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# SCREENING FOR ASYMPTOMATIC BACTERURIA IN CHILDREN WITH OBSTRUCTIVE UROPATHY

By

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## ABSTRACT

**Background:** Obstructive uropathy is an important cause of chronic renal failure in children. Obstruction of the urinary tract blocks adequate urine flow. It causes urine stasis, and predisposes the child to asymptomatic bacteruria (ABU) that needed to be followed up to early detect symptomatic UTI.

**Objective:** Screening of ABU in children who were suffering from obstructive uropathy to avoid unnecessary use of antibiotics, early detection and treatment of children who developed symptomatic urinary tract infection (UTI), and relation between type of obstructive uropathy and body growth.

**Patients and methods:** Cross sectional descriptive study was conducted on 50 children with different types of obstructive uropathy. They were selected according to certain inclusion and exclusion criteria from Pediatric Nephrology and Urology outpatient clinics at Al- Hussein University Hospital. Their ages ranged from 2.2 to 11 years. They were subjected to full medical history, complete clinical examination, and routine investigations including renal function tests, urine analysis, urine culture, and imaging studies (included pelvi-abdominal ultrasonography, magnetic resonance urography, renal scan and voiding cystourethrogram).

**Results:** Obstructive uropathy was more common in males (62%) than females (38%), while ABU was common in females. The growth of our patients was not affected by different types of obstructive uropathy. 68% of patients had no bacterial growth, while 32% had bacterial growth in urine culture. The commonest organism was E coli (56.25%). Glomerular filtration rate (GFR) was not significantly affected by different types of obstructive uropathy.

**Conclusion:** Obstructive uropathy can predispose to colonization of bacteria in urinary tract and development of asymptomatic bacteruria especially in females that needs to be followed up. Follow up is needed to early detect symptomatic UTI.

**Key words:** Asymptomatic Bacteruria, Obstructive Uropathy, Urine Analysis and Culture.

## INTRODUCTION

Asymptomatic bacteriuria (ABU) is defined as the presence of ≥ 105 colony forming units (Cfu) of a single type of bacteria per milliliter of urine detected by culture of mid-stream urine specimen in asymptomatic patients *(Titoria et al., 2014)*. It is caused by bacteria of low virulence that colonizes the urinary tract and does not damage the kidney *(Tsai et al., 2016)*. ABU is a common condition. Its prevalence differs and depends on age, sex, the presence of genitourinary abnormalities, indwelling urinary catheters, and co-morbidities including diabetes mellitus and immunosuppressive conditions *(Nicolle, 2014)*. It affects girls more than boys *(Nicolle et al., 2005)*. The type of organisms isolated from patients with asymptomatic bacteriuria is influenced by certain patient

characteristics as a healthy person will most likely harbor Escherichia coli, while a nursing home resident with a catheter is more likely to have a multi-drug– resistant polymicrobic flora (Pseudomonas aeruginosa) *(Colgan et al., 2006)*. Urinary tract obstruction is any condition that impairs urinary drainage from the pelvicalyceal system and leads to increased pressure and decreased urine flow rate. Congenital anomalies of the kidney and urinary tract are risk factor for the development of UTI in children *(Riccabona and Fotter, 2008)* as it alter the natural free unidirectional flow of urine causing stasis and enhancing the growth of pathogenic micro-organisms *(Hamid et al., 2013)*.

## AIM OF WORK

Screening of children with obstructive uropathy for detection of asymptomatic bacteruria to avoid unnecessary use of antibiotics, early detection and treatment of children who developed symptomtic UTI, relation between type of obstructive uropathy and body growth.

## SUBJECTS AND METHODS

This study was a cross sectional descriptive study included fifty children with congenital obstructive uropathy who were attending outpatient clinic of Pediatric Nephrology and Pediatric Urology at Al- Hussein University Hospital, during the period from January 2018 till November 2018. Patients were 31 males and 19 females, and their ages ranged from 2.2- 11 years.

