

**MORPHOLOGY AND COMPOSITIONAL ANALYSIS  
(INFRARED SPECTROSCOPY) OF URINARY STONES  
IN CENTRAL SINDH  
(NAWABSHAH AND ADJOINING AREAS)**

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**(2010)**



*IN THE NAME OF*

ALLAH

THE MOST BENEFICENT

THE MOST

MERCIFUL

**Dedicated to** \_\_\_\_\_

**My late father who taught me resilience and patience and  
from whom I have learnt to negotiate the challenges of life with  
dignity and courage.**

**My loving mother, who is my inexhaustible source of comfort, love  
and optimism.**

**My caring and selfless sisters who toiled laboriously for my comfort  
and enabled me to remain focused upon my objectives.**

**My energetic and obedient son.**

## CERTIFICATE

It is certified that the thesis work entitled "Morphology and compositional analysis (Infrared spectroscopy) of Urinary stones in central Sindh (Nawabshah and adjoining areas) is the original work of Dr. Jan Muhammad Memon and has been carried out under my direct supervision and guidance. It is further certified that the material included in thesis have not been used in part or full in manuscript already submitted or in the process of submission in partial/complete fulfillment of the award of any other degree. I am fully satisfied with his genuine research work and fulfill the requirements and qualify the conditions for submitting the thesis to award the degree of Doctor of Philosophy in Medicine (Urolithiasis)



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It is certified the thesis work entitled "Morphology and compositional analysis (Infrared spectroscopy) of Urinary stones in central Sindh(Nawabshah and adjoining areas) with reference to (Office order No:D/830-Acad/27-02-2007, University of the Punjab Lahore) is prepared and submitted on the basis of experimental results by author Dr. Jan Muhammad Memon under my guidance and supervision. I am fully satisfied with his original research work reported in this manuscript and certify its reality/ correctness and authenticity. It is further certified that the thesis work has been prepared according to the prescribed format and fulfills the requirements and qualifies the conditions for submitting the thesis to award Ph.D Degree through the official procedures of the university as Co-supervisor



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## SUMMARY

Urolithiasis is an increasing and major public health problem in Sindh province. Due to lack of research facilities, the remoteness and difficult geographical situation, prevailing medical problems are virtually unknown in the state of Nawabshah. So far no study regarding morphology and compositional analysis of urinary stones has emerged from this area. The high percentage of hospital admissions, surgical procedures and serious complications stressed the need to research on this major issue. The total population of Nawabshah is 1.15 billion and agricultural based city with hot climate.

The hospital incidence of urolithiasis per annum showed 3.6 % (hospital statistics) that indicates urinary stone disease is still prevalent in central Sindh. The higher incidence of stone disease in our part of the world may be declared as stone belt possibly due to warm climate, low protein intake and high consanguinity. The present study comprised 139 (69.5%) males and 61(30.5%) females with male predominance of male female ratio of 2.2 ratio:1. The peak incidence was found in 11-20 years age group (31%) and second peak in the 21-30 years age group(20%). The clinical pattern of urinary stone disease revealed that the upper urinary tract(kidney and ureter) stones(66.2) were more prevalent than lower urinary tract(urinary bladder and urethra)(33.8%). This clinical diversity is due to changes in dietary habits and life styles and increased caloric intake. The chief clinical presentation was pain in (48%) of urolith patients with the second peak of haematuria (17.7%).

Urinary stones continue to occupy an important place in every day clinical practice. The surgical treatment of urinary stone disease has unparalleled progress

