The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 12, 2025

TENDENCY OF PHYSICAL ACTIVITY IN KIDNEY STONES PATIENTS: CROSS-SECTIONAL STUDY

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DOI: https://doi.org/10.5281/zenodo.17934766

Keywords
Kidney stone, Nephrolithiasis, MET, IPAQ, CKD, HDN, RFT, ARF

Article History
Received: 15 October 2025
Accepted: 27 November 2025
Published: 15 December 2025

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Abstract

Background: *Kidney stone disease is a crystal fusion formed usually inside the kidneys. Distressing about 12% of the world population. It is an increasing urological disorder of human health.*

Objectives: *To estimate the tendency of physical activity in kidney stone patients.*

Methodology: *The comparative cross-sectional study was conducted from June 2023 to September 2023 at Pakistan Kidney Center, Abbottabad. 100 patients aged 20-60 years, fulfilling the inclusion criteria of nephrolithiasis were selected through non-probability convenient sampling technique and were asked to fill the questionnaire IPAQ (International physical activity questionnaire). The sample size was calculated by Rao soft.*

Results: *A total n=100 participants with age of 41.20±12.663. Out of 100 participants 50(50%) were male and 50(50%) were female. Physical activity related to grades of kidney stone were categorized. In grade 1, the high level of physical active was 7%, moderate 12% and low physical activity was 19%. In grade 2 high physical activity was 24%, moderate 14 % and low 4%. In grade 3 the high physical activity was 16%, moderate 3% and low 1%.*

Conclusion: *This present study concluded that high physical activity in existing kidney stone patients have grade 2 kidney stones. This mean that high physical activity without proper hydradtion level, techniques and surroundings may increase kidney stone size in patients with already kidneystone.*

INTRODUCTION

The urinary tract, urinary device or renal system or renal framework, incorporates the kidneys, ureters, bladder, and the urethra. A pair of reddish brown kidneys are present in left and right retroperitoneal space at level of T12 to L3. The kidneys role as a chief excretory organ for abolition of metabolic wastes from the body. (1) Stones along the urinary tract may be positioned within the kidneys, ureters

and urinary bladder. It has been associated with an increased risk of end-stage renal failure (2). The side effects or symptoms of kidney stone are connected with their area whether it is inside the kidney, ureter, or urinary bladder. At first, stone arrangement in all actuality does not cause any symptoms(2). Later, signs and symptoms of the stone disease encompass renal colic (extreme cramping ache), flank ache (ache within the again facet), haematuria (bloody urine), obstructive uropathy (urinary tract disorder), urinary tract infections, blockage of urine float, and hydro nephrosis (dilation of the kidney). These conditions may additionally result in nausea and vomiting with associated affected by the stone event (3)

The peak age in men is 30 years; women have a bimodal age distribution, with peaks at 35 and 55 years. Kidney stones, which are stable crystals that shape from dissolved minerals in urine, can be caused by each environmental and metabolic issues (4). Chemical composition of kidney stones relies upon on the abnormalities in urine composition of various chemical compounds. Stones range in size, shape, and chemical compositions (mineralogy). Based on versions in mineral composition and pathogenesis, kidney stones are generally labeled into Calcium oxalate and Calcium phosphate stones account for nearly 70% of all renal stones. Struvite stones occur to the volume of 10-15% and those stones normally due to contamination. Uric Acid or Urate stones bills 3-10% excessive purines weight loss plan responsible for those (5). Cystine stones are much less common form of stones and those are less than 2 % (6).

Repetitive stone development is a common problem with all types of stones and therefore an important part of the medical care of patients with stone disease. Once a kidney stone forms, the probability that a second stone will form within five to seven years is approximately 50% (7). Kidney stones are categorized into Grade 1 non-existent (5-12mm), Grade 2 mild (12-20 mm) and grade 3 strong (>20mm) (8). Physical activity is accepted worldwide as a public health priority. A physically active lifestyle has been shown to significantly reduce the risk of many diseases. 12 % of population is supposed to have urinary stones, out of which half (50%) might wind up with loss of kidney or renal harm. A physically active lifestyle has been shown to significantly reduce the risk of many diseases.