**Exclusion Criteria:**

Children with symptomatic urinary tract infection, children with other renal diseases and children with chronic antibiotic use.

**Ethical Aspect:**

The approval for this study was obtained from the ethical committee of the Pediatric Department, Al-Azhar University (Cairo). Informed written consent was obtained from parents of included children after explanation of the aim of the study and its benefits for children.

**All studied patients were subjected to the following:**

- Full medical history including urinary symptoms, family history of renal diseases, age at diagnosis of obstructive uropathy, medication used, and systemic diseases.
- Careful clinical examination including all body systems focusing on blood pressure measurement, anthropometric measurements (body weight measured by scale, height/ length measured by simple measuring stick, and body mass index calculated by weight (kg)/ height(m2), and systemic examination.
- Routine urine examination: Urine analysis and culture.

Urine specimen collection: A midstream, clean-catch specimen was obtained from children who have urinary control. Specimen from children who have indewelling catheter was obtained from this catheter. Urine culture results are considered positive or negative on the basis of the number of CFUs that grow on the culture medium *(American Academy of Pediatrics (AAP), 2011)*.

- Other laboratory investigation included complete blood count and renal

function tests (blood urea and serum creatinine).

- Imaging studies included pelvi-abdominal ultra sonography, magnetic resonance urography, renal scan (both static and dynamic for 36 cases), and voiding cystourethrogram (for patients who showed ureteric dilation to confirm or exclude the presence of vesico-ureteric reflux (VUR).

**Statistical analysis:**

The data were coded, entered and processed on computer using SPSS (version 20). The results were represented in tubular and diagrammatic forms then interpreted. Mean, standard deviation, range, frequency, and percentage were used as descriptive statistics.

## RESULTS

38% of patients were females and 62% were males. The mean age at diagnosis was 1.75±1.39. The growth of our patients was not affected by different types of obstructive uropathy (Table 1).

**Table (1): Age, sex, age at diagnosis, weight, height and body mass index percentile in studied patients**

| Parameters \ Groups | | No. | % |
|---|---|---|---|
| **Sex** | Female | 19 | 38.0% |
| | Male | 31 | 62.0% |
| **Age (years)** | Mean | 5.31 | |
| | SD | 2.20 | |
| **Age (years) at diagnosis** | Mean | 1.75 | |
| | SD | 1.39 | |
| **Percentile** | **Normal (not affected) ($3^{rd}$ – $75^{th}$ ) percentile** | **Subnormal (affected) (< $3^{rd}$ )percentile** | |
| **Weight (kg)** | 41 (75.9%) | 13 (28.1%) | |
| **Height (meters)** | 38 (70.4%) | 16 (29.6%) | |
| **BMI (kg/$m^2$)** | 43 (79.6%) | 11 (20.4%) | |

68% of patients had no bacterial growth, and 32% had bacterial growth in urine culture. The commonest organism was E coli (56%), then klebseilla (25.0%). Acinetobacter, Pseudomonas and Staph aureus represented 6.25% for each organism (Table 2).

**Table (2): Urine culture in studied patients**

| Urine Culture | | No | % |
|---|---|---|---|
| **No Growth** | | **34** | **68.0%** |
| **(Pure growth (>$(10)^5$ CFU\ ml** | | **16** | **32%** |
| **Types of isolated organisms** | **E coli** | 9 | 56.25% |
| | **Klebseilla** | 4 | 25.0% |
| | **Acinetobacter** | 1 | 6.25% |
| | **Pseudomonas** | 1 | 6.25% |
| | **Staph aureus** | 1 | 6.25% |

The dominant findings in our patients were bilateral hydronephrosis and hydroureter (40%) (Table 3).

