



Manuscript ID ZUMJ-2001-1704 (R1)

DOI 10.21608/zumj.2020.22787.1704

ORIGINAL ARTICLE

Prevalence of Urinary Tract Infection among Febrile Neonates in Neonatal Intensive Care Unit and Outpatient clinic in Zagazig university and Al-ahrar teaching hospitals

Nagwa Ahmed ElShafie¹, Mohammed Mahmoud Shehab¹, Manal Mohammed Al-Amen and², Manar Yousef Saad Yousef^{*3}

¹ Pediatric Department, Faculty of Medicine, Zagazig University, Zagazig, Egypt

² clinical pathology Department, Faculty of Medicine, Zagazig University, Zagazig, Egypt

³ pediatric Department, Faculty of Medicine, Zagazig University, Zagazig, Egypt

*Corresponding author:

Manar Yousef Saad Yousef
Pediatric Department, Alahrar
teaching hospital, Zagazig, Egypt.

E-mail:

manar.yousef53@yahoo.com

Submit Date 2020-02-03

Revise Date 2020-08-14

Accept Date 2020-08-26

ABSTRACT

Background: UTI/pyelonephritis is the most common bacterial infection found in infants with fever without a source (FWS). Febrile UTI is associated with upper tract involvement ("pyelonephritis") in >70% of infants and young children, therefore the terms are often used interchangeably in this population. UTI is usually an occult infection in young children, and must be considered in any young child presenting with fever without specific localizing signs and symptoms. Aims: To determine frequency of urinary tract infection (UTI) in febrile neonates in NICU& outpatient clinic and the causative organisms in our locality to improve NICUs outcome and shorten the period of incubation.

Methods: Cross sectional study was conducted on 77 (50 males &27 females) febrile neonates admitted to Neonatal Intensive Care Unit &Out-patient clinic of Pediatric Department at Zagazig University and Al-Ahrar Hospitals in the period from April 2017 to April 2018. Their ages ranged between (0 to 2 months). They were investigated by CBC, CRP, urine analysis, urine culture, blood culture and pelvi-abdominal U/S.

Results: Results of the present study showed that frequency of UTI among our febrile neonates was 10 out of 77(12.99%). Prevalence of UTI was higher in males compared to females (70% males (7/10) & 30% females (3/10)). Bacterial infections were the most common cause of UTI with E.Coli being the most frequent pathogen causing 70% while in 30% Klebsiella pneumonia was detected.

Conclusions: This study had high-lightened the importance of routine urine analysis and culture (especially in high risk) in febrile neonates without source (FWS) and the prevalence of UTI early in life.

Keywords: UTI, Febrile neonates, NICU



INTRODUCTION

Urinary tract infection (UTI) is one of the most common bacterial infection in children, which may be localized to the kidney or bladder or spread to the tissue outside the urinary tract [1]. Occurrence rates vary widely depending on age, sex and race. The rate in uncircumcised febrile boys < 3 months of age is 20.7% compared with 2.4% in circumcised boys and declining to 7.3% and 0.3%, respectively, in boys six to 12 months of age. However, contamination is very common in obtaining a urine sample from a male when the foreskin cannot be retracted over estimating rates in uncircumcised males. In febrile girls, approximately 7.5% <3 months of age, 5.7% three to six months of age, 8.3% six to 12 months of age

and 2.1% 12 to 24 months of age had a UTI as the cause of their fever[2]

METHODS

Cross sectional study was conducted on 77 (50 males &27 females) febrile neonates, their ages ranged between (0 to 2 months). The study was conducted in Neonatal Intensive Care Unit &Out-patient clinic of Pediatric Department at Zagazig University and Al-Ahrar Hospitals in the period from April 2017 to April 2018. The inclusion criteria were febrile neonates (0-2 months) from Neonatal Intensive Care Unit &Out-patient clinic of Pediatric Department in Zagazig University and Al-Ahrar Hospitals without any other definite organ infection and exclusion criteria: were any other definite organ infection. The written informed