Numerous factors, including hereditary and environmental components, play a role in the development of renal calculi. The incidence and occurrence of kidney stone development were reported to be 2% to 19% in several western nations, with a high proportion among men. Kidney stones are among the most common urological conditions in Asia. The incidence and configuration of stones differ around the globe, and there are many variations at the end of time. In North America, the incidence ranges from 7% to 13%; in Europe, it ranges from 5% to 9%; and in Asia, it ranges from 1% to 5% (9).

The most patients having kidney stones are under age of 35 to 50 years of age. Patients with right kidney stones were 44 (65.7 %) and left kidney stones were 29 (43.3%). Humanity has suffered from nephrolithiasis for many centuries. Pakistan is among the nations where the prevalence of this disease is highest. Our study includes 100 CT scans throughout study period, in which 64% patients had kidney stones and 36% were not having kidney stones (9).

A regular physical activity lowers the risk of chronic illness and improves wellness. Physical education programs' main objective is to promote lifelong physical activity. This supposition is also in line with arguments in favor of employing physical education as a tool for public health (10). Physical activity is crucial for the social, physical, and mental growth of both genders, as well as for maintaining a healthy weight. But the widespread detrimental effects of physical inactivity on health-related concerns are also acknowledged on a global scale, such as obesity that is the root of many non-communicable diseases (NCDs) (11)

The risk of cardiovascular disease, stroke, hypertension, type 2 diabetes, osteoporosis, obesity, colon and breast cancer, anxiety, and depression has been convincingly proven to be reduced by physical activity. In a dose-dependent manner, diet and exercise interventions lower blood pressure, lessen insulin resistance, reduce visceral belly fat, enhance lipoprotein profiles, and lower the risk of diabetes, all of which are linked to the development of kidney stones (12).

Moderate physical exercise, without increased fluid intake to compensate for excessive sweating, may cause the crystallization of uric acid and calcium oxalate in urine and may enhance the risk of the formation of renal stones composed of these salts (13)

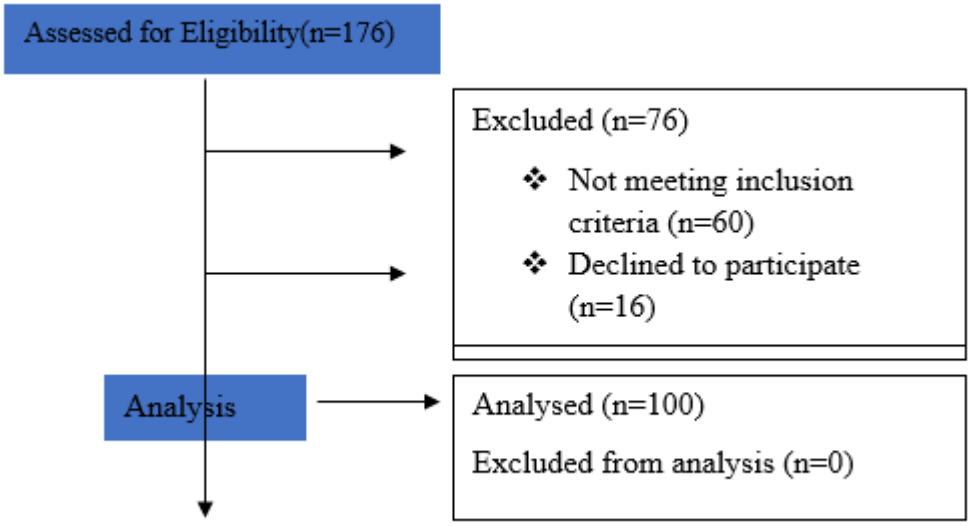
Overall relationship between physical activity and kidney stone is complex and not well understood. Limited literature is available regarding the level of physical activity among kidney stone patients in Pakistan and no such study is conducted in Hazara division. Therefore, the research is proposed to determine the tendency of physical activity in kidney stone patients

