015), lack of attraction in health websites (Lahdenpera et al. 2001, Wilson et al. 2010), reduced speed of access to internet (Qadir et al. 2009), lack of availability of computer and internet at home (Woessmann et al. 2004, Kuhlemeier et al. 2007), lack of training in ICTs (Pelgrum 2001, Childs et al. 2005), decreased efficiency of computer labs, privacy concerns on internet, less authentic
websites, adversities of self medications (Shaikh 2009, Abbas et al. 2014), vast illustrations on internet (Nassiri et al. 2014), and banned youtube in Pakistan.

The sixth objective was to explore some suggestions from the respondents to improve digital health literacy. The study explored different suggestions through qualitative method e.g. avoiding unnecessary illustrations and complex languages on internet (Walsh et al. 2008, Eisenstein 2013), conduction of trainings in ICTs (Galanouli et al. 2004, Dee et al. 2005), arrangement of different health seminars and conferences (Scandurra, I.2008), availability and accessibility of ICT resources (Kimaro et al. 2006, Qadir et al. 2009), categorization of authentic and unauthentic websites (Choi et al. 2013), decreasing the level of load shedding of electricity, celebration of health days (Tonelli, M. et al. 2014, Yasmeen et al. 2015), assuring privacy of patients (Malhotra et al. 2004, Bansa et al. 2010), and designing doctor-patients interactive webs (Cohen et al. 2011).

7.3.1. Theoretical Relevance

Technology Acceptance Model (TAM) by Fred Davis (1989) was used as theoretical framework for the study which made the view that technology usage is affected by Perceived Ease of Use (PEU) and Perceived Usefulness (PU). Literature depicted that different researchers used different indicators to measure PEU and PU. The present research used predetermined themes in the quantitative portion to measure PEU (easy to operate, easy to perform desired work, applications are softer, applications are flexible) while the Focus Group Discussions (FGDs) and In-depth interviews brought new emergent themes relating PEU through inductive process (ICT skills, increased speed of access to internet, availability of computer and internet at home, efficient computer labs, trainings in ICTs, categorization of authentic and unauthentic websites, and doctor-patients interactive webs). In the same manner PU was measured by predetermined indicators in quantitative portion (Increase health information, Increase performance, Increase effectiveness of health) while the qualitative portion helped to explore new themes which were pertinent to PU (reliable information, assurance of privacy, authentic information). To summarize the discussion it can be concluded that TAM model is quite pertinent to the present study, as the results are depicting that PU and PEU are directly linked to the usage of digital health literacy. The decreased level of Perceived Ease of Use (PEU) and Perceived Usefulness will result into decreased level of DHL usage and vice versa.
7.4. Implications of study
Implications of study are listed below:

7.4.1. Implication for Patients
Digital health literacy is functional for patients in many ways.
   I. It is easy to access.
   II. It makes it easy to interact with a doctor.
   III. It assures the privacy of the patient.
   IV. It is quick in results (DeMonte et al. 2015).
   V. It improves the health conditions of patients (Radu et al. 2014).
   VI. eHealth can save expenditures of patients.

7.4.2. Implications for society
Digital health literacy is functional for society as well.
   I. According to Koh et al. (2012) a society can save 73 billion USD annually through using digital health.
   II. In 1994, world Tele Communication Development Conference (WTDC), proposed to use ICTs to get better the health situation of developing countries, as it will result in reducing expenditures (Radu et al. 2014).
   III. Incorporation of electronic resources in medical system can effect into the cost of installation and protection of technologies, but this will not hamper the price saving effect of digital health (“eHealth”, 2015).
   IV. In 2005 WHO stalwartly suggested to initiate digital health literacy programs to condense the costs of costly medical systems.

7.5. Recommendations
Recommendations are as follows:

7.5.1. Recommendations for Policy Makers
   I. There should be availability and accessibility to ICT resources among universities students.
   II. Students should be trained to use the ICTs in seeking health related information.
   III. Both male and female students should have equal opportunities to use laboratories, libraries and other information source.
IV. Conferences and seminars are needed to be arranged, which should inculcate interest among students to use digital health literacy.

V. Health related website are needed to avoid complex terminology and should use simple language, so that students can understand of the material.

VI. There should be technical and administrative support to student from the institutions relating digital health literacy.

VII. Radio and TV should play a vital role to promote digital health literacy among students.

VIII. There should be financial support to students from institutions and government, so that they can get access to new online information resources e.g. eBooks, journals and articles. Because most of the time, one has to pay to get access to these resources.