consent was obtained from all participants, the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The study was done according to the Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans. Detailed history about age, sex & maternal fever as well as general condition of the infant to roll out sepsis and other organ affection symptoms were taken, then all participants were subjected to clinical examination (Neurological, Respiratory, GIT, Circulatory examination, Circumcision or other congenital anomalies), Laboratory Methods (CBC with differential count, Urine analysis, culture & sensitivity, Blood culture, C reactive protein (CRP)), Imaging studies (renal ultrasound will be used to assess structural anomalies, vesicourethral reflux, dysfunctional voiding or other condition requiring further evaluation and treatment). Urine analysis: The diagnosis of UTI is suggested by presence of at least 5 leukocytes per high power field. According to the presence of ≥ 5 leucocyte HPF in urine analysis, infants were classified to two groups: Group I: - ve group without pyuria (< 5 leucocyte HPF in urine analysis). Group II: + ve group with pyuria suggestive to have UTI (≥ 5 leucocyte HPF in urine analysis). Urine collection technique (urine bag) Wash hands with soap and water, use povidone -iodine swabs to clean (sterilization of diaper area by water and soap then by alcohol 70%), place sterile urine bag over penis or labia, reclean and replace new urine bag if no urine in 30 min and empty bag into sterile urine container for routine examination. The submitted urine specimens were examined as soon as possible. There is no universal preservative for all tests and no preservative is as satisfactory as the fresh specimen of the urine. The samples of urine were subjected to: Macroscopic examination: colour, aspect, odour, specific gravity Chemical examination by Multistexo Baya® diagnostics

Microscopic Examination Microscopic examination of the sediment using 10x and 40x objectives Culture & sensitivity Culture is required when the urine contains bacteria, cells, casts, protein, nitrite, or has a markedly alkaline or acid reaction, it is not necessary to culture urine which is microscopically and biochemically normal.

STATISTICAL ANALYSIS

The data was analyzed using Microsoft Excel 2010 and statistical package for social science (SPSS version 24.0) for windows (SPSS IBM., Chicago, IL). Continuous normally distributed variables were represented as mean \pm SD. with 95% confidence interval and using the frequencies and percentage for Categorical and non-normal variables; a p value < 0.05 will be considered statistically significant.

RESULTS

Seventy-seven individuals were involved in this study 50 males & 27 females.

Results of tables Table 1: shows that the prevalence of UTI in febrile neonates was 12.99%. Table 2: shows that the prevalence of UTI in full term neonates was 9.1% and in preterm was 18.2% in preterm neonate. Table 3: shows that E-Coli was present in (70%) and klebsiella was present in (30%) of group II (positive for UTI in urine culture). Table 4: shows that there was highly statistically significant difference between group I and group II regarding abdominal sonar findings as majority of positive cases had positive finding ($p < 0.01$) specially presence of hydronephrosis. ($p < 0.05$). Table 5: This table shows that there was highly statistically significant difference between neonates of both groups as regard laboratory investigations specially presence of pyuria, positive urine, blood culture and +ve CRP which were significantly higher among group II UTI positive cases ($p < 0.01$). However there was no significant difference between them regarding mean level of WBCs and CRP.

Table (1): Prevalence of UTI in febrile studied neonates

%	Frequency	Total
12.99%	10	77

Table (2): Prevalence of UTI in full term and preterm of febrile studied neonates

%	Frequency	Total
9.1%	4	Full term (N. =44)
18.2%	6	Preterm (N. =33)

Table (3): Causative organisms of UTI among the studied neonates evidenced by urine culture

%	UTI cases (10)	Organism
70.0	7	E.Coli
30.0	3	Klebsiella

Table (4): pelvi-abdominal ultrasound findings of the studied neonates.

parameter	Group I (-ve cases) (N.= 67)		Group II (+ve cases) (N.= 10)		χ ²	p value
	N.	%	N.	%		
US finding						
• Positive	1	1.5	4	40.0	Fisher	0.001**
• Negative	66	98.5	6	60.0		
• Hydronephrosis	0	0.0	2	20.0	Fisher	0.03*
• Right grade I nephropathy	1	1.5	0	0.0	Fisher	0.99
• VUR III	0	0.0	1	10.0	Fisher	0.26
• VUR IV	0	0.0	1	10.0	Fisher	0.26

Table (5): laboratory investigations of the studied cases.

