Short Communication

Iran J Pediatr
Mar 2010; Vol 20 (No 1), Pp:97-100

Diaper Type as a Risk Factor in Urinary Tract Infection of Children

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Received: *Mar 06, 2009*; Final Revision: *Jul 22, 2009*; Accepted: *Oct 14, 2009*

Abstract

Objective: Urinary tract is one of the most common sources of infection in children under the age of two years. Many known and unknown risk factors predispose to this important disease in children. This study was conducted to determine whether using a specific type of diaper plays a role in urinary tract infection (UTI) in girls under the age of 2 years.

Methods: This case control study was performed in hospitalized children; girls with their first urinary tract infection were selected as cases, and those admitted for other reasons comprised the control group. Two groups were matched for age (±1 month), and other known risk factors for UTI. Type of diapers (superabsorbent, standard disposable and washable cotton), used for these children during six months, from October 2007 to March 2008, were compared in both groups.

Findings: Fifty-nine matched pair infant girls less than 2 years were selected. It was revealed that in cases with UTI superabsorbent diapers were used more frequently than in controls (Odds ratio =3.29, *P*-value=0.005) There were no significant differences in other factors like number of diapers used per day, the time between defecation and diaper change, mothers' educational level, level of family income and mother's occupation.

Conclusion: The use of superabsorbent diapers could be a risk factor for urinary tract infection in infant girls.

Iranian Journal of Pediatrics, Volume 20 (Number 1), March 2010, Pages: 97-100

Key Words: Urinary Tract Infection; Diapers; Risk Factors; Infants; Children

Introduction

Urinary tract infection (UTI) is one of the most important and serious infections in children. It occurs in 3-5% of girls and 1% of boys up to 5 years, and peaks during infancy and toilet training period[1,2]. UTI may lead to renal scarring, impaired glomerular function, early

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hypertension, and end stage renal disease in the future[3-6]. Treatment goals are to eliminate the infection and prevent kidney damage.

The periurethral area is colonized by both anaerobic and aerobic bacteria from the gastrointestinal tract, which serve as part of a normal defense barrier against pathogenic microorganisms. The most common risk factor leading to UTI is urinary stasis that deranges this equilibrium[7]. This can result from vesicoureteral reflux, bladder dysfunction, habitually infrequent or incomplete voiding, stones, and outflow obstruction due to labial adhesion or constipation[8,9]. Other probable risk factors in girls include back to front wiping, poor perineal hygiene and bubble baths[10]. In only one prospective case control study in 1996 that we found in literature, there was no difference in incidence of UTI in children using different types of diapers[11].

This study was done to investigate if the type of diapers used in infancy is a possible risk factor in UTI in young girls. We compared the use of different types of diapers in two groups, ie children with definite UTI and the control group without UTI.

Subjects and Methods

This case control study was performed in girls under the age of two years hospitalized in Mofid Children's Hospital from October 2007 to March 2008. Female children under the age of two years admitted with their first UTI were selected as cases and girls hospitalized for some other reasons (mainly elective surgery), served as controls. We considered definite UTI when the child had fever with positive pyuria (urine WBC >5 in hpp) and positive urine culture (colony count $>10^5$/cc) in clean catch or bag specimen.

Two groups were matched for age (±1 month) and for known risk factors for UTI, like labial adhesion, constipation, style of buttock wiping and bubble bath. Children with renal dysfunction or structural urinary tract anomaly except labial adhesion were excluded from this study.

Questionnaires were completed by a trained nurse; relevant information included details of the types of diapers used prior to the first diagnosed UTI, ie the use of superabsorbent, standard disposable or washable cotton diapers. The type and number of diapers used daily as well as the time of diaper change after defecation were documented. The study protocol was approved by the Ethics Committee of the Shahid Beheshti University of Medical Scinces.

Also, level of maternal education, mother's occupation and the family income were recorded.

The data was summarized as follows: proportional values for qualitative variables and median (minimum-maximum) for quantitative variables. Comparisons between the two groups were performed by paired *t*-test and McNemar test and differences considered significant if *P*-value <0.05.

