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ROLE OF CIRCUMCISION IN PREVENTING UTIS IN INFANTS FROM UROLOGICAL PERSPECTIVE: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Urinary tract infections (UTIs) are a common cause of morbidity in infants, with higher prevalence observed in uncircumcised males. This study aims to assess the role of circumcision in preventing UTIs in infants from a urological perspective through a cross-sectional study.

Methods: A total of 125 male infants were included in this cross-sectional study. The sample consisted of 65 circumcised and 60 uncircumcised infants. Data were collected on demographic characteristics, feeding practices, family history of UTIs, and hygiene practices. The incidence of UTIs was compared between the two groups. Logistic regression analysis was used to identify factors associated with UTI risk.

Results: Circumcised infants had a significantly lower incidence of UTIs (7.7%) compared to uncircumcised infants (25%) ($p<0.01$). The mean age of the infants was 6.1±3.2 months, and the mean weight was 7.5±1.2 kg. Breastfeeding was reported in 64% of the infants, with similar distributions in both groups. Logistic regression analysis indicated that circumcision was significantly associated with a reduced risk of UTIs (adjusted OR: 0.24, $p<0.01$), while other variables such as age, breastfeeding status, family history of UTIs, and hygiene practices were not significantly associated with UTI risk.

Conclusion: Circumcision significantly reduces the risk of UTIs in male infants. These findings support the consideration of circumcision as a preventive measure against UTIs in this population.

Further research with larger sample sizes and longitudinal designs is warranted to confirm these findings and explore additional risk factors.

Keywords: Circumcision, urinary tract infection, infants, urology, preventive health, cross-sectional study

INTRODUCTION

Urinary tract infections (UTIs) represent a significant concern in pediatric health, particularly affecting infants and young children. UTIs can lead to severe complications if not promptly diagnosed and treated, including renal scarring, hypertension, and in extreme cases, renal failure. The incidence of UTIs in infants varies globally, influenced by a range of factors including gender, hygiene practices, and anatomical considerations. Among the numerous preventive strategies, circumcision has been proposed as a potential measure to reduce the risk of UTIs, particularly in male infants. This article delves into the role of circumcision in preventing UTIs from a urological perspective, offering insights derived from a comprehensive cross-sectional study.

Circumcision, the surgical removal of the foreskin, has been practiced for millennia for cultural, religious, and medical reasons. Its potential health benefits, particularly in relation to UTI prevention, have been a subject of considerable debate within the medical community. The foreskin is hypothesized to harbor pathogens, thereby increasing the risk of infections, including UTIs. Several studies suggest that circumcised males have a lower incidence of UTIs compared to their uncircumcised counterparts, but the extent of this protective effect and its clinical significance remain contentious.

UTIs in infants are primarily caused by bacterial pathogens, with Escherichia coli being the most common culprit. The pathogenesis involves the ascent of bacteria through the urethra into the bladder, and in severe cases, up to the kidneys. The presence of the foreskin can create a conducive environment for bacterial growth, owing to factors such as retained urine, smegma accumulation, and warm, moist conditions. By removing the foreskin, circumcision may reduce the reservoir for these pathogens, thereby lowering the risk of infection.

From a urological perspective, understanding the anatomical and physiological implications of circumcision is crucial. The procedure itself is relatively simple, typically performed during the neonatal period when the risks and complications are minimal. However, the decision to circumcise involves weighing potential benefits against risks such as pain, bleeding, and rare but serious complications like infection or improper healing.

By elucidating the relationship between circumcision and UTI risk, we aim to contribute to a more nuanced understanding of this preventive measure. The findings of this study could have significant implications for pediatric health policies, particularly in regions with high UTI prevalence or where circumcision practices are culturally entrenched.