IX. Government and institutions should devise a list of authentic websites. This will help the students to avoid themselves from fake and unauthentic information, and they can also avoid themselves from difference kind of online frauds.

X. Websites relating health information should use simple and easy language, so that student belonging to different field could easily grasp the information.

XI. Government should try to reduce or abolish the load shedding of electricity, as it is a great hurdle to the successful implementation of digital health literacy.

XII. There are number of videos and lectures relating health on Youtube, Ban should be uplifted from it, so that student could get health related knowledge through lectures and videos.

XIII. Websites should not ask about the personal information of health seekers, because most of patients consider it a threat for their privacy.

XIV. Efforts should be made to improve the ICT skills of students. Students of every field should be taught basic computer skills.

XV. Speed of access to internet should be improved, so that students can get their desired health information without wasting much time.

7.5.2. **Recommendations to Improve the Studying Topic**

I. It is needed to trace out the behavior of people relating digital health literacy while taking a country level population for research.

II. Like students, perception of male and female teachers should be evaluated relating the topic.
III. The present research used cross sectional research design. Further researchers are suggested to use some longitudinal model which could compare the attitude at different times.
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Annex-A. Questionnaire
Institutional, Socio-Cultural and Technical Challenges to Digital Health Literacy among University Students

Respected Respondent,

I am student of PhD in Sociology from Institute of Social & Cultural Studies, University of the Punjab. The present questionnaire is to collect data for my dissertation on the above mentioned topic. I hope your kindness will pay attention to this academic activity. I assure you all kind of privacy securities.

Age:.................... Gender:.............

Education (Recent Class):
  a. B.S (Hons.) or Masters Class
  b. MS or Mphil
  c. PhD

Institution Type:
  a. Engineering University
  b. Health Sciences
  c. Animal sciences
  d. General

Institution Sector:
  a. Private
  b. Public

Availability of personal computer at home:
  a. Yes
  b. No

Availability of internet at home for personal use:
  a. Yes
  b. No

Daily time spent on Computer
  a. 0-1 hour
  b. 2-3 hour
  c. 4-5 hour (Above)

Please rate your digital (Information & communication ICT) skills

<table>
<thead>
<tr>
<th>No</th>
<th>Type of ICT</th>
<th>Excellent</th>
<th>Good</th>
<th>Bad</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Spreadsheet Program</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Graphics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Type of ICT</td>
<td>Very Often</td>
<td>Often</td>
<td>Rarely</td>
<td>Never</td>
</tr>
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<td>-------------</td>
<td>------------</td>
<td>-------</td>
<td>--------</td>
<td>-------</td>
</tr>
<tr>
<td>1</td>
<td>To what extent do you seek health information through computer?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>To what extent do you use computer to get knowledge about your illness?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>To what extent do you use computer to get knowledge about your pain?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>To what extent do you use computer to get access to a doctor?</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>To what extent do you use computer to know about the symptoms of different diseases?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>To what extent do you use computers to get knowledge about self medication?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What is your level of technology usage in health literacy?

Please give your opinion on below given statements. (Technological Barriers)

<table>
<thead>
<tr>
<th>No</th>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I have lack of guidance in usage of ICT in health seeking.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I feel it difficult to get health related knowledge through computer.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>The health related knowledge learned through computer is difficult to implement.</td>
<td></td>
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<tr>
<td>4</td>
<td>There is lack of ICT trainings relating to health literacy.</td>
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<tr>
<td>5</td>
<td>Performance of technology is poor in health literacy.</td>
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<tr>
<td>6</td>
<td>Using computers for health literacy is much</td>
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</tr>
</tbody>
</table>
What is your level of expertise in searching health information through ICT?

<table>
<thead>
<tr>
<th>No</th>
<th>Statement</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I know what health resources are available on the Internet.</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>I know where to find health resources on the Internet.</td>
<td></td>
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<tr>
<td>3</td>
<td>I know how to find health resources on the Internet.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I know how to use the Internet to answer my questions about health.</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>I know how to use the health information I find on the Internet to help me.</td>
<td></td>
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<tr>
<td>6</td>
<td>I have the skills I need to evaluate the health resources I find on the Internet.</td>
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</tbody>
</table>

Please give your opinion about following statements. (Institutional Challenges).