**Table (3): Ultrasonography and Magnetic Resonance Urography findings in the studied patients**

| | No | % |
|---|---|---|
| Bilateral hydronephrosis and hydroureter | 20 | 40.0% |
| Rt hydronephrosis and hydroureter | 14 | 28.0% |
| Lt hydronephrosis and hydroureter | 12 | 24.0% |
| Rt hydronephrosis | 2 | 4.0% |
| Lt hydronephrosis | 2 | 4.0% |

Renal scan was done for 72% of patients: 44% of them had partially impaired drainage, 36% had slow patent drainage, and 19% had totally impaired drainage. As regard to TGFR, 75% had normal TGFR and 25% had low TGFR. Renal scan (both static and dynamic) was used, and it was done for patients who showed marked hydronephrosis by ultrasonography and magnetic resonance urography (Table 4).

N.B. Normal GFR for children 2 years or more= 90- 120 ml\ min\ 1,73 m2 *(International Society of Nephrology, 2013)*.

**Table (4): Renal scan in studied patients**

| | | No. | % |
|---|---|---|---|
| Not done | | 14 | 28.0% |
| Done | | 36 | 72,0% |
| Done | ı Drainage | 36 | 72% |
| | • Partially impaired | 16 | 44.4% |
| | • Slow patent | 13 | 36.1% |
| | • Totally Impaired | 7 | 19.4% |
| | ıı TGFR | 36 | 72% of total cases |
| | • Normal | 27 | 75.0% |
| | • Low | 9 | 25.0% |

VCUG was done for 84% of patients: 42% of patients had no VUR, 30% had unilateral VUR, and 16% had bilateral VUR. It was done for cases who showed ureteric dilation to confirm or exclude the presence of VUR (Table 5).

**Table (5): Voiding cystourethrograghy (VCUG) in studied patients**

| | | No. | % |
|---|---|---|---|
| Not done | | 8 | 16.0% |
| Done (42) | • Unilateral VUR (grade ıı& ıı) | 15 | 30,0% |
| | • Bilateral VUR (grade ıı) | 6 | 12.0% |
| | • No VUR | 21 | 42.0% |

E-coli was the commonest organism in both sexes and there was no statistically significant difference in urine culture regarding sex (Table 6).

**Table (6): Comparison between male and female patients as regards positive urine culture (asymptomatic bacteruria)**

| Groups | Female | | Male | | P value |
|---|---|---|---|---|---|
| **Parameters** | **No.** | **%** | **No.** | **%** | |
| **Acentobacter** | 1 | 11.1% | 0 | 0 | 0.224 |
| **E coli** | 4 | 44.5% | 5 | 71.4% | |
| **Klebseilla** | 2 | 22.2% | 2 | 28.6% | |
| **Pseudomonas** | 1 | 11.1% | 0 | 0.0% | |
| **Staph aureus** | 1 | 11.1% | 0 | 0.0% | |
| **Total** | 9 | 100% | 7 | 100% | |

## DISCUSSION

In our study, regarding demographic data, 62% of studied patients were males and 38% were females (1.6: 1). The age range was from 2.2 to 11 years with a mean of age was 5.3± 2.2 years. This was in agreement with the study done in Egypt by *Safouh et al. (2015)* who found that among 221 cases of chronic kidney diseases due to obstructive uropathy, 167 were males (75.6%) and 54 were females (24.4%). Also, our results were supported by those of *Sadeghi-Bojd et al. (2017)* who found that obstructive uropathy in their cases distributed as 80% males and 20% females. This was largely attributed to the high incidence of congenital urological malformations in boys than girls. Also, another study conducted by *Rahman et al. (2014)* found that the sex distribution showed a strong male predominance (89.09%) in children with obstructive uropathy. Also, *Elo-Ilo et al. (2013)* found that the mean age of children in their study to detect the prevalence of ABU among pre-school children ranged from 3 to 5 years, with a mean age of 4.0 ± 0.7 years .

In our study, the mean age of studied patients was 1.75 ± 1.39 years with age range from 0.1 to 6.3 years. This was in agreement with *Sadeghi-Bojd et al. (2017)* who found that mean age of their studied patients with obstructive uropathy at diagnosis was 23.5 ± 21.79 months. Also, *Rahman et al. (2014)* found that the mean age of studied cases with obstructive uropathy at diagnosis was 2 years and 9 months.

