Detection of Bacteriuria in a Special Need School

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Summary:

Urinary tract infection (UTI) is a common cause of serious bacterial infection with a high morbidity in young children. Mentally retarded children are at increased risk of developing infections as a result of the influence of mental retardation on learning different concepts, and due to their liabilities to immune deficiency.

Aim:

To assess significant bacteriuria in mentally retarded children, as well as to determine the validity of urine dipstick as a screening test, compared to the standard urine culture.

Methods:

This study was a case control study, conducted on 135 children aged from 7 to 15 years old: 95 mentally retarded, collected from a school for children with special needs and 40 apparently normal children as controls with matched age and sex. Mentally retarded children were classified as mild and moderate, according to their IQ scores. A mid stream urine sample was aseptically collected from each child for microscopic analysis, screening using urinary dipstick for nitrite and leukocyte esterase, and conventional culture.

Results:

Significant bacteriuria was (13.7%) in cases compared to (7.5%) in controls with no statistically significant difference (P > 0.05). Statistically significant difference was found between cases in the internal sector of the school compared to the external as regards significant bacteriuria (where it was higher in internal sector), (P=0.05). Statistically significant difference was found between moderate mentally retarded compared with mild as regards significant bacteriuria (P=0.05). Statistically significant difference was found between cases and control as regards nocturnal enuresis (P < 0.05). A highly significant association was found between history of previous UTI and significant

bacteriuria in both cases and controls (P < 0.005). The commonest organism found was Staphylococcus aureus (37.5%), followed by Ecoli (25%). Nitrite test sensitivity was (75%) and specificity (96.6%) while leukocyte esterase test sensitivity (68.8%) and specificity (97.5%).

Conclusion:

Significant bacteriuria was found in higher percentages in institutionalized and in moderate mentally retarded children compared to mild. History of previous UTI could be considered as a risk factor for occurrence of significant bacteriuria. Bacteriuria could be screened by urine dipstick, however, it must be confirmed by urine culture

Introduction:

Urinary tract infection (UTI) is a leading cause of childhood morbidity and is one of the commonest renal diseases in childhood (Adelek, 2009)

UTI describes a spectrum of disease from bacteriuria to pyelonephritis and can be clinically grouped into symptomatic or asymptomatic (Nicolle, 2000).

Approximately 8% of the girls and 2% of boys acquire UTI by the age of 7 years. UTI is associated with long term morbidity, with renal damage reported in about 5% of affected children (Jonathan, 2010)

Asymptomatic bacteriuria occurred reliably more frequently in females as compared with males. Some girls are mistakenly identified as having asymptomatic bacteriuria where as they actually are symptomatic, experiencing day or night incontinence or perineal discomfort. (Jack, 2007)

Identifying predisposing factors to urinary tract infection as voiding dysfunction, severe constipation, day time with or without night time wetting is beneficial, if these factors are present, relative risk for recurrent urinary tract infections is 60% (Bakker et al., 2004)

A large epidemiological study has demonstrated

progressive renal scarring leading to hypertension, proteinuria, and chronic renal insufficiency as sequalea of urinary tract infection (Shah and Upadhyay, 2005)

Rapid recognition of urinary tract infection and rapid appropriate early antimicrobial treatment are the keys to prevent renal damage, scarring and subsequent complications (Schlager, 2001)

Mental retardation is a disability characterized by significant limitations in both intellectual, functioning and adaptive behavior (conceptual, social and practical)that occurs before age 18 (Moog, 2005).

The health of people with intellectual disabilities is being neglected, resulting in them being affected by health problems to greater extent than the general population (Janicki, etal, 2002).

Studies of the prevalence of medical conditions among people with intellectual disabilities living in institutions report that these individuals carry burden of chronic disease which is greater than that in general population (Jin etal, 2003)

Subjects And Methods:

The present study was a case control, done in the period between February 2009 and May 2009.It was conducted on 135 children: 95 mentally retarded and 40 children as controls with matched age and sex. Cases were selected from (Bright hope school for children with special needs) located at Nasr city at Cairo.