Methodology:

Comparative cross-sectional study was conducted at Pakistan Kidney Center, for time duration of 4 months. The study was initiated after the approval from the Institutional Ethical Review Committee of Helping Hand Institute of Rehabilitation Sciences Trust, Manshera (Ref# RC-EA-2023/087). The non-probability convenient sampling technique was applied. RAO software was used to calculate the sample size of 100. Patients aged 20-60 years, both males and females, with Nephrolithiasis were included in this study. Patients with diabetic neuropathy, other chronic kidney diseases or physically disable were excluded from this study.

Data was collected from patients after signed written consent. International Physical Activity Questionnaire (IPAQ) was used. The International Physical Activity Questionnaire serves as a comparable standardized measure of daily physical activity from different countries and cultural backgrounds. The long form of the IPAQ was used for detailed assessment of habitual physical activity, such as work, transportation, daily household activities, and leisure activities. The physical activity measured by IPAQ, which has three categories to measure the physical activity level. High, moderate and low level of physical activity on basis of MET utilization (14). Metabolic equivalent is evaluating the intensity or utilization of oxygen during activity (15). 1 kilo-calorie on per kg and that nearly equal to the consumption of energy in sitting MET was calculated by IPAQ.

Data was analysed by using IBM SPSS version 22. The statistical significance was setup at confidence interval (CI) of 95% i.e. p value of 0.05. Data was presented using the Consolidated Standards of Reporting Trials (CONSORT) checklist. Descriptive statistics were used to determine the percentages and frequencies of the acquired data.



Results:

Total 100 participants were examined and data was taken from them. Among them 50 participants were male while 50 were females. The mean age was 41.20 ± 12.663 (Figure 1). Many of the patients reported different comorbidities including Diabetes, hypertension, obesity, UTI, and polycythemia, which is shown in figure