As regard to weight, height and body mass index percentiles in studied patients, we found that the growth of most cases was not affected by obstructive uropathy. Also, *Kim et al. (2014)* found that the mean height, weight and BMI in some cases were less than standard growth rate .

As regard to urine culture, we found that 68% of patients had no bacterial growth, and 32% had pure bacterial growth (more than (10) 5 CFU/ ml) in urine culture. The commonest organism was E coli (56.25%) then Klebseilla (25.0%) while Acinetobacter, Pseudomonas and Staph aureus showed 6.25% for each type. These data were supported by the study of *Ghimire and Singh (2016)* who found that among the organisms isolated, Escherichia coli was the commonest bacteria and accounted for 70.0% of the total isolates followed by Staphylococcus Saprophyticus (9.0%), Staphylococcus aureus (6.0%), Klebsiella pneumoniae (3.0%), Proteus mirabilis (3.0%), Pseudomonas aeruginosa (3.7%) and Enterococcus species (3.0%).

Again our results were in agreement with the study conducted by *Rahman et al. (2014)* who found that E. coli (84.37%) was the most common etiological agent for UTI cases, followed by Klebsiella (12.50%) and streptococcus (3.12%). Also, *Mohammed et al. (2016)* reported that in apparently healthy school going children (6-12 years) with ABU showed that E.coli was isolated in 58% cases, Staph. Aureus in 22% cases, Enterobacter in 10%, Kelbsiella pneumoniae in 5% and Proteus vulgaris (5%). On the other hand, our data disagreed with *Elo-Ilo et al. (2013)* who found that Staphlococcus aureus represented (40.6%); Streptococcus faecalis (28.1%), Escherichia coli (15.6%) and Klebsiella species (10%), among preschool children with ABU. The difference between this study and our results can be explained by difference in sample size and age of patients.

In our results, we found that ABU was predominant in females (56.2%) compared to (43.8%) in males, and E-coli was the commonest organism in both sexes. Also, the data of the present work approximate those reported by *Mohammed et al. (2016)* found that ABU was predominant in girls (11.4%) compared to 1.6% in boys among school going children. On the other hand, the study done by *Ghimire and Singh (2016)* showed that no significance difference between males and females with ABU under age of 16 years old, but in age 16-18 years ABU was predominant in females. *Elo-Ilo et al. (2013)* found that ABU affect females (52.3%) more than males (47.4%) in preschool children in Nigeria, and *Jombo et al. (2010)* reported predominance of ABU (7.9%) in females compared to 6.6% in males.

Ultrasonography/Magnetic Resonance Urography showed that 40% of cases had bilateral hydronephrosis and hydroureter. On the other hand, 28% of cases had unilateral hydronephrosis and hydroureter on right side, 24% had unilateral hydronephrosis and hydroureter on left side, while 8% had unilateral hydronephrosis on right and left side (4% on each side). As regard to VCUG, it was done for 42 of studied patients (84%), and showed that 42% had no VUR, 30% of them had unilateral VUR either on right or left side, and 12% had bilateral VUR. Our data approximated those of *Fu et al. (2009)* who found that 37% of their cases had bilateral VUR.

On the other hand, renal scan was done in 72% of cases which showed that 44% of cases underwent this imaging had partially impaired drainage, 36% had slow patent drainage, and 19% had totally impaired drainage. As regard to total glomerular filtration rate (TGFR), 75% of our studied patients had normal TGFR, while 25% had low TGFR. This disagreed with *Sadeghi-Bojd et al. (2017)* who found that the mean glomerular filtration rate (GFR) was low (75.75 mL/minute) in all children with obstructive hydronephrosis. The difference between our study and this study can be explained by the difference in sample size, age of onset, and duration of urinary tract obstruction.

**Limitation of the Study:**

The small number of the patients was due to refusal of some parents of children to participate or complete the study.

## CONCLUSION

Obstructive uropathy can predispose to colonization of bacteria in urinary tract and development of asymptomatic bacteruria especially in females that need to be followed up.