<table>
<thead>
<tr>
<th>No</th>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>There is availability of ICT (Information &amp; Communication Technology) resources in our institution.</td>
<td></td>
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<tr>
<td>2</td>
<td>I have access to ICT (Information &amp; Communication Technology) resources in our institution.</td>
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<tr>
<td>3</td>
<td>I can get technical support from my institution relating to ICT (Information &amp; Communication Technology).</td>
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<tr>
<td>4</td>
<td>The university computer lab is much efficient.</td>
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<tr>
<td>5</td>
<td>There are enough financial resources in our institution relating to ICT (Information &amp; Communication Technology).</td>
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<td></td>
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</tr>
<tr>
<td>No</td>
<td>Statement</td>
<td>Strongly Agree</td>
<td>Agree</td>
<td>Disagree</td>
<td>Strongly Disagree</td>
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</tr>
<tr>
<td>6</td>
<td>We can avail every kind of administrative support from our institution relating to ICT (Information &amp; Communication Technology).</td>
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</tbody>
</table>
Annex-B - Semi-structured Interview Questions for Experiencing Participants

1. Describe the things you enjoy doing with technology and the web each week.

   [Probes: How significant is the web for your social life, do you utilize it to keep in touch with your friends? What gadgets/devices/things do you employ the most, is there anything you couldn’t live without”? How much time on normal do you pay out online each week? Is there anything that bothers you about being online?]

2. Think of the ways you have used technology and the web for your study work. Describe a typical week.

   [Probes: How do you keep track of things? What systems for learning online do you have? Can you give us any examples of when you’ve asked your colleagues for help on your work online? What kind of online resources have you found that help you with your work? How did you find them? What other gadgets or devices do you use for your study?]

8. Think about your health. Tell me what you think about your health.

   [Probes: How do you think you see your physical fitness? Do you suffer some disease? Whenever you face some health issue, to whom you consult? Do you think that health information can make positive effects to health? What are your health information sources? Do you visit some health related website when you suffer some medical issue?]

9. Think of a time when you had a situation where you needed answers about health issue or solutions and you did a quick search and made do with it. You knew there were other sources but you decided not to use them. Please include sources such as friends, family, colleagues, mentors, etc. Prompt for both academic and informal examples.

   [Probes: Did you simply take the first answer/solution you were able to find? What was the situation? What sources did you use? What led you to use them...and not others? Did they help? How? What sources did you decide not to use? What led to this/these
decision/s? What did source A give you that you thought source B could not? Are there situations where source B would ‘be a better choice for you? How did you decide when it was time to stop looking? How did you assess what was good enough?]

5. Have there been times when you were advised to use an internet source to solve your health problem?, and used other source(s) instead?

[Probes: What made you decide to use what you were advised to use? What made you decide not to use other source? Briefly explain your decision after advice? What other sources of health information were you advised to get health information?]

6. What would your ideal way of getting health information be? How would you go about using the systems and services? When? Where? How?

7. What are your previous experiences about challenges in searching online health?

[Probes: Do you believe searching online health needs extra-ordinary computer skills? Had you ever some problem searching health online? Do you have availability and accessibility of internet sources at home and studying place? If hurdles are removed, would you like to use online health? Can searching health on internet result into risk for health]

8. Had you any suggestions to improve searching online health behavior?

9. What comments or questions do you have for me? Is there anything you would like me to explain?

10. What would you like to tell me that you’ve thought about during this interview?
Annex-c. Variables and Operationalization