MATERIALS AND METHODS

This cross-sectional study was carried out at Sheikh Zayed Hospital Lahore a tertiary care hospital over a period of six months, from January to June 2023. A total of 125 male infants, aged between 0 and 12 months, were recruited for this study. Male infants aged 0-12 months, and infants with documented circumcision status (circumcised or uncircumcised). Infants with congenital urological anomalies (vesicoureteral reflux, posterior urethral valves), infants with immunodeficiencies or chronic conditions affecting the urinary tract were excluded from study.

Data were collected through a combination of medical record review, parental surveys, and clinical evaluations. The following information was documented for each participant: circumcision status (circumcised or uncircumcised), age at the time of circumcision, incidence of UTIs confirmed by urine culture, demographic information (age, weight, family history of UTIs), feeding practices (breastfeeding, formula feeding), hygiene practices (frequency of diaper changes, use of wipes or water) and any prior history of UTI or urological issues. UTI was defined based on clinical

symptoms and confirmed by urine culture. Clinical symptoms included fever, irritability, poor feeding, and foul-smelling urine. A positive urine culture was defined as the presence of at least 100,000 colony-forming units (CFU) per milliliter of a single pathogen in a catheterized or suprapubic aspirate urine sample. For clean-catch samples, a threshold of 50,000 CFU/mL was used. The primary outcome was the incidence of UTIs in circumcised versus uncircumcised infants.
Data were analyzed using SPSS version 26.0. Descriptive statistics were used to summarize the baseline characteristics of the study population. Continuous variables were expressed as means and standard deviations, while categorical variables were presented as frequencies and percentages. Chi-square tests were used to compare the incidence of UTIs between the two groups. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to assess the strength of the association between circumcision status and UTI risk.

STUDY RESULTS

The baseline characteristics of the study population were similar between circumcised and uncircumcised infants. The mean age was 6.1 months overall, with circumcised infants having a mean age of 6.2 months and uncircumcised infants having a mean age of 6.0 months. The mean weight was 7.5 kg overall, with circumcised infants weighing 7.6 kg on average and uncircumcised infants weighing 7.4 kg. Breastfeeding was reported in 64% of the total population, with 62% of the circumcised group and 67% of the uncircumcised group being breastfed. Formula feeding was noted in 36% of the total population, with 38% of the circumcised group and 33% of the uncircumcised group being formula-fed. A family history of UTIs was present in 16% of the total population, with similar rates in both groups (15% in circumcised and 17% in uncircumcised). Hygiene practices, measured by the number of diaper changes per day, were also comparable between the groups, with an overall mean of 6.5 changes per day (6.4 in circumcised and 6.6 in uncircumcised).
The incidence of UTIs was significantly lower in circumcised infants compared to uncircumcised infants. Among the circumcised group, 7.7% (5 out of 65) had a UTI, while 25% (15 out of 60) of the uncircumcised group had a UTI. Overall, 16% (20 out of 125) of the study population experienced a UTI.
The logistic regression analysis revealed that circumcision status was significantly associated with a reduced risk of UTIs. The adjusted odds ratio (OR) for UTI risk in circumcised infants was 0.24 (95% CI: 0.08 - 0.72, $p < 0.01$), indicating that circumcised infants were 76% less likely to develop a UTI compared to uncircumcised infants. Other variables, such as age (OR: 1.02, $p = 0.63$), breastfeeding status (OR: 0.87, $p = 0.79$), family history of UTIs (OR: 1.41, $p = 0.55$), and hygiene practices (OR: 0.98, $p = 0.85$), were not significantly associated with UTI risk.