in the past two decades due to rapid and explosive development of minimally invasive and non invasive techniques and open surgery has such a limited role that its performance is regarded as a sign of failure in modern day urinary stone treatment<sup>17</sup>. To think of open surgery in this manner is likely to do a disservice to a small but important segment of urinary stone-patient population Open surgery is the only available option in our part of the world. Operative procedures in our series included for renal calculi (46.5%), bladder (43.5%), ureteral (15%) and urethral (2.5%) which is not in agreement with other series due to certain reasons, (i) unavailability of equipment for non-invasive and minimally invasive techniques; (ii) lack of expertise (iii) increased cost burden "financial pain" (iv) major strata of patients are illiterate and below the poverty line The art of open stone surgery in modern era there fore plays an essential and integral part of stone service for trainees and poor public to attain an acceptable standard of competence and should be served for some time by the current generation A treatment policy is considered a standard if health and economic outcomes are apparent and there is a near – unanimous decision about which treatment is optimal. A great saying " gone are the days when open surgical procedures were the treatment of choice for all stones even in large and well equipped stone centers and today's urologists are unlikely to perform many open procedures for stone disease<sup>31</sup> does not hold correct and applicable in this region. Open surgery is still the "gold standard" option because only available, less expensive, more dependable, highly effective in the management of stone disease. Hence it appears to be among first line therapies in less developed, neglected, economically weak and remote areas of rural Sindh.

Stone composition has changed substantially over the past two decades with a progressive increase in frequency of calcium oxalate stones which accounts for

(68.71%) and uric acid (15.9%), sturvite (14.3%) and xanthine (0.97%). The high percentage of calcium oxalate stones is due to high dietary intake of green leafy vegetables and dehydration due to hot climate and low fluid intake as strong etiologic agents for calculogenesis.

Calcium and oxalate are present in the diet so it would seem sensible to exclude these to avoid the problem but unfortunately not so simple. For the well-being of urinary tract the most important daily habit is to drink lot of fluids, limit oxalate foods like green leafs' vegetables, reduce salt intakes, reduce protein intake and take more citrous juices. The effect of climate on the prevalence of stone disease in our part of the world may be indirect, though the effect of temperature making a relationship between higher environmental temperature and higher seasonal incidence of urinary stone disease. High temperature increases perspiration leading to urinary crystallization and a higher incidence of urolithiasis during summer months. The dietary habits may vary with social structure and beggary of influence, poverty, illiteracy and poor nutrition might increase the risk of lithiasis in vegetarian population.

The present work has shown direct link between the morphology and compositional analysis of urinary stones, providing a better ground for the clinicians to analyze the removed stones on the same pattern for their diagnostic, therapeutic and prophylactic purposes.

Establishment of modern stones clinics to manage referral cases from rural and urban areas with the road map of evaluation and treatment plan. Establish public awareness programmes on the prevention of the stone disease and teaching sessions for primary physicians to make early diagnosis and appropriate treatment. That should be expected to reduce the number of complications of stone disease



like renal failure in public defense.

The sharing of knowledge among scientists, researchers, physicians and public representatives would be directed toward improving diagnosis, enhancing treatment, public awareness with the cure of urinary stone disease in public service.

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**Dr. Jan Muhammad Memon**

## LIST OF ABBREVIATIONS

PUJ:	Pelvi-ureteric junction
VUJ:	Vesicoureteric junction
UTI:	Urinary tract infection
MSK:	Medullary sponge kidney
AH:	Absorptive hypercalciuria
VDR:	Vitamin D receptor
PTH:	Parathyroid hormone
LUTS:	Lower urinary tract symptoms
BOO:	Bladder outlet obstruction
IBD:	Inflammatory bowel disease
XRD:	Xanthine dehydrogenase
WHEW:	Whewellite
WHED:	Wheddite
WHIT:	Whitlockite
BR:	Brushite
AP:	Apatite
KUB:	Kidney ureter bladder
IVU:	Intravenous urogram
MRI:	Magnetic resonance imaging
NC HCT:	Non contrast helical CT
CMP:	Crystal matrix protein
RL:	Renal lithostathine
GAGs:	Glycosamino glycans
THP:	Tam Horsfall protein
IRS:	Infrared spectroscopy
FT-IR:	Fourier infrared spectroscopy
XRD:	X-ray diffraction
XRF:	X-ray fluorescence
SEM:	Scanning electron microscopy
US:	Ultrasonography
DM:	Diabetes mellitus
CVS:	Cardiovascular system
CT:	Computed tomography
UA:	Uric acid
MAP:	Magnesium ammonium phosphate
UPTF1:	Urinary prothrombin fragment 1
sym:	symmetrical
asym:	asymmetrical
NFK:	Non functioning kidney

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