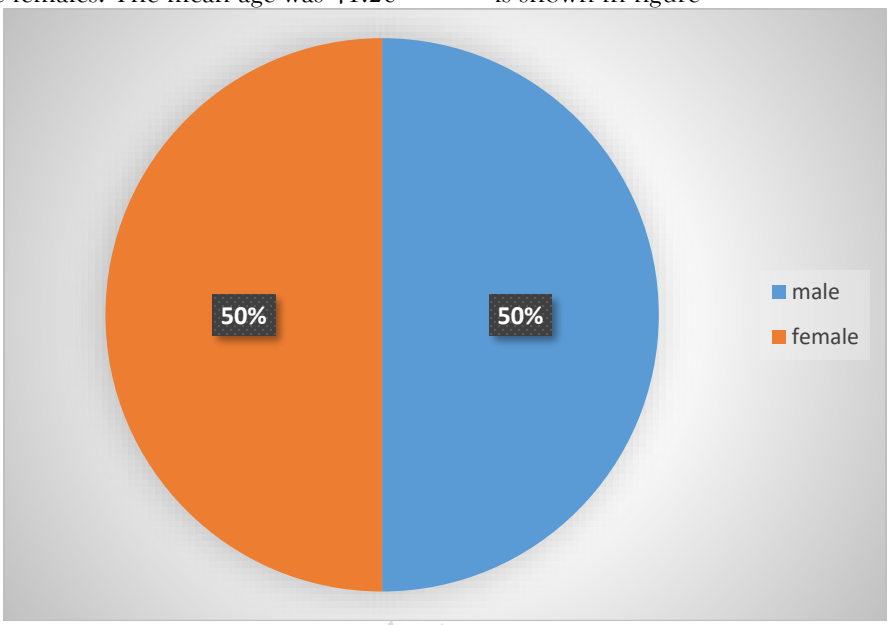


Figure 1: Percentages of gender in kidney stone patients

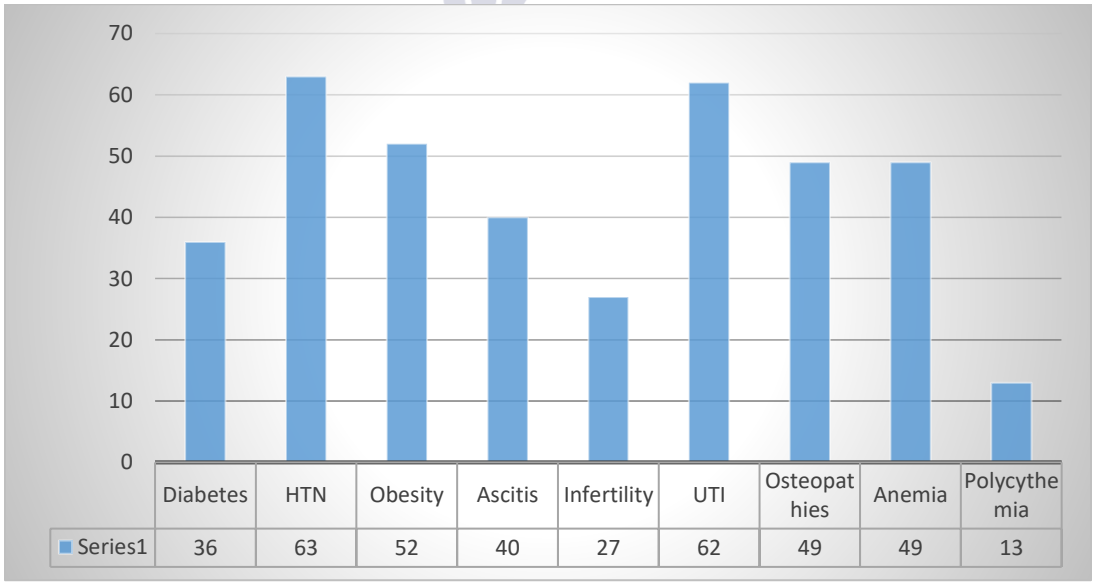


Figure 2: Percentages of comorbidities related to kidney stone among participants

Out of the 100 participants, 38 participants had grade 1 kidney stones, 42 had grade 2, and 20 had grade 3 kidney stones. There were 18 participants with no Hydronephrosis, 32 with mild, 30 with moderate and 20 with severe hydronephrosis. 72 people were reported with unilateral kidney stones, whereas 28 had bilateral kidney stones (Table 1).

Table 1: Age categories, Grades and Status of Kidney stones

Category	Sub-category	Frequency	MEAN ±SD
Kidney stones in age categories	20-37 years 38-47 years 48-61 years	40(40) 26(26) 34(34)	25.94±4.351 43±3.00 55.56±4.396
Grades of kidney stone	Grade 1 Grade 2 Grade3	38(38) (Males 17%) (Females 21%) 42(42) (Males 23%) (Females 19%) 20(20) (Males 10%) (Females 10%)	
Status of kidney stone	Single left calculi Single right calculi Multiple left calculi Multiple right calculi Bilateral single calculi Bilateral multiple calculi	20(20) 27(27) 11(11) 13(13) 18(18) 11(11)	
Presence of kidney stone	Unilateral Bilateral	72(72) 28(28)	
Hydronephrosis	No Mild Moderate Severe	18(18) 32(32) 30(30) 20(20)	

Association of physical activity was checked with grades of kidney stones, grades of hydronephrosis, presence of kidney stones and with alkaline phosphatases, which is shown in Table 2.

Table 2: Association of physical activity with kidney stones, hydronephrosis and Alkaline Phosphatases.