This school had 2 sectors: external and internal sectors: 30 children were collected from the external sector, while 65 children were collected from the internal one. Controls were collected from El Zahraa polyclinics at Nasr city, all children fulfilled inclusion criteria: age groups from 7-15 years, both sex were included, cases had been previously diagnosed as mentally disabled according to IQ scores, and they were toilet -trained.

bacteriuria in both cases and controls (P < 0.005). The commonest organism found was Staphylococcus aureus (37.5%), followed by E.coli (25%). Nitrite test sensitivity was (75%) and specificity (96.6%) while leukocyte esterase test sensitivity (68.8%) and specificity (97.5%).

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Children who were under treatment of antibiotics in the preceding 48 hours, or with external genitalia infection, or with congenital renal problems, or with neurological diseases affecting on urological system were excluded.

Ethical Issue:

Informed consent to perform this study was obtained from school authorities and care givers.

All children of the study were subjected to: full history taking, through Clinical examination and Laboratory investigations.

Method of collecting mid stream urine specimens were explained to the care givers. A urine sample was obtained from each child in a sterile disposable container, fixed in an ice bag then transported to the Central Laboratories in faculty of medicine in Ain shams University within one hour of collection, where it is exposed to:

1. Urine Analysis:.
   ¤ Microscopical Examination: A part of each specimen was centrifugated and the deposits were examined by standard technique principally for presence of pus cells (reported as number of WBCS/HPF. Significant Pyuria (more than 10 leukocytes/mm^3) suggest infection (Smith etal, 2003).
   ¤ Screening test for infection by using urine dipstick for nitrite and leukocytes.
      a. Leukocyte esterase test: This reveals the presence of granulocyte esterases by producing beige-pink to purple color. The result should be read between 60- 120 seconds to allow for complete color development.
      b. Nitrite Test: This test is based on conversion of nitrate to nitrite by the action of Gram negative bacteria in the urine. This test is specific for nitrite

and will not react with any other substance normally excreted in urine. Any degree of uniform pink to red color should be interpreted as positive result suggesting the presence of nitrite (Latorre, 2001).

2. Urine Culture: Each urine specimen was subjected to the following:
   ¤ Semi quantitative culture by conventional culture techniques.
   ¤ A standard loop technique was used to place (0.01ml) of urine on blood agar plate and Macconkey's agar plate. Incubation done up to 48 hours at 37o C.
   ¤ Phenotypic identification of isolated pathogens by:
      a. Morphological characteristics and simple biochemical reactions including (catalase test, coagulase test for identification of gram positive cocci oxidase test, tripple sugar iron agar for identification of gram negative).
      b. Interpretation of the urine culture: significant bacteriuria was considered if viable bacterial count (VBC) was $\geq$ 105 cfu/ ml (Parvin, 2007)

Limitation To The Study:

Difficulty in obtaining the samples from mentally disabled children.

Refusal from some care givers to cooperate

Statistical Analysis

Data were entered and analyzed using SPSS (Statistical Package of Social Science) version 12 (www.SPSS.Com. 2004) Data were collected, verified, revised, coded, tabulated then edited on computer.

The following tests were done: Mean (X), Chi square test (X^2), Standard deviation (SD), Pearson correlation coefficient (r)

Difference in results is significant if probabilities is <0.05, and insignificant if it is >0.05

Results:

This study was a case control study done in the period between February 2009 and May 2009. It was conducted on 135 children: 95 mentally retarded and 40 children with average mentality as controls with matched age and sex.

Cases were selected from (Bright hope school for children with special needs) located at Nasr city at Cairo

This school had 2 sectors: external and internal; (30) children were collected from the external sector, while 65 children were collected from the internal one.

Controls were collected from El Zahraa polyclinics at Nasr city.

The age of children included in the study was from 7 to 15 years old: In controls the mean was (11.05±2.2), while it was (10.67±2.3) in internal sector, and (10.66±2.2) in the external sector.