<table>
<thead>
<tr>
<th>Variable</th>
<th>Operationalization</th>
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</thead>
</table>
| **1) Institution Type** | 1) Engineering universities  
2) Health sciences universities  
3) Animal sciences universities  
4) General universities |
| **2) ICT Skills** | 5) Computers skills  
6) Spreadsheet program skills  
7) Graphics skills  
8) Word process skills  
9) Desktop publishing skills  
10) CD ROM, DVD skills  
11) Presentation skills  
12) Internet skills  
13) Electronic mail  
14) Authoring e-content |
| **3) Expertise in Searching Health** | 15) Knowledge of available health resources on internet.  
16) Knowledge about where to find health on internet.  
17) Knowledge of how to find health on internet.  
18) Knowledge of getting answer from internet about health.  
19) Knowledge of using health information collected from internet.  
20) Knowledge of differentiation between low and high quality health resources on internet. |
| **4) Technological Challenges** | 21) Lack of guidance  
22) Difficult to use  
23) Difficult to implement  
24) Lack of ICT training  
25) Poor performance of technology  
26) Expensive  
27) Lack of new information  
28) Threat for privacy |
<table>
<thead>
<tr>
<th>Variable</th>
<th>Operationalization</th>
</tr>
</thead>
</table>
| 5) Institutional Challenges   | 29) Availability of ICT resources.  
                              | 30) Accessibility to ICT  
                              | 31) Technical support  
                              | 32) Efficient labs  
                              | 33) Enough financial resources from institution relating ICT  
                              | 34) Administrative support from institution |
| 6) Level of Technology Usage in Health Literacy | 35) Level of getting health information through ICT.  
                              | 36) Getting knowledge about illness  
                              | 37) Getting knowledge about pain  
                              | 38) Getting access to doctor  
                              | 39) Getting knowledge about symptoms of diseases  
                              | 40) Getting knowledge about self-medication  
                              | 41) Getting knowledge about dieting plan  
                              | 42) Getting knowledge about exercises |
| 7) Universities              | 43) HEC recognized  
                              | 44) Universities in Lahore  
                              | 45) The universities, which have online students are not included in this research |
| 8) Socio Cultural             | 46) A few socio cultural characteristics were included in this research, which included age, gender, education, institution type and sector and daily time spent on computer. |
| 9) Digital Health Literacy    | 47) seeking, finding and understanding health information through electronic resources |
| 10) Education                 | 48) BS or Masters  
                              | 49) MS or MPhil  
                              | 50) PhD. |
Annex-D. Categories of Digital Health Literacy

Rating of ICT Skills

- Rating of Computer Skills
- Rating of Spreadsheet Program Skills
- Rating of Graphics Skills
- Rating of Word process Skills
- Rating of Desktop publishing Skills
- Rating of Presentation Skills
- Rating of Internet Skills
- Rating of Electronic mail Skills
- Rating of Authoring e-content Skills

Level of technology usage in health literacy

- To what extent do you seek health information through computer?
- To what extent do you use computer to get knowledge about your illness?
- To what extent do you use computer to get knowledge about your pain?
- To what extent do you use computer to get access to a doctor?
- To what extent do you use computer to know about the symptoms of different diseases?
- To what extent do you use computers to get knowledge about self medication?

Technological Barriers

- I have lack of guidance in usage of ICT in health seeking.
- I feel it difficult to get health related knowledge through computer.
- The health related knowledge learned through computer is difficult to implement.
- There is lack of ICT trainings relating to health literacy.
- Performance of technology is poor in health literacy.
- Using computers for health literacy is much expensive.
- There is lack of new health information on computers.

Level of expertise in searching health

- I know what health resources are available on the Internet.
- I know where to find health resources on the Internet.
- I know how to find health resources on the Internet.
- I know how to use the Internet to answer my questions about health.
- I know how to use the health information I find on the Internet to help me.
- I have the skills I need to evaluate the health resources I find on the Internet.

Institutional Challenges

- There is availability of ICT (Information & Communication Technology) resources in our institution.
I have access to ICT (Information & Communication Technology) resources in our institution.
I can get technical support from my institution relating ICT (Information & Communication Technology).
The university computer lab is much efficient.
There are enough financial resources in our institution relating to ICT (Information & Communication Technology).
We can avail every kind of administrative support from our institution relating to ICT (Information & Communication Technology).
Annex-E. Code Book for Behavior Questions

ICT Skills
   1. Excellent
   2. Good
   3. Bad
   4. Poor

Level of Usage of Digital Health Literacy
   1. Very Often
   2. Often
   3. Rarely
   4. Never

Views about Technological Barriers in Digital Health Literacy
   1. Strongly Agree
   2. Agree
   3. Disagree
   4. Strongly Disagree

Opinion about Level of Expertise in Digital Health Literacy
   1. Strongly Disagree
   2. Disagree
   3. Agree
   4. Strongly Agree.

Opinion about Institutional Challenges Relating Digital Health Literacy
   1. Strongly Disagree
   2. Disagree
   3. Agree
   4. Strongly Agree.
Annex-F. Code Book for Demographic Question

Type of Institution

1. Animal Sciences Universities
2. General Universities
3. Engineering Universities
4. Health Sciences Universities

Gender

1. Male
2. Female

Education (Class)

1. Bs/Masters
2. Ms/Mphil
3. PhD

Age

1. 17-20 years
2. 21-24 years
3. 25-28 years
4. 29=> years

Availability of PC at home

1. Yes
2. NO

Availability of Internet at Home

1. Yes
2. No
Time Spent on Computer

1. 0-1 Hours
2. 2-3 Hours
3. 4-5 Hours
4. 6=> Hours