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# Prevalence and aetiology of Hydronephrosis in adults

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## ABSTRACT

**Introduction:** Hydronephrosis is usually caused by an underlying medical condition or risk occasionally as congenital blockage, unilateral obstructive uropathy, kidney stones, UTIs, tissue scarring, blood clots, neuromuscular problems, Cancer or BPH and pregnancy. This current study was directed to determine the etiological factors and prevalence causes of Hydronephrosis

**Material and Methods:** A Retrospective study was conducted at two private health care setups in Gujranwala, Pakistan. After Informed consent data was collected over period of 8 Months Jan 2020 to Sep 2020. Data was analysed on SPSS version 20 frequencies and percentages were mentioned. Aetiological factors of Hydronephrosis were evaluated on ultrasound.

**Results:** This study included 213 patients, with those aged 41-50 years (45%) having the highest prevalence of hydronephrosis. Gender Includes 30% females and 70% males. About 86% had Hydronephrosis in Unilateral kidney and 13% in bilateral kidneys. The grading of Hydronephrosis was found as highest in Grade2: 122 (57.3%). The causes of Hydronephrosis were observed on Ultrasound and found most prevalent cases of Calculi 60%, 13% females had Hydronephrosis due to Pregnancy, 8.9% males had Hydronephrosis due to Benign Prostatic Hyperplasia.

**Conclusion:** The study concluded that Renal Calculi are the most prevalent cause of Hydronephrosis followed Pregnancy and BPH.

**Keywords:** Hydronephrosis, Aetiology, Renal Calculi, BPH, Pregnancy

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## INTRODUCTION

Hydronephrosis occurs when an obstruction stops the urine from kidneys to drain into the bladder[(1)]. The obstruction can cause swelling of kidneys which can be unilateral or bilateral[(2)]. The kidneys filter the blood and eliminate extra waste materials from the body[(3)]. The fluid gets accumulated in the renal pelvis and get transferred to urinary bladder via narrow tubular structures called as ureters which have narrow constrictions and may be the common site for obstruction by calculi[(4)]. Hydronephrosis usually happens when passage of urine is obstructed or the reflux when urine reverse back causing the renal pelvis to swell[(5)]. Obstruction causes an increase in urinary tract stress leading to biochemical and morphological alterations[(6)]. The kidney's regular function necessitates the elimination of final metabolic products as well as an excessive amount of water[(7)]. The urinary outflow can be restricted or there can be retrograde migration of urine which remains in the bladder can lead towards enlarged renal pelvis[(8)] [(9)]. Despite medical advances, Hydronephrosis remains a major issue[(10)]. The urologists face a lot of problems due to partial or total obstruction which is a common health problem[(1, 11)].

Hydronephrosis is usually caused by an underlying medical condition or risk occasionally as congenital blockage, unilateral obstructive uropathy, kidney stones, UTIs, tissue scarring, blood clots, neuromuscular problems, Cancer or

BPH and pregnancy.[11, 12] According to modern research Hydronephrosis (or hydroureter) is the most frequent condition, although ureteral and renal pelvic dilatation is more apparent on the right side of the body and occurs in 80 to 90% of pregnant women.[13, 14] Using ultrasonography, maternal Hydronephrosis is most commonly found during the beginning of the third trimester,[15, 16] which experts believe is owing to progesterone's actions on the ureters, which lower their tone.[17] The specific origin and presentation of Hydronephrosis or hydroureter in adults vary from neonates and children. [18] The most frequent birth abnormalities that induce Hydronephrosis in foetuses and new-borns are ureter pelvic junction blockage and vesico-ureteral reflex.[19, 20] Major cause of bladder outlet obstruction in young individuals is kidney stone which can be single and multiple, followed by tumours, neurogenic bladder, and inflammatory ureteral strictures.[14] While in older patients Renal Calculi, benign prostatic hyperplasia or carcinoma in men, pelvic neoplasm can be the most common causes for Hydronephrosis.[21, 22]

Hydronephrosis sometimes may or may not be Symptomatic.[23] A pain and discomfort on back and the side of abdomen or groin area known as Flank pain is common symptom.[24] Some other signs and symptoms include nausea, fever, pain while urination, frequency, urgency, incontinence and incomplete urination.[25] The severity of the disease vary in showing signs and symptoms.[21] The most common sign for Hydronephrosis is flank pain in contrast to the other disorders like Inflammation in Urinary tract, chronic and acute kidney failure.[26] The society of foetal urology (SFU) classification scheme divides the Hydronephrosis into five groups as Grade 0 to 4.[27] Hydronephrosis is not present in grade 0 patients. Patients of Grade 1 can have Mild Dilatation of the renal pelvis. Patients of Grade 2 can have mild dilatation of the renal pelvis along with dilatation of major calyces. Patients of Grade 3 have moderate dilations involving all calyces. Patients in Grade 4 have severe dilations along with dilatation of all calyces and thinning of the renal parenchyma[28] .

