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Comparison of Frequency of UTI between Circumcised and Uncircumcised Children Presenting at a Tertiary Care Hospital

Dr. Muhammad Zubair (Corresponding Author)
Postgraduate Resident Paediatrics, University of Child Health Science and Children Hospital, Lahore Email: drzubair113@gmail.com

Dr. Wajiha Rizwan.
Associate Professor Paediatrics, University of Child Health Science and Children Hospital, Lahore

Dr. Khaver Ali
Senior Registrar Paediatrics, University of Child Health Science and Children Hospital, Lahore

Author Details

Corresponding E-mail & Author*:

Dr. Muhammad Zubair
Postgraduate Resident Paediatrics, University of Child Health Science and Children Hospital, Lahore
Email: drzubair113@gmail.com

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Abstract

Background: Urinary tract infection (UTI) is one of the most frequent bacterial infections in children and an important cause of morbidity. The presence or absence of circumcision in male children has been identified as a key factor influencing UTI susceptibility. **Objective:** The aim of this study was to compare the frequency of urinary tract infections between circumcised and uncircumcised male children presenting with fever and dysuria. **Methodology:** This analytical cross-sectional study was conducted at the Department of Pediatrics, The Children's Hospital and The Institute of Child Health, Lahore from January 2025 to May 2025. A total of 150 male children aged 2 to 12 years were included using a non-probability consecutive sampling technique. Urine samples were collected under aseptic conditions and analyzed by culture and sensitivity testing. **Results:** The mean age of participants was 6.1 ± 2.9 years. Out of 150 children, 75 (50%) were circumcised and 75 (50%) were uncircumcised. UTI was diagnosed in 39.7% of uncircumcised children compared to 12.0% of circumcised children (p = 0.001). *Escherichia coli* was the most commonly isolated pathogen (70.6%), followed by *Klebsiella pneumoniae* (14.7%), *Proteus mirabilis* (8.8%), and *Enterococcus* species (5.9%). **Conclusion:** It is concluded that urinary tract infections occur significantly more frequently among uncircumcised male children compared to circumcised ones. Circumcision provides a clear protective effect against UTI in boys. The most commonly isolated organism was Escherichia coli, followed by Klebsiella and Proteus species

Introduction

Male circumcision is one of the most common surgical procedures performed, with an estimated 38.7% of males circumcised worldwide [1]. Although this activity has been widely practiced for spiritual and health-related purposes for millennia, its practice remains controversial, and, indeed, is viewed by some as barbaric. Nationally and internationally, there may be differences in circumcision rates by Region and Culture [2]. Also, circumcision is defined as a surgical intervention involving the removal of specific penile tissue, the prepuce, as well as the exposure of the glans [3]. With approximately 70 million boys born worldwide on an annual basis and 27 million male circumcisions performed each year of which 50% is for religious or cultural reasons [4], incurred recent evidence has correlated male circumcision to a decreased prevalence of asymptomatic urinary tract infections in infancy, as well as a lower risk of contracting sexually transmitted infections: most importantly, the Human Immunodeficiency Virus (HIV) [5]. As to the variables concerning the rates of circumcision as a preventive procedure of penile cancer in later infancy and urinary tract infection during neonatal circumcision, (collections of circumcision performed in the first months of life) is reported to be the most cost-effective. In the overall procedure, approximately 25% of the Global Population is reported to be circumcised. A coagulation profile is a necessary part of the pre-operative assessment for circumcision; however, it is not done routinely except in cases where a family history of coagulopathy is present [6]. Uncircumcised boys are at an increased risk of urinary tract infection, which may be due to the increased colonization of pathogenic bacteria and foreskin that can trigger ascending infections [7,8]. Vishal et al. (2016) reported that the prevalence of urinary tract infection is more in uncircumcised males (9.33%) compared to circumcised males (6.67%) [9]. In a study by Dubrovsky et al. (2012), within the circumcised boys, 4.8% had a urinary tract infection and in comparison, 30.0% of the uncircumcised boys had a urinary tract infection, which indicates that the urinary tract infection rate is lower in circumcised boys [10]. The frequency of urinary tract infection in uncircumcised boys was 76.9%, and was significantly greater than that of circumcised boys (23.1%) [11]. Though, evidence shows that uncircumcised boys have a higher risk of UTI due to increased bacterial colonization under the foreskin, but local data from Pakistan are limited. Since circumcision practices and hygiene vary across regions, it is important to generate local evidence. This study compares UTI frequency in circumcised versus uncircumcised boys to better understand the protective role of circumcision in our population and support informed clinical decision-making.

Methodology

This analytical cross-sectional study was conducted at Department of Paediatrics, The Childrens Hospital & The Institute of Child Health, Lahore from January 2025 to May 2025. Data were collected through non-probability, consecutive sampling technique. A sample size of 150 cases is calculated using 95% confidence level, 7% margin of error and expected worldwide prevalence of circumcision as 25% [6].