Findings

One-hundred and eighteen children between 1 to 24 months were included in the study. Fifty-nine pairs of cases, (children with UTI), and controls were matched. Mean age was 9.57 months (SD=6.06) in cases and 9.60 months (SD=5.80) in control group. As shown in Table 1, superabsorbent diaper was used more frequently in cases than in controls (62.71% vs. 35.59%; OR= 3.29, *P*-value=0.005).

The difference between number of diapers used per day in controls (6.4+3.4) and cases (7.9 +7.3) was not statistically significant (*P*-value=0.15). The time between defecation and diaper change was less than 5 minutes in majority of the children in both groups and was almost similar (89.83% in cases vs. 77.97% in controls, *P*-value=0.014). Mothers' educational level in controls was lower than in cases. (*P*-value=0.02). There were no significant differences in other factors like level of family income and mother's occupation in the two groups (Table 1).

Table 1: Comparison of diaper types in Case and Control groups

Parameters	Cases	Controls	*P*-value
Type of napkin			
Superabsorbent Diaper	37 (62.71%)	21 (35.59%)	0.005
Ordinary Diaper	22 (37.29%)	38 (64.41%)	
Number of diapers per day	6.4 + 3.4	7.9 + 7.3	0.15
Time between defecation and diaper change			
Less than 5 minutes	53 (89.83%)	46 (77.97%)	0.14
Between 5 and 30 minutes	6 (10.17%)	13 (22.03%)	
Mother education			
Less than high school	14 (23.73%)	27 (45.76%)	0.02
High school or higher	45 (76.27%)	32 (54.24%)	
Mother's occupation			
Occupied	6 (10.17%)	8 (13.56%)	0.8
Housewife	53 (89.83%)	51(86.44%)	
Income			
≤ 3 million rials	23 (39.0%)	34 (57.6%)	0.10
> 6 million rials	36 (61.0%)	25 (42.4%)	

Discussion

The epidemiology of UTI during childhood varies by age, gender and various other factors. The incidence of UTI is highest in the first 2 years of life but decreases later[12] In this study we have shown that the type of diaper could be a risk factor for UTI in little girls. UTI was seen more frequently with the use of superabsorbent diapers as compared to using other diapers.

In one prospective case control study in 1996, there wasn't any difference in incidence of UTI in children using three different types of diapers.

The odds ratios for risk of contracting UTI according to different diaper types used prior to the first UTI diagnosis were 0.95 for superabsorbent diapers, 1.04 for standard disposable diapers and 1.00 for washable cotton diapers[11] However, during the course of that study, use of cotton washable nappies had been replaced by the superabsorbent diaper, thus producing a bias and making the results unreliable.

One explanation that could account for the different results in our study is the frequency of diaper changes in both groups. We expected that because of the high price of superabsorbent diapers, these types of diapers would be changed less often. However our study showed that there was no difference in number of daily diaper changes between the two groups.

A logical explanation for difference in the incidence of UTI between children with different types of diapers is insufficient ventilation in genital area with the use of superabsorbent diapers. The main source of UTI is through the ascending route and it usually occurs as a consequence of colonization of the periurethral area by a virulent organism that subsequently gains access to the bladder[13], in superabsorbent diapers there is a suitable environment for bacterial overgrowth due to incomplete evaporation of urine, thus providing a ready source of infection. In contrast, urine evaporates more rapidly in washable cotton diapers.

In older girls poor perineal hygiene and insufficient ventilation due to tight clothing is a predisposing factor for UTI. In addition, it seems prudent to advise parents to keep the infant's genital area dry thus reducing bacterial overgrowth and the consequent risk of infection.

Limitation of our study was an underestimation of case and control patients with washable cotton diapers, therefore we gathered children with this type of diapers and disposable diapers in one group known as ordinary diapers

Conclusion

As washable cotton diapers are not ordinarily used nowadays, we recommend the use of diapers equipped with ventilation or with alarm systems such as a color change when wet. We also recommend that, to decrease bacterial overgrowth, the perineum should be dried thoroughly after washing

Acknowledgment

We appreciate all supports of Pediatric Infectious Research Center (PIRC) and personnel of infection and surgery wards of Mofid Children's Hospital.

Conflict of Interest: All authors have no conflicts of interest to declare, and did not have any financial or Non-Financial conflict of interest.

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