Variable	Group I (-ve cases) (N.= 67)		Group II (+ve cases) (N.= 10)		χ ² test	p value
	N.	%	N.	%		
• Pyuria	0	0.0	10	100.0	Fisher	<0.001**
• Urine culture						
- positive	0	0.0	10	100.0	Fisher	<0.001**
- negative	67	100.0	0	0.0		
• Blood culture						
- positive	2	3.0	3	30.0	Fisher	0.028*
- negative	65	97.0	7	70.0		
• C reactive protein (CRP)						
- positive	26	38.8	9	90.0	Fisher	0.002*
- negative	41	61.2	1	10.0		
• CRP positive cases	11.54±7.33		18±15.0		MW	
• X±SD	7.5		12		1.2	0.23
• Median	(6 – 24)		(6 – 48)			
• Range						
• White blood cells (WBCs)					MW	
• X±SD	11.19±5.27		12.9±5.54		1.2	0.23
• median	10		11.5			
• Range	(5 – 34)		(6 – 23)			

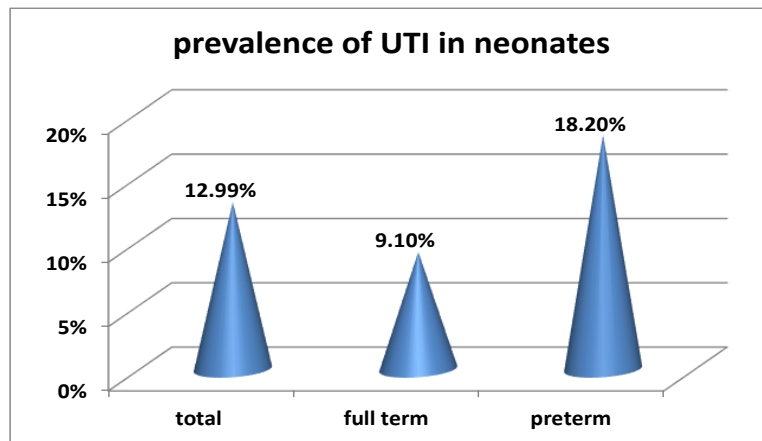


Figure (1): bar chart showing prevalence of UTI in febrile studied neonates.

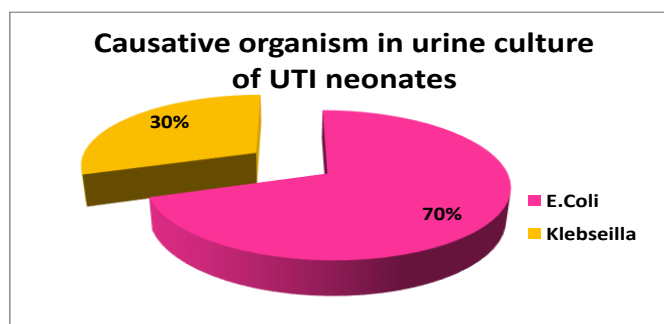


Figure (2): pie chart showing causative organism of UTI in neonates

DISCUSSION

Urinary tract infections (UTIs) in infants are common. The true incidence of UTI in the first days of life is difficult to assess, as most large studies have included such cases in the broader age categories (7%–9%). Small studies indicate the incidence in the febrile infant is between 10.7% and 15.4%. Occurrence of UTIs in the first 3 days of life is reportedly rare (0%–1%) in the United States and up to 1.8% in developing countries. No cases are detected in the first 24 hours of life [3]. When UTI is diagnosed in a child, an attempt should be made to identify any risk factors for the UTI. The risk is highest in children having anatomic anomaly, voiding dysfunction, constipation, neurogenic bladder, uninhibited detrusor contraction, girls, and uncircumcised boys. Children who receive broad spectrum antibiotics (e.g., amoxicillin, cephalexin) that are likely to alter gastrointestinal (GI) and periurethral flora are at increased risk for UTI, because these drugs disturb the urinary tract's natural defense against colonization by pathogenic bacteria [4]. The present study included 77)50 males & 27