As regard gender distribution there were 45 males (47.3%) in cases {being 31(47.7%) in internal sector and 14 (46.7%) in external sector} and 50 females (52.7%) {Being 34 (52.3%) in internal sector and 16 (53.3%) in external sector}, while in controls there were: 22 males (55%) and 18 females (45%)

As regards the blood pressure of the children: in cases systolic ranged from 90 to 130 mmHg (mean 102±9) and diastolic ranged from 60 to 85 (mean 69±6), while in controls the systolic ranged from 90 to 120mm Hg (mean 100.4± 8) and diastolic ranged from 60 to 80 (mean 68 ± 5)

As regards IQ score registered: cases are classified as mild mentally retarded with IQ ranged from 52 to 68 (mean 59.67±4.8) in internal sector, and from 55 to 68 (mean 60.8±3.9) in external sector, while for moderate mental retardation IQ ranged from 36 to 47 (mean 42.1±3.9) in internal

sector, and from 38 to 48 (mean 42.4 ± 3.5) in external sector

There was no statistically significant difference between cases and controls as regards significant bacteriuria, asymptomatic bacteriuria, and symptomatic bacteriuria

Significant bacteriuria was (13.7%) among cases versus (7.5%) in controls (p=0.44) asymptomatic bacteriuria was (9.5%) versus (7.5%) In controls (p=0.75), while symptomatic bacteriuria was (4.2%) in cases, no symptomatic bacteriuria was found in controls.(P=0.39)

A statistically significant difference was shown between cases in internal sector with significant bacteriuria (15.4%)compared to those in external sector (10%) P=0.05. while no statistically significant difference between cases in internal and external sector regarding asymptomatic bacteriuria (P=0.48) and symptomatic bacteriuria (P=0.52)

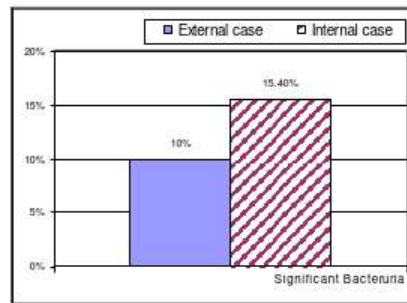Figure 1: Comparison between external and internal cases regarding bacteriuria

Table 1: Relation between significant bacteriuria and degree of mental retardation

| Bacteriuria	Mild mental retardation (n=74)		Moderate mental retardation (n=21)		X^2	p	S
	n	%	n	%			
-Ve	68	91.9	14	66.7	10.99	0.05	S
+Ve	6	8.1	7	33.3			

A statistically significant difference between mild and moderate mentally retarded children was

found, as higher percentages of children with moderate mental retardation had significant bacteriuria (33.3%) compared to those with mild mental retardation(8.1%)P=0.05

Accordingly, correlation test between IQ score and bacteriuria was done, which showed a negative correlation between them, correlation=-0.333 at significant level P=0.05

Figure2: Relation between significant bacteriuria and degree of mental retardation
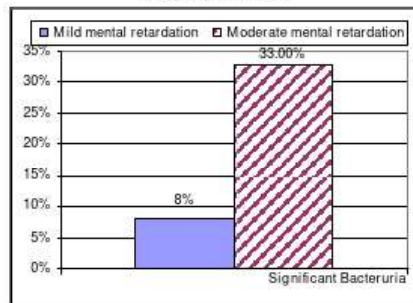
As regards the comparison between the studied groups and types of isolated bacteria, no statistically significance difference was found P>0.05

Staph aureus was the commonest organism being found in cultures of 6 urine specimens and accounting for (37.5%) of the total bacterial isolates, followed by E.coli found in 4 specimens (25%), Staphylococcus saprophyticcus found in 2 specimens (12.5%), Pseudomonas found in 2 specimens (12.5%), Proteus found in 1 specimen (6.25%), and Acinetobacter found in 1 specimen (6.25%)

There was no statistically significant difference between cases and controls regarding dysuria (P=0.26) and frequency (P=0.18) while nocturnal enuresis showed highly statistically significant difference in cases (31.6%) compared with controls (10%) being higher in internal sector (38.5%) than in external one (16.7%), (P=0.002)

Table 2: Relation between significant bacteriuria, history of previous UTI, and nocturnal enuresis in cases