Radiological imaging like ultrasound can reveal the importance of urodynamic and the existence of Hydronephrosis[29]. To avoid difficulties, clear parameters and hazardous findings that are symptomatic of renal injury must be diagnosed as soon as possible. This research will aid in the diagnosis and treatment of mild Hydronephrosis before it progresses to acute and chronic renal failure.

## MATERIALS AND METHODS

It is a Retrospective study conducted at two private health care setups in Gujranwala, Pakistan. After Informed consent data was collected over period of 8 Months from January 2020 to September 2020. Following the study period, all patients identified with Hydronephrosis during an ultrasound scan investigation presented at the study location were enrolled. Data was collected using convenient approach on specially designs sheet in which age, gender, Unilateral Kidney or Bilateral Kidneys and its Grading of Hydronephrosis were recorded. Data was analysed on SPSS version 20. The causes were confirmed by considering history, lab reports and ultrasound evaluation on Toshiba SSA-770A, 3.5 MHz with convex transducer was used to evaluate patients.

## RESULTS

Patients presenting to the radiology department for ultrasound scanning were evaluated in the current study, and the aetiology of hydronephrosis was discovered. In Table 1 age distribution of patients with Hydronephrosis is written, in which the most Prevalent age group of 41-50 years 96 (45%) patients presented with Hydronephrosis. The female patients in this inclusion were 64 (30%) and 149 (70%) were males. The kidney involvement in terms of sides is shown as 185 (86%) hydronephrosis due to disease in the unilateral kidney and 28 (13%) involvement in both or bilateral kidneys. In Table 1 the grading of Hydronephrosis was mentioned as Grade 1: 33 (15.5%), Grade 2: 122 (57.3%), Grade 3: 39(18.3%), Grade 4: 19(8.9%). The causes of Hydronephrosis was observed on Ultrasound Equipment and results shows that most Prevalent cases of Calculi 129 (60%) causing Hydronephrosis, 28 (13%) females had Hydronephrosis due to Pregnancy, 19 (8.9%) males had Benign Prostatic Hyperplasia and 6 (2.8%) had Prostate cancer. About 4 Patients (1.9%) had PUJ stenosis causing Hydronephrosis. About 27 Patients (12.7%) the finding of cause of Hydronephrosis was undetermined.

## DISCUSSION

In current study the diagnosis of Hydronephrosis was evaluated on Ultrasound in which the grading of Hydronephrosis was mentioned. SFU grading such as Patients of Grade 1 can have Mild Dilatation of the renal pelvis. Patients of Grade 2 can have mild dilatation of the renal pelvis along dilatation of major calyces. Patients of Grade 3 have moderate dilations along dilatation of all calyces. Patients of Grade 4 have severe dilations along dilatation of all calyces and thinning of the renal parenchyma.

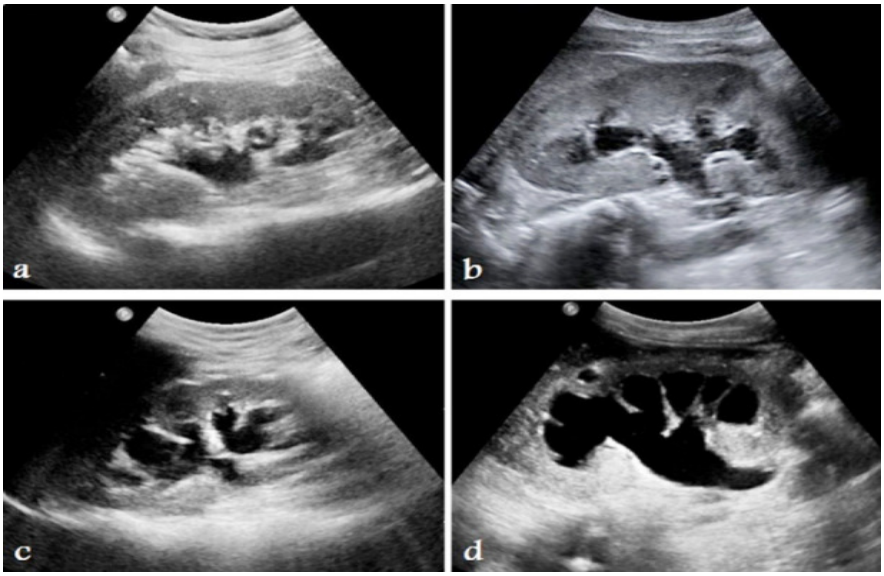


**Figure 01:** Right kidney of patients showing Grade1 (a), Grade2 (b), Grade3 (c), Grade4 (d) Hydronephrosis according to SFU grading system[27]