females) febrile neonates (0-2 months) admitted to Neonatal Intensive Care Unit & Out-patient clinic of Pediatric Department in Zagazig University and Al-Ahrar Hospitals in the period from 1\4\2017 to 1\4\2018. Results showed positive UTI in 10 neonates representing 12.99% of febrile neonates of the study. According to results of urine analysis and culture, we classified our neonates into two groups; group I (- ve cases) without UTI that included 67 neonate (43 males & 24 females) and group II (+ ve cases) with UTI that included 10 neonate (7 male & 3 female). Urinary tract infections represent 14.9% of all clinical forms of infections in neonatal units (NU) and NICU [5]. The present study showed that out of 77 febrile neonates, 10 infants (12.99%) proved to have UTI by positive urine culture. This is in agreement with Morley et al., [6] who states that the prevalence of UTI in febrile young infants within the context of larger age group: (ages 0-2 months) ranges between 10 and 13%. Also this result is parallel to Engelhorn et al., [7] who showed a prevalence of 13.6% of UTI in their febrile neonates. Additionally this result is similar

to that of Lin et al., [8] in whose study out of 162 febrile infants < 8 weeks of age, 22 had positive urine culture (13.6%). On the other hand, a lower percentage of UTI than that detected in the present study was recorded by Gracia et al., [9] where they found the incidence of UTI in 160 asymptomatic jaundiced infants younger than 8 weeks of age to be only 7.5%. This difference is mostly due to carrying out their study on afebrile neonates.

Results of the present study showed higher prevalence of UTI in males compared to females (70% males (7/10) & 30% females (3/10)). This is in agreement with Movahedian et al., [10] in whose study out of 38 neonates with UTI, 27 were males (71%). Also in the study of Bonadio et al., [3], out of 100 patients < 30 days old with UTI, 73% were males, showing the higher incidence of UTI in males compared to females in that age. On the other hand male to female ratio was only 1.1:1 in the study of Falcoa et al., [11] where males represented 52.6% of their cases, while females represented 47.7%. This difference may be explained by doing that study only on full-term neonates. UTI was present more in preterm than full term neonates 18.2%, 9.1% respectively. In our study there is an agreement with Tamim et al., [12] who showed in their study higher rate of UTI in preterm than full term newborns, but it may disagree with Bauer et al., [13] where they found that prevalence of UTI in preterm neonates ranges between 4 & 25%.

In our study all cases with UTI were uncircumcised boys (100%). Uncircumcised boys had the highest incidence of UTI (21%) whereas circumcised boys and girls had (2%) & (5%) incidence respectively in the study of Shaikh [14] on UTI in infants < 3 months of age. Also high incidence of UTI in uncircumcised boys was reported by Schoen et al., [15] where out of 154 male infants with UTI, 132 (86%) were uncircumcised.

The present study showed that neonates who proved to have UTI (10 cases) manifested mainly by poor suckling (30%), lethargy (50%), vomiting (10%) and jaundice (10%). This runs with Madhu et al., [16] who carried out a prospective study on 207 neonates with suspected sepsis and diagnosed UTI by positive urine culture in 10.8% of neonates with early onset sepsis (EOS) and in 35.3% of neonates with late onset sepsis (LOS). They mentioned that symptoms of UTI in those neonates were nonspecific and manifested as systemic symptoms such as fever, irregular temperature, vomiting, refusal of feeding, jaundice, lethargy and poor weight gain.

Among community infants who present with febrile UTI, the prevalence of high (grade 5) vesicourethral reflux (VUR) diagnosed on

subsequent (VCUG) is approximately 1% Puopolo [17]. Infants with antenatal hydronephrosis are nearly 12 times more likely to have pyelonephrosis related hospitalization in the first year of life Walsh et al., [18]. Our study showed that urinary tract abnormalities in febrile newborns with UTI were detected in 4 cases out of 10 patients (40%), 2 cases of hydronephrosis and 2 cases with VUR. This result approximates that of a study done by Francisco et al., [19] where urinary tract abnormalities were found in 6 patients with UTI (55%) which included hydronephrosis (3 patients), pelviectasis (2 patients) and renal stone in one patient. Also percentage of urinary tract abnormalities detected in cases of the present study is near to that recorded by Goldman et al., [20] in a prospective study on infants younger than 8 weeks old (49%). In that study, 22 male neonates out of 45 with UTI had urinary tract abnormalities that included VUR in 19, VUR with a double collecting system in one, VUR with a posterior urethral valve in one and one infant had an ureteropelvic junction stricture, renal atrophy and scarring. In a 10 year evaluation study done by William and Gary. [21] to evaluate febrile neonates < 30 days old, 100 patients out of 670 had UTI. Renal ultrasound performed in 95 patients in that study showed anatomic abnormalities in 47%, mainly hydronephrosis (24%) with VUR on voiding cystourethrogram in 5 patients a result to which our finding is near.