Variables		Significant Bacteriuria				X^2	P	S
		-ve (n=82)		+ ve (n=13)				
		n	%	n	%			
History Of Previousuti	- Ve	78	95.1	6	46.2	26.3	0.001	HS
	+ Ve	4	4.9	7	53.8			
Nocturnal Enuresis	- Ve	59	72	6	46.2	3.4	0.06	NS
	+ Ve	23	28	7	53.8			

There was a highly statistically significant association between significant bacteriuria and presence of history of previous UTI in cases as (53.8%) of children with significant bacteriuria had a previous history of UTI (P=0.001), and on showing the association between nocturnal enuresis and significant bacteriuria P value is closed to be significant (P=0.06)

Figure 3: Relation between significant bacteriuria and history of UTI in cases
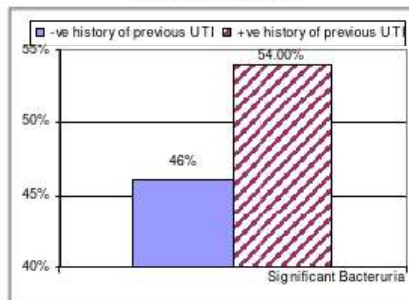
As for nitrite test evaluation in this study, it had a sensitivity of (75%) specificity of (96.6%) While leukocyte esterase test had a sensitivity of (68.8%) and specificity of (97.5%)

Discussion:

UTI is among the most commonly diagnosed bacterial infections of childhood. A prompt treatment is essential because UTI have been considered an important risk factor for the development of renal insufficiency, or end stage renal failure (Ayazi, 2007).

The term bacteriuria means the presence of bacteria in urine, it may results from contamination during or after collection of urine or it may indicate the presence of bacteria in urine, to distinguish among these possibilities, the term (significant bacteriuria) was introduced which was defined as the occurrence of 105 or more bacteria per ml of the same organism of a voided mid stream urine aseptically collected. Bacteriuria can be divided into symptomatic and asymptomatic (Janet, 2006).

ASB is a common medical condition. It was defined as the presence of ≥ 105 colonies forming units/ml without symptoms of UTI. (Rozsia et al, 2003)

Approximately 8%of the girls and 2% of boys acquire UTI by the age of 7 years. UTI is associated with long term morbidity, with renal damage reported in about 5% of affected children (Jonathan, 2010)

UTI is spontaneously arisen by urethral contamination with the stools, but other factors predispose this problem, factors such as age, sex, urethral and genital problems, immune deficiency, catheterization, general disability, voiding disorders are effective (Chon et al, 2001).

Studies of the prevalence of medical conditions among people with intellectual disabilities living in institutions report that these individuals carry burden of chronic disease which is greater than that in general population (Jin et al, 2003).

This study was designed to assess the prevalence of bacteriuria in mentally disabled children in a school for children with special needs located in Nasr city at Cairo, as well as, to determine the validity of simple screening test (nitrite and leukocyte esterase dipsticks) as rapid diagnostic tests compared to standard urine culture.

The present study was conducted on 135 children: 95 mentally retarded and 40 apparently

normal controls with matched age and sex.

The school has 2 sectors: external and internal sectors, 30 children were collected from the external sector, while 65 from the internal one.

In the present study, there was no statistically significant difference between cases and controls as regards significant bacteriuria, asymptomatic bacteriuria (ASB), and symptomatic bacteriuria: the prevalence of significant bacteriuria by culture among cases was (13.7%), versus (7.5%) in controls P=0.44 that of ASB was (9.5%) versus (7.5%) in controls P=0.75 and of symptomatic bacteriuria was (4.2%) while no symptomatic bacteriuria was found in controls (P=0.39).

This was in agreement with a study done by Yang (2009) in China to detect voiding dysfunction in 51 children with mental retardation, where the prevalence of significant bacteriuria was about (18%) in mentally retarded and (8%) in controls, yet it did not reach significant difference P>0.05.

In a descriptive study done by Homero (2003) in Brazil on 100 mentally retarded aged from 7-35 years to assess development of bladder control in mentally retarded children, significant bacteriuria occurred in about (29%) of cases.