Table 1: Baseline Characteristics of the Study Population

Characteristic	Total (n=125)	Circumcised (n=65)	Uncircumcised (n=60)
Age (months), mean (SD)	6.1±3.2	6.2±3.1	6.0±3.3
Weight (kg), mean (SD)	7.5±1.2	7.6±1.1	7.4±1.3
Breastfed, n (%)	80 (64%)	40 (62%)	40 (67%)
Formula-fed, n (%)	45 (36%)	25 (38%)	20 (33%)
Family history of UTIs, n (%)	20 (16%)	10 (15%)	10 (17%)
Hygiene practices (diaper changes per day), mean (SD)	6.5±1.8	6.4±1.7	6.6±1.9

Table 2: Incidence of UTIs in Circumcised vs. Uncircumcised Infants

UTI Incidence	Circumcised (n=65)	Uncircumcised (n=60)	Total (n=125)
UTI cases, n (%)	5 (7.7%)	15 (25%)	20 (16%)
No UTI cases, n (%)	60 (92.3%)	45 (75%)	105 (84%)

Table 3: Logistic Regression Analysis of Factors Associated with UTI Risk

Variable	Adjusted OR (95% CI)	p-value
Circumcision status	0.24 (0.08 - 0.72)	<0.01
Age (months)	1.02 (0.95 - 1.08)	0.63
Breastfed	0.87 (0.32 - 2.34)	0.79
Family history of UTIs	1.41 (0.45 - 4.38)	0.55
Hygiene practices	0.98 (0.78 - 1.22)	0.85

DISCUSSION

The present study aimed to investigate the prevalence of urinary tract infections (UTIs) in male infants in our region, focusing on the potential protective effect of circumcision. Our findings revealed a significant association between circumcision and a reduced incidence of UTIs. This section discusses our results in the context of existing literature and studies from other regions. Our study found that circumcised infants had a significantly lower incidence of UTIs (7.7%) compared to uncircumcised infants (25%). This aligns with the results from various studies that emphasize the protective role of circumcision against UTIs in male infants.[11] For instance, studies have shown that the incidence of UTIs is higher in uncircumcised male infants due to the presence of the foreskin, which can harbor bacteria and facilitate their ascent into the urinary tract.[12,13,14,15]

A study conducted in northern Saudi Arabia, involving 606 confirmed UTI cases, found a higher incidence of UTIs in males under one year of age compared to females.[13] This observation supports our findings that male infants, especially those who are uncircumcised, are at a greater risk of developing UTIs. However, the Saudi study also highlighted that UTIs were more common in females in older age groups, which was not within the scope of our study focused on infants.

The Saudi study identified E. coli as the most prevalent pathogen causing UTIs, responsible for 56.23% of cases, followed by Klebsiella (28.8%).[13] Although our study did not isolate pathogens, the prevalence of E. coli in UTI cases is consistent with global data. For instance, studies from Iran and Nigeria also reported E. coli as the predominant pathogen, accounting for 40% and 52.77% of UTI cases, respectively.[16,17] This consistency suggests a commonality in the etiological agents of pediatric UTIs across different regions.

The Saudi study also noted that constipation was a major risk factor for UTIs in their pediatric population.[13,18,19] While our study did not specifically investigate constipation, it is an area worth exploring in future research to understand its impact on UTI incidence in our region. The findings of our study have important clinical implications. Given the significant reduction in UTI risk associated with circumcision, healthcare providers can consider discussing the potential benefits of circumcision with parents of male infants, particularly in regions with high UTI prevalence. However, the decision to circumcise should also take into account cultural, ethical, and individual health considerations.[20]

Future research should aim to replicate our study with larger sample sizes and in different populations to confirm these findings and explore additional risk factors such as constipation and congenital abnormalities. Longitudinal studies could provide insights into the long-term health outcomes associated with circumcision and UTI prevention.[21]

Our study has several limitations that should be acknowledged. The sample size of 125 infants is relatively small, which may limit the generalizability of our findings. Additionally, the study's cross-sectional design does not allow for the establishment of causality. Recall bias in parental reporting of hygiene practices and feeding could also affect the accuracy of the data.

CONCLUSION

In conclusion, our study demonstrates that circumcision significantly reduces the risk of UTIs in male infants. This finding is consistent with existing literature and underscores the potential health benefits of circumcision in preventing UTIs. Further research with larger cohorts and consideration

of additional risk factors is needed to enhance our understanding of UTI prevention in pediatric populations.

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