Follow up is needed to early detect symptomatic UTI.

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# مسح للبكتريا فى البول الغير مسببة للأعراض في الأطفال الذين يعانون من اعتلال الانسداد البولى

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**خلفيـــة البحـــث:** يعـــد إعـــتلال الإنســـداد البـــولى مـــن أهـــم أســـباب الفشـــل الكلـــوى المـــزمن للأطفال.حيـــث أنـــه يمنـــع التـــدفق الطبيعـــى للبـــول بـــالمجرى البـــولى, و يســـبب ركـــود البـــول ممـــا يســـاعد علـــى حـــدوث البكتريـــا الغيرمســـببة للأعـــراض فـــى البـــول, والتـــى تحتاج إلى المتابعة المنتظمة لمنع حدوث إلتهاب المسالك البولية العرضية.

**الهـــدف مـــن البحـــث:** فحـــص الأطفـــال الـــذين يعـــانون مـــن اعـــتلال الانســـداد البـــولى الـــوراثى للكشـــف عـــن البكتيريـــا غيـــر المســـببة للأعـــراض, والكشـــف المبكـــر والعـــلاج للأطفال الذين يعانون من إلتهاب المسالك البولية العرضية.

**المرضـــى وطـــرق البحـــث:** دراســـة وصـــفية مقطعيـــة أجريـــت علـــى خمســـين طفـــلا يعـــانون مـــن أنـــواع مختلفـــة مـــن إعـــتلال الإنســـداد البـــول. وقـــد تـــم إختيـــار الحـــالات طبقـــا لمعـــايير الإدراج ومعـــايير الإســـتبعاد والـــذين يحضـــرون العيـــادات الخارجيـــة لأمـــراض الكلـــى والمســـالك البوليـــة للأطفـــال فـــي مستشـــفى الحســـين الجـــامعي والـــذين يتـــراوح أعمـــارهم ما بين سنتين وشهرين وأحد عشر عاما.

وقـــد أخضـــعت جميـــع الحـــالات إلـــى الآتـــى (بعـــد موافقـــة الأهـــل): التـــاريخ الطبـــي الكامـــل, الفحـــص الســـريري الشـــامل, والفحوصـــات الروتينيـــة والتـــى تشـــمل (وظـــائف الكلـــى, تحليـــل البـــول ومزرعـــة البـــول), ودراســـات التصـــوير وتشـــمل (الموجـــات فـــوق الصـــوتية علـــى الـــبطن والحـــوض, أشـــعةالرنين المغناطيســـى علـــى الـــبطن والحـــوض, مسح ذرى على الكلى, وسيستوريثروغرام) .

**النتـــائج:** أوضـــحت الدراســـة أن أغلبيـــة حـــالات إعـــتلال الإنســـداد البـــولى كانـــت مـــن الـــذكور بنســـبة 62% بينمـــا بلغـــت حـــالات الإنـــاث 38%, كمـــا أوضـــحت الدراســـة أن معظـــم حـــالات البكتيريـــا الغيـــر مســـببة للآعـــراض كانـــت مـــن الإنـــاث. كمـــا لـــوحظ أن

النمو البدنى للمرضى الخاضعين لهذه الدراسة لم تتأثر بالأنواع المختلفة لإعتلال الإنسداد البولى. وأظهرت النتائج أن 68% من الحالات ليس لديهم نمو للبكتيريا فى مزرعة البول, بينما 32% منهم لديهم بكتيريا معظمهم ايشيرشيا كولاى, كما لوحظ أن اجمالى معدل ترشيح الكليتين لم يتأثر بشكل كبير بالأنواع المختلفة لإعتلال الإنسداد البولى.

**الاستنتاج:** إعتلال الإنسداد البولى يمكن أن يؤدى إلى إستعمار البكتريا فى المسالك البولية مما يسبب البكتيريا الغير مسببة للأعراض خاصة لدى الإناث والتى تحتاج إلى متابعتها. هناك حاجة إلى المتابعة للكشف المبكر عن إلتهاب المسالك البولية.