Another study done by Chapman (2008) for urine screening on 46 adults with learning disabilities, he found that (27%) of them had UTI.

In a study done by EL-Gamal (2005) 350 urine samples collected from normal school children aged from 11-17 were screened for the presence of significant bacteriuria the prevalence was (7.7%) that of ASB was (6%) and of symptomatic bacteriuria was (1.7%). Another study done by Janet (2006) on 300 normal children, the prevalence of significant bacteriuria was (10%).

On the other hand in a study done by Akhi (2004) to detect presence of significant bacteriuria among mentally retarded children under age of 14,

he found that the incidence of UTI in mentally retarded group was (5%) versus (0%) in normal people; this may contribute to differences in size samples.

In the present study a statistically significant difference was shown between cases in internal sector with significant bacteriuria (15.4%) compared to those in external sector (10%) P=0.05.This coincide with study done by Parvin (2007) who found higher percentage of significant bacteriuria in institutionalized than in other population. This was supported with many studies showing increase percentages of significant bacteriuria in institutionalized people (Gabriella et al, 2000; Nicolle et al, 2000).

As regards the relation between the degree of mental retardation and significant bacteriuria, results showed a highly statistically significant relation, as higher percentages of children with moderate mental retardation had significant bacteriuria (33.3%) compared to those with mild mental retardation(8.1%) P=0.05.

In a study done by Yang (2009) who noted higher percentage of UTI in severe mentally retarded about (43%) than found in mild and moderate mentally retarded about (23%). However, Homero (2003) found higher percentage of UTI (39%) in mildly retarded group than in the moderately retarded (28%) while the least percentage was found in the severe and profound group (9%); this was found to be due to the associated voiding dysfunction found in mild mentally retarded group thus, increasing the chance of infection.

As regards the types of bacterial isolates, in the present study, Staph aureus accounted for (37.5%) of the total bacterial isolates, followed by Ecoli (25%), Staphylococcus Saprophyticcus (12.5%), Pseudomonas (12.5%), Proteus (6.25%), Acineto bacter (6.25%).

Similarly, Akortha (2008) found that the most common bacterial isolate was Staph aureus (22.8%) followed by Klebsiella (10.1%) then Ecoli (8.2%). Also, El-Gamal et al (2005) reported in her study that Staph aureus accounted for (55.6%) followed by Ecoli (11.1%), klebsiella (11.1%), Proteus (11.1%), Pseudomonas (7.4%) and Enterococcus faecalis (3.7%). This was going with Omer and Ahmed (1992) as they found that Staph aureus was the commonest cause of ASB, followed by Ecoli.

Also, EL- Gamel and saleh (1991) reported in their study Staph aureus in (30%) followed by Staph coag-ve (15%), Streptococcus pyogens in (6%) klebseilla in (9%), and Entero coccus (21%).

On the other hand, Staphylococcus ranged from (0.7%) to (8.5%) in studies done by Biyikli (2004), Arslan, (2002), Saleh (2003).

In a study done by Bijay (2007) he reported that Ecoli accounted for (57.16%) followed by klebsiella pneumonia (14.28%), Enterococcus faecalis (14.28%), Pseudomonas (14.28%).This coincide with Akhi, (2004) who reported in his study on mentally retarded children that Ecoli was the most prevalent organism detected in(60%) of cases.

Concerning Staphylococcus aureus being the most common bacterial isolates in the present study may be explained by difficulty in cleaning the perineum.

As regards the frequency of symptoms found among the studied groups, our study showed there was no statistically significant difference between cases and control regarding frequency and dysuria P>0.05.However, nocturnal enuresis showed highly statistically significant difference between cases compared with controls, being higher in the internal sector than in the external one P<0.005 moreover on showing the relation between nocturnal enuresis and significant bacteriuria in cases, P value is closed to be significant P=0.06, promising to reach a

statistically significant level on taking a larger sample size, while such relation was of no statistical significance in controls P>0.05

This was going with a study done by Spee (1998) in showing the prevalence of nocturnal enuresis between school children; he found that children in a school for mental retardation reported higher percentage of nocturnal enuresis than children in main stream education (14%) versus (6%) respectively.