Inclusion Criteria:

Male children aged 2 to 12 years presenting with fever (≥100.4°F) and any of following abdominal pain, dysuria or urinary retention in absence of other systemic signs.

Written informed consent obtained from parents or guardians.

Exclusion Criteria:
Children with previously diagnosed renal calculi or posterior urethral valves
Children with renal parenchymal diseases such as nephrotic syndrome, glomerulonephritis, or renal failure
Children who received antibiotics within the last two weeks before presentation
Children with immunodeficiency states, history of urinary catheter insertion within the previous seven days, or congenital genitourinary anomalies such as atonic bladder, neurogenic bladder, or hypospadias

Data Collection
After approval from the hospital's ethical review committee, 150 male children fulfilling the inclusion and exclusion criteria were enrolled from the outpatient department of Paediatrics at The Children's Hospital, Lahore, through non-probability consecutive sampling. The circumcision status of each participant was recorded. A detailed history was taken, and written informed consent was obtained from parents. Urine samples were collected in sterile containers with parental assistance and sent to the hospital laboratory for complete examination and culture. All urine cultures were processed in the same laboratory and interpreted by the same consultant pathologist to minimize bias. Relevant baseline investigations were also performed. UTI was labelled when a child had fever (≥ 100.4F) and any of following symptoms: urinary retention, dysuria and abdominal pain along with either positive urine culture or urine bacteria count> 10^5 with positive leukocyte esterase or nitrates. Demographic details including age, weight, and fever were noted in a predesigned proforma. Confounding variables were controlled through strict application of exclusion criteria.

Data Analysis
Data were entered and analyzed using SPSS version 20. Quantitative variables such as age, weight, and temperature were expressed as mean ± standard deviation (SD). Qualitative variables, including circumcision status and presence of UTI, were presented as frequencies and percentages. The Chi-square test was applied to compare the frequency of UTI between circumcised and uncircumcised groups, with a p-value ≤ 0.05 considered statistically significant. Data were further stratified according to age and weight to identify effect modifiers, and post-stratification Chi-square tests were applied to evaluate subgroup differences.

Results
Data were collected from 150 patients, mean age of participants was 6.1 ± 2.9 years, with an equal distribution of circumcised (75, 50%) and uncircumcised (75, 50%) children. Most children belonged to low- or middle-income households, with 38.7% from low-income families and 42.7% from middle-income families. Only 18.6% were from high-income families.
Regarding maternal education, nearly one-quarter of mothers (24.7%) were illiterate, while the majority had some level of formal schooling (Table 1).

Table 1. Demographic Characteristics of the Study Population (n = 150)

Variable	Category	n (%)
Age (years)	Mean ± SD	6.1 ± 2.9
Socioeconomic Status	Low (< 50,000/month)	58 (38.7)
	Middle (50,000–100,000/month)	64 (42.7)
	High (> 100,000/month)	28 (18.6)

Mother's Educational Status	Illiterate	37 (24.7)
	Middle	49 (32.7)
	Matric	42 (28.0)
	Higher	22 (14.6)
Circumcision Status	Circumcised	75 (50.0)
	Uncircumcised	75 (50.0)

UTI occurrence was markedly lower in circumcised boys, with 9 (12.0%) affected compared to 30 (39.7%) uncircumcised boys, a statistically significant difference (p = 0.001). Overall, 39 (26.0%) of all participants had a confirmed UTI.
Among the UTI-positive children (n = 39), dysuria was present in 39 (100%), lower abdominal pain in 31 (79.5%), and urinary retention in 14 (35.9%) (Table 2).

Table 2. Frequency of Urinary Tract Infection (UTI) by Circumcision Status

Variable	Category	UTI Present n (%)	UTI Absent n (%)	p-value (chi-square)
Circumcision Status	Circumcised	9 (12.0)	66 (88.0)	0.001
	Uncircumcised	30 (39.7)	45 (60.3)	
	Total	**39 (26.0)**	**111 (74.0)**	
Symptoms Among UTI-Positive Patients (n = 39)	Lower abdominal pain	31 (79.5)	8 (20.5)	—
	Dysuria	39 (100.0)	0 (0.0)	—
	Urinary retention	14 (35.9)	25 (64.1)	—

UTI rates were 17 (29.3%) in low-, 15 (23.4%) in middle-, and 7 (25.0%) in high-income groups, with no significant association (p = 0.223). Maternal education also showed no significant link to UTI occurrence (p = 0.184). (Table 3).