Association		Level of Physical Activity
Grades of Kidney Stones	**Grade 1**	Low (19%) Moderate (12%) High (7%)
	Grade 2	Low (4%) Moderate (14%) High (24%)
	Grade 3	Low (1%) Moderate (3%) High (16%)
Grades of Hydronephrosis	**No**	Low (9%) Moderate (6%) High (3%)
	Mild	Low (6%) Moderate (7%) High (19%)
	Moderate	Low (5%) Moderate (13%) High (12%)
	High	Low (4%) Moderate (3%) High (13%)

Presence of Kidney Stones	**Unilateral**	Low (19%) Moderate (23%) High (30%)
	Bilateral	Low (5%) Moderate (6%) High (17%)
Status of Kidney Stones	**Single Left Calculi**	Low (5%) Moderate (6%) High (9%)
	Single Right Calculi	Low (8%) Moderate (10%) High (9%)
	Multiple Left Calculi	Low (2%) Moderate (4%) High (5%)
	Multiple Right Calculi	Low (3%) Moderate (3%) High (7%)
	Single Bilateral	Low (3%) Moderate (4%) High (11%)
	Multiple Bilateral	Low (3%) Moderate (2%) High (6%)
Alkaline Phosphatases	**Grade 1**	Below Normal (1%) Normal (26%) Slightly raised (5%) Highly raised (6%)
	Grade 2	Below Normal (1%) Normal (19%) Slightly raised (8% Highly raised (14%)
	Grade 3	Below Normal (1%) Normal (9%) Slightly raised (7%) Highly raised (3%)

DISCUSSION:

The present study was conducted to estimate the tendency of PA in kidney stone patients. Data was collected through (IPAQ) and statistically analyzed to find out the percentiles of physical activity. The current study evaluated the percentages of comorbidities associated with kidney stone, and association of grades of kidney stone with MET. According to the results of present study tendency of PA was directly linked in existing kidney stone patients.

The present study was done with n=100 participants with mean age and standard deviation of 41.20 ± 12.663. Both genders were involved in the study according to inclusion criteria. Male patients were 50% and female patients were 50%. Gulalay et al., 2022, stated that about 7% of women and 13% of men may have kidney stones throughout their

lifetimes, and the prevalence of kidney stones is predicted to increase internationally.

The present study showed the proportions of different comorbidities related to kidney stone. Hypertension and diabetes with 63 and 36%, infertility with 64%, ascites with 32%, obesity with 52%, urinary tract infection 62% and anaemia and polycythaemia with 49% and 13%. Saenz-Medina et al recorded that hypertension (29.3%) and diabetes (16.4%) being the most frequently coded in nephrolithiasis.

The present study showed IPAQ was used to estimate the level of PA in kidney stone patient. According to present study three categories of MET high, moderate, low level of PA in grades of kidney stone. low level of physical activity in grade 1 (19%), grade 2 (4%) and grade 3 (1%). Moderate level of physical activity in grade 1 were (12%), grade 2 (14%) and garde 3 were (3%).High level of physical activity in grade 1 were (7%), grade 2 were (24%) and grade 3 were (16%). The high physical activity in symptomatic kidney stone patients exerbate condition due to dehydration and several conditions.

. According to Feng et al., in 2020 conducted a survey in order to find out association between physical activity and kidney stone. Based on study it was concluded that there was a significant negative correlation between physical activity and kidney stones. This suggests that once physical activity reaches a certain level, the prevalence of kidney stones hardly decreases further with further increases in physical activity means that when physical activity increased to 2480 MET-min week, the prevalence of kidney stones in the overall population decreased by approximately 33%, while further increases in physical activity did not produce any further marked reduction in the risk

The limitation of the study was small sample size due to shortage of time. Another limitation of the study was that was only conducted in Hazara region. More research with larger sample size and generalized population will further validate the reported findings.

CONCLUSION:

Over all physical Activitry inhibit kidney stone but it is concluded from the present study there is direct link of physical Activity and exsisting kidney stone. This present study concluded that high physical activity in existing kidney stone patients have grade 2 kidney stones. High physical activity without proper hydradtion level, techniques and surroundings may increase kidney stone size in patients with already kidneystone. It is also concluded that the vigorius activity in exsisting kidney stone patients with low socioeconomic status and in special population like labours have more large renal calculi due to insufficient hydration level and respective to their environment.

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