Similarity, in a study done by Barroso et al (2005) for comparative analysis of the frequency of lower urinary tract dysfunction among institutionalized and non-institutionalized children, he found that there was a statistically significant higher level of nocturnal enuresis in institutionalized than in non institutionalized (P<0.005).

Also, in a study done by Erik et al (2001)on 38 mentally retarded children for evaluating voiding and continence patterns in mentally and motor disabled children, night time wetting occurred in higher percentages (66.6%) in children with moderate mental retardation.

On the other hand, in a study done by Yang (2009) frequency was higher in mentally retarded than in controls, while dysuria was lower.

As regards the relation between significant bacteriuria and history of previous UTI, the present study showed that there was a highly statistically significant relation in both cases and controls P=0.005. this was going with a study done by Jin et al(2007).

As for nitrite test evaluation in this study, it was found to have a sensitivity of (75%) and specificity of (96.6%.) Leukocyte esterase test in this study was found to have a sensitivity of (68.8%) and specificity of (97.5%). Similarly, Rehmani (2004) in his observation study on 948 patients coming to Emergency section of Aghakhan University Hospital, dip stick results showed that the sensitivity of nitrite test was (81%).

A meta analysis done by Whiting et al (2005) for diagnosis of UTI in children found that dip stick test positive for both nitrite and leukocyte esterase provide strong evidence in favor of UTI thus confirming the usefulness in ruling out disease with dip stick negative for both of them.

However, in a study done by Prem (2007), he reported that sensitivity of nitrite was (13.5%) and specificity (98, 9%) while leukocyte sensitivity was (42.9%) and specificity (96%) the lower percentage of sensitivity of nitrite test in his study may refer to the definition of bacteriuria and pyuria used, the process used for urine collection and analysis, and differences in the microorganisms detectable by dip stick testing.

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الملخص

الكشف عن بكتريا البول فى مدرسة لذوى الاحتياجات الخاصة

تُعتبر عدوى المسالك البولية من اكثر أنواع البكتريا شيوعًا بين الأطفال. أن الأطفال ذوى الأعاقة الذهنية معرضين أكثر للأصابة بمختلف أنواع العدوى بسبب تأثير الإعاقة على تعلم مفاهيم مختلفة مثل النظافة الشخصية والمهارات الإجتماعية وبسبب ضعف المناعة.

الهدف من الدراسة تقييم مدى إنتشار البكتريا المسببة لعدوى المسالك البولية فى عينة من الأطفال ذوى الإعاقة الذهنية ومقارنتها بالأطفال الطبيعيين وكذلك تقييم إستخدام إختبارات مسحية للكشف المبكر ومقارنتها بنتائج مزرعة البول.

١٣٥ طفل (٩٥ من ذوى الإعاقة الذهنية و٤٠ طفل ضوابط من نفس الفئة العمرية والجنس) تتراوح الأعمار من ٧- ١٥ سنة قد خضعوا فحص إكلينكى شامل وقد تم إخذ عينة بول وعاء معقم لعمل فحص ميكروسكوبى وإختبار مسحى ومزرعه بول.

وقد أشارت نتائج البحث إلى عدم وجود فروق دالة إحصائيًا بين الأطفال ذوى الإعاقة الذهنية والضوابط من حيث وجود بكتريا البول مع إرتفاع نسبة الإصابة فى ألأطفال ذوى الإعاقة الذهنية المقيمين بالقسم الداخلى بالمدرسة وكذلك إرتفاع نسبة الإصابة فى ألأطفال متوسطى الإعاقة الذهنية مقارنة بذوى الإعاقة البسيطة وكذلك إرتفاع نسبة التبول اللاإرادى فى الطفل ذوى الإعاقة الذهنية مقارنة بالضوابط.

كما إشارت النتائج أيضًا إلى إرتفاع حساسية وخصوصية الإختبارات المسحية مما يمكن من إستخدامها لعمل مسح للكشف المبكر عن العدوى لتجنب المخاطر الناتجة عن المرض.