Table 3. UTI Frequency According to Socioeconomic and Maternal Education Status

Variable	Category	UTI Present n (%)	UTI Absent n (%)	p-value
Socioeconomic Status	Low	17 (29.3)	41 (70.7)	0.223
	Middle	15 (23.4)	49 (76.6)	
	High	7 (25.0)	21 (75.0)	
Mother's Education	Illiterate	13 (35.1)	24 (64.9)	0.184
	Middle	12 (24.5)	37 (75.5)	
	Matric	9 (21.4)	33 (78.6)	
	Higher	5 (22.7)	17 (77.3)	

Escherichia coli was the most common pathogen, found in 27 (69.2%) UTI cases. Other isolates included Klebsiella pneumoniae 6 (15.4%), Proteus mirabilis 4 (10.3%), and Enterococcus faecalis 2 (5.1%) (Table 4).

Table 4. Microbiological Findings in Culture-Positive UTI Cases (n = 39)

Organism Isolated	**n (%)**
Escherichia coli	27 (69.2)
Klebsiella pneumoniae	6 (15.4)
Proteus mirabilis	4 (10.3)
Enterococcus faecalis	2 (5.1)

Discussion

The present study aimed to compare the frequency of urinary tract infections (UTIs) between circumcised and uncircumcised male children aged 2 to 12 years presenting with fever and dysuria. The study results indicated that uncircumcised children had a higher prevalence of UTI (39.7%) when contrasted to those that had been circumcised (12.0%) and a highly statistically significant p (0.001) value was obtained. Circumcision was confirmed to be protective of urinary tract infections in male children and this protective nature is crucial in particular in those early ages when urinary tract infections are frequent due to lax hygiene and active colonization of foreskin by infection causing uropathogens. This study results are in line with the results of many previous studies that showed a substantially higher UTI occurrence prevalence in uncircumcised male infants and children [12]. There have been several biological factors suggested in relation of this difference and are noted below. Uncircumcised boys have a preputial sac that provides a warm and soft space which facilitates colonization of uropathogenic Escherichia coli. Furthermore, the foreskin inner mucosal surface is less keratinized, so this layer is more easily colonized and can increase the likelihood of uropathogenic microbial ascension through the urinary tract. Circumcision assists in the removal of this reservoir and as such can substantially reduce bacterial load that is in the vicinity the urethral meatus. Thus, circumcision can significantly be seen to be reducing the likelihood of infection [13]. In this study, E. coli was identified as the single most prevalent organism (70.6%) isolated from urine cultures, followed by Klebsiella pneumoniae (14.7%), Proteus mirabilis (8.8%), and Enterococcus species (5.9%). This distribution of microbes is consistent with worldwide statistics that show that E. coli is the etiological agent of 70–90% of community-acquired UTI cases in children. The predominance of Gram-negative species of bacteria underscores the necessity of empirical antibiotic treatment that sufficiently covers these bacteria as well as the local patterns of antimicrobial resistance [14]. The overall UTI infection incidence of 22.7% in this group is higher than that which is reported in the general UTI population. This difference in primary reports may be due to this group being more symptomatic in that they presented with UTI associated fever and/or dysuria. For this group of suspected UTI cases, the UTI infection rate would be higher than in the general population. The groundwork for this research is also likely to have caused this difference with a high culture determined UTI incidence in both outpatient and inpatient populations [15]. The interpretation also indicates the research and circumcision's role in UTI prevention. In a place, like Pakistan, with likely more variable hygiene and health care circumcision can be a more valuable preventive procedure. The findings observed in this study regarding decreased infection rates among circumcised boys supports circumcision from a medical perspective, as well as a religious and cultural one. If circumcision is done

during infancy, this can help shorten the length of time boys are vulnerable to urinary tract infections and subsequent renal issues and infections, such as pyelonephritis, scarring, and other renal complications [16]. The study's focused design, confirmed infections through laboratory testing, and control over other variables such as antibiotics and other health issues were also aspects that added to the strength of this study [17,18]. There are a number of other limitations as well. Although this is a single-center study, and with a small sample size, the conclusions of this study may not be able to accurately reflect the dynamics of the population as a whole. Moreover, the design of the study does not allow for any cause and effect conclusions, only correlations. The exclusion of infants under 2 years old also impacts the ability to compare this study to other studies that have neonatal data, especially since circumcision has been found to provide the best protective effect.

Conclusion

It is concluded that urinary tract infection occurs significantly more frequently in uncircumcised male children compared to circumcised ones. In this study, 39.7% of uncircumcised boys were diagnosed with UTI, whereas only 12.0% of circumcised boys were affected, indicating a clear protective role of circumcision. The most commonly isolated organism was *Escherichia coli*, followed by *Klebsiella* and *Proteus* species, consistent with typical pediatric UTI microbiology. These findings suggest that circumcision substantially lowers the risk of infection by reducing bacterial colonization around the urethral opening. Therefore, circumcision may be considered a preventive measure, especially in early childhood and in settings with limited hygiene resources.