Bacterial infections are the most common cause of UTI with E.Coli being the most frequent pathogen causing 70-90% of UTI Pennesi et al., [22]. Urine cultures in our study showed E.Coli in 7 out of 10 patients (70%) while in 30% Klebsiella pneumonia was detected. Presence of E.Coli in 70% of urine culture in patients of the present study approximates results of Zorc et al., [23] where E.Coli grew in 80% of their patients with UTI. Also E.Coli was the dominant isolated organism with a relative frequency of 76.3% in the study of Peymaneh et al., [24]. Not only this but also in a study done by William & Gary. [21] urine cultures were positive for the following bacterial pathogens: E.Coli (71), Enterococcus (10), Klebsiella pneumonia (7), Klebsiella oxytoca (3) with the E.Coli being the most common pathogen. In the present study, blood culture was positive in 3 patients (30%), 3/10 of cases with UTI. Organisms encountered were Klebsiella, E.Coli & Candida. This is in agreement with Tamim et al., [12] who found that 38% of infants with positive urine culture had also positive blood culture. Regarding laboratory data such as CBC and CRP, results in the present study showed no difference between infants with UTI and those without UTI. This goes with Foglia & Lorch [25] who stated that

peripheral WBCs count, and CRP do not help discriminate between patients with or without UTI.

CONCLUSION

This study had high-lighted the need for routine urine analysis and culture especially in high risk febrile neonates and to monitor the prevalence of UTI early in life. Also routine ultrasonographic screening should be done in all newborns with UTI. Thus, save the newborns and prevent the risk of complications which may end in renal scarring and renal failure.

Acknowledgement

The authors are grateful for the patients without whom this study would not have been done.