**Table 01:** Showing the frequency and percentages of age groups, Gender, Involved Kidney/s, and Aetiology of Patients having Hydronephrosis

| Variables | Categories | Frequency | Percentage |
|---|---|---|---|
| Age Groups | 20-30 | 46 | 21.6 |
| | 31-40 | 71 | 33.3 |
| | 41-50 | 96 | 45.1 |
| | Total | 213 | 100.0 |
| Gender | Female | 64 | 30.0 |
| | Male | 149 | 70.0 |
| | Total | 213 | 100.0 |
| Kidney/s | Unilateral Kidney | 185 | 86.9 |
| | Bilateral Kidneys | 28 | 13.1 |
| | Total | 213 | 100.0 |
| Grading of Hydronephrosis | Grade 1 | 33 | 15.5 |
| | Grade 2 | 122 | 57.3 |
| | Grade 3 | 39 | 18.3 |
| | Grade 4 | 19 | 8.9 |
| | Total | 213 | 100.0 |
| Aetilogy of Hydronephrosis | Calculi | 129 | 60.6 |
| | Pregnancy | 28 | 13.1 |
| | BPH | 19 | 8.9 |
| | Prostate Cancer | 6 | 2.8 |
| | PUJ Stenosis | 4 | 1.9 |
| | Not Determined | 27 | 12.7 |
| | Total | 213 | 100.0 |

In 1993, S. K. Fernbach published a study and explained that SFU has tried to standardise ultrasonography performance and grading systems. At that time SFU members created and used an ultrasound-based approach to grade Hydronephrosis in 36 institutions. The current study has graded as Grade 1: 33 (15.5%), Grade 2: 122 (57.3%), Grade 3: 39(18.3%), and Grade 4: 19 (8.9%). The presence of the calices, renal pelvis and renal parenchyma are major constituents for the use of the grading for Hydronephrosis.

A retrospective study by Sultan Abdul Waddod Published in 2021 in Pakistan explains the Hydronephrosis by examining 233 patients which included 91.41% were adults following 66.10% as male and 33.90% as female. The current study also has the similar findings of Hydronephrosis in which most common age group of 41-50 years was 45%. The patients included in this study were 30% females and 70% males relating with the previous literature article mentioned. About (57.3%) in Grade 2 Hydronephrosis was evaluated in current study whereas it had almost similar result relating as 58% of patients suffering from grade-2, 21.5% in grade-3, 11.6% in grade-1, and 8.2% grade-4 in previous research. He also found the causes as 54.1% as Calculi in terms of cause of Hydronephrosis. The etiological findings of current study found that most Prevalent cases of Calculi were 60% causing Hydronephrosis, 13% due to Pregnancy, 8.9% males had Benign Prostatic Hyperplasia and 2.8% had Prostate cancer. About 1.9% had PUJ stenosis causing Hydronephrosis. About 12.7% of the findings on ultrasound were undetermined.

Another study by Gowadhan Dare published in 2019 and goal of his study was to look at the causes, symptoms, diagnostic methods, and treatment possibilities for unilateral Hydronephrosis. He conducted a study in a tertiary care Hospital in which he examined and evaluated 72 unilateral Patients on ultrasound and found that 50 (69.44%) of Hydronephrosis were due to ureteric calculi, PUJ obstruction 18 (25%) and renal calculi 4 (5.56%). He has similar results with current study in which the kidney involvement was 185 (86%) in Unilateral kidney and 28 (13%) as Bilateral kidneys. In current study the causes of Hydronephrosis were observed on Ultrasound Equipment as prevalent cases of Calculi were 129 (60%) causing Hydronephrosis, 28 (13%) females had Hydronephrosis due to Pregnancy, 19 (8.9%) males had Benign Prostatic Hyperplasia and 6 (2.8%) had Prostate cancer. About 4 Patients (1.9%) had PUJ stenosis causing Hydronephrosis which is almost similar to the previous study. He came to the conclusion that ureteric calculus, renal calculus and obstruction at pelvic-ureteric junction were the aetiological reasons for unilateral Hydronephrosis and that treatment should be tailored to the aetiology.

## CONCLUSION

In conclusion ultrasonography is helpful in identifying Hydronephrosis and determining its aetiological factors. Ureteral and kidney stones are the most prevalent cause of Hydronephrosis. Pregnancy was the second most prevalent cause of Hydronephrosis in women, while benign prostatic hypertrophy was the third most prevalent cause in men.

## CONFLICTS OF INTEREST

There was no conflict of interests between authors.

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