REFERENCES

Morris BJ, Wamai RG, Henebeng EB, Tobian AA, Klausner JD, Banerjee J, et al. Estimation of country-specific and global prevalence of male circumcision. Population Health Metr. 2016;14(1):1-3.

Fdwsd Svoboda JS, Adler PW, Van Howe RS. Circumcision is unethical and unlawful. J Law Med Ethics. 2016;44(2):263-82.

Kose E, Yavascan O, Turan O, Kangin M, Bal A, Alparslan C, et al. The effect of circumcision on the frequency of urinary tract infection, growth and nutrition status in infants with antenatal hydronephrosis. Renal Fail. 2015;35(10):1365-9.

Moosa S, Muhammad AA, Dogar S, Iftikhar S, Johnson W, Latif A, et al. Implementation of an infant male circumcision programme, Pakistan. Bulletin World Health Organ. 2021;99(4):250.

Farley TM, Samuelson J, Grabowski MK, Ameyan W, Gray RH, Baggaley R et al. Impact of male circumcision on risk of HIV infection in men in a changing epidemic context–systematic review and meta-analysis. J Int AIDS Soc. 2020;23(6):e25490.

Saqib HM, Bukhari SM, Makki MU. Perception and practices of circumcision among rural and urban population of Pakistan. Pak J Med Health Sci. 2017;11(3):1020-2.

Eisenberg ML, Galusha D, Kennedy WA, Cullen MR. The relationship between neonatal circumcision, urinary tract infection, and health. World J Men's Health. 2018;36(3):176-82.

Onywera H, Williamson AL, Ponomarenko J, Meiring TL. The penile microbiota in uncircumcised and circumcised men: relationships with HIV and human papillomavirus infections and cervicovaginal microbiota. Front Med. 2020;7:383-89.

Vishal Garg and Pawan Kumar. Study of urinary tract infections in febrile infants and children 2 to 24 months at a tertiary care centre. Int J Med Res Prof. 2016;2(5):113-16.

Dubrovsky AS, Foster BJ, Jednak R, Mok E, McGillivray D. Visibility of the urethral meatus and risk of urinary tract infections in uncircumcised boys. Canadian Med Assoc J. 2012;184(15):E796-803.

Saeed CH, Otraqchi KI, Mansoor IY. Prevalence of urinary tract infections and antibiotics susceptibility pattern among infants and young children in Erbil city. Zanco J Med Sci.2015;19(1):915-922.

Bawazir OA, Alsaiari WRS. Plastibell circumcision: Comparison between neonates and infants. Urol Ann. 2020 Oct-Dec;12(4):347-351. doi: 10.4103/UA.UA_146_19. Epub 2020 Oct 15. PMID: 33776331; PMCID: PMC7992528.

Hasan SM, Ibrahim KS. Molecular Characterization of Extended Spectrum β-Lactamase (ESBL) and Virulence Gene-Factors in Uropathogenic *Escherichia coli* (UPEC) in Children in Duhok City, Kurdistan Region, Iraq. Antibiotics (Basel). 2022 Sep 14;11(9):1246. doi: 10.3390/antibiotics11091246. PMID: 36140025; PMCID: PMC9495206.

Almofarreh M, Alowaa Z, Junainah E, Alshahrani N, Alharbi M, Alkhalifah W, et al. Prevalence of urinary tract infection among children. Int J Contemp Pediatr 2018;5:2356-9.

VanderWall, Joshua Thomas MD; Jenkins, Christopher MD. Does neonatal circumcision decrease the incidence of urinary tract infection?. Evidence-Based Practice 22(12):p 20, December 2019. | DOI: 10.1097/EBP.0000000000000408

Chan JY, Khondker A, Lee MJ, Kim JK, Chancy M, Chua ME, Santos JD, Brownrigg N, Richter J, Lorenzo AJ, Rickard M. The role of circumcision in preventing urinary tract infections in children with antenatal hydronephrosis: Systematic review and meta-analysis. J Pediatr Urol. 2023 Dec;19(6):766-777. doi: 10.1016/j.jpurol.2023.07.017. Epub 2023 Aug 2. PMID: 37563014.

Han Y, Gao W, Wang B, Gao Z, Diao M, Zuo C, Zhang M, Diao Y, Wang C, Liu H, Gu Y. The potential causal relationship between BMI, T1D, urolithiasis, and hydronephrosis in European ancestry: A Mendelian randomization analysis. Medicine (Baltimore). 2024 Sep 27;103(39):e39914. doi: 10.1097/MD.0000000000039914. PMID: 39331875; PMCID: PMC11441904.

Chan JY, Khondker A, Lee MJ, et al. . The role of circumcision in preventing urinary tract infections in children with antenatal hydronephrosis: systematic review and meta-analysis. J Pediatr Urol. 2023;19:766–77