REFERENCES

- 1- Quigley R. Diagnosis of urinary tract infections in children. *Current opinion in pediatrics*, (2009); 21(2), 194-8.
- 2- Robinson JL, Finlay JC, Lang ME, Bortolussi R. Urinary tract infection in infants and children: Diagnosis and management. *Paediatrics & child health*, (2014); 19(6), 315-9.
- 3- Bonadio W, Maida G. Urinary tract infection in outpatient febrile infants younger than 30 days of age: a 10-year evaluation. *Pediatr Infect Dis J.*, (2014); 33(4), 342-4.
- 4- Zaffanello M, Malerba G, Cataldi L, Antoniazzi F, Franchini M, Monti E, et al. Genetic risk for recurrent urinary tract infections in humans: a systematic review. *BioMed Research International*, (2010); 321082.
- 5- Jurczak A, Kordek A, Grochans E, Giedrys-Kalemba S. Clinical forms of infections in neonates hospitalized in clinic of obstetrics and perinatology within the space of one year. *Adv Med Sci.* (2007); 52.
- 6- Morley EJ, Lapoint JM, Roy LW, Cantor R, Grant WD, Paolo WF, et al. Rates of positive blood, urine, and cerebrospinal fluid cultures in children younger than 60 days during the vaccination era. *Pediatric emergency care*, (2012); 28(2), 125-30.
- 7- Engelhorn C, Hoffmann F, Kurowski M, Stocker H, Kruse G, Notheis G, et al. Long-term pharmacokinetics of amprenavir in combination with delavirdine in HIV-infected children. *Aids*, (2004); 18(10), 1473-5.
- 8- Lin DS, Huang SH, Lin CC, Tung YC, Huang TT, Chiu NC., et al. Urinary tract infection in febrile infants younger than eight weeks of age. *Pediatrics*, (2000); 105(2), e20-e20.
- 9- Garcia FJ, Nager AL. Jaundice as an early diagnostic sign of urinary tract infection in infancy. *Pediatrics*, (2002); 109(5), 846-51.
- 10- Movahedian AH, Mosayebi Z, Moniri R. Urinary tract infections in hospitalized newborns in Beheshti Hospital, Iran: A retrospective study. *J Infect Dis Antimicrob Agents*, (2007); 24(1), 7-11.
- 11- Falcão MC, Leone C R, D'Andrea RA, Berardi R, Ono NA, Vaz FA. Urinary tract infection in full-term newborn infants: risk factor analysis. *Revista do Hospital das Clínicas*, (2000); 55(1), 9-16.
- 12- Tamim MM, Alesseh H, Aziz H. Analysis of the efficacy of urine culture as part of sepsis evaluation in the premature infant. *Pediatr Infect Dis J.* (2003); 22(9), 805-8.
- 13- Bauer S, Eliakim A, Pomeranz A, Regev R, Litmanovits I, Arnon S, et al. Urinary tract infection in very low birth weight preterm infants. *Pediatr Infect Dis J.* (2003); 22(5), 426-9.
- 14- Shaikh N, Morone NE, Bost JE, Farrell MH. Prevalence of urinary tract infection in childhood: a meta-analysis. *Pediatr Infect Dis J.* (2008); 27(4), 302-8.
- 15- Schoen EJ, Colby CJ, Ray GT. Newborn circumcision decreases incidence and costs of urinary tract infections during the first year of life. *Pediatrics*, (2000); 105(4), 789-93.
- 16- Madhu GN, SB S S. A study of urinary tract infection in neonatal sepsis. *J Evol Med Dent Sci.* (2014); 3(5), 1235-40.
- 17- Hansen AR, Eichenwald EC, Stark AR, Martin CR. *CLOherty and Stark's Manual of neonatal care.* Lippincott Williams & Wilkins. (2016); Pp.717.
- 18- Walsh TJ, Hsieh S, Grady R, Mueller BA. Antenatal hydronephrosis and the risk of pyelonephritis hospitalization during the first year of life. *Urology*, (2007); 69(5), 970-4.
- 19- Garcia FJ, Nager AL. Jaundice as an early diagnostic sign of urinary tract infection in infancy. *Pediatrics*, (2002); 109(5), 846-51.
- 20- Goldman M, Lahat E, Strauss S, Reisler G, Livne A, Gordin L, et al. Imaging after urinary tract infection in male neonates. *Pediatrics*, (2000); 105(6), 1232-5.
- 21- Bonadio, W, Maida G. Urinary tract infection in outpatient febrile infants younger than 30 days of age: a 10-year evaluation. *Pediatr Infect Dis J.* (2014). 33(4), 342-4.
- 22- Pennesi M, L'Erario I, Travan L, Ventura A. Managing children under 36 months of age with febrile urinary tract infection: a new approach. *Pediatric Nephrology*, (2012); 27(4), 611-5.
- 23- Zorc JJ, Levine DA, Platt SL, Dayan PS, Macias CG, Krief W, et al. Clinical and demographic factors associated with urinary tract infection in young febrile infants. *Pediatrics*, (2005); 116(3), 644-8.
- 24- Taheri PA, Navabi B, Shariat M. Neonatal urinary tract infection: clinical response to empirical therapy versus in vitro susceptibility at Bahrami Children's Hospital-neonatal ward: 2001-2010. *Acta Medica Iranica*, (2012); 348-52.
- 25- Foglia EE, Lorch SA. Clinical predictors of urinary tract infection in the neonatal intensive care unit. *J Neonatal Perinatal Med.* (2012); 5(4), 327-33.

To Cite:

ElShafie, N., Shehab, M., Al-Amen, M., Yousef, M., Prevalence of Urinary Tract Infection among Febrile Neonates in Neonatal Intensive Care Unit and Outpatient clinic in Zagazig university and Al-ahrar teaching hospitals. *Zagazig University Medical Journal*, 2023; (167-172): -.doi: 10.21608/zumj.2020.22787.1704.