Correlation between use of disposable diapers and phimosis incidence in children at H. Adam Malik Hospital Medan

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Abstract

Background: The phimosis prevalence is increasing every year. One of using disposable diapers side effects is phimosis.
Aim : Authors are interested in further researching about correlation between phimosis incidence and use of disposable diapers in children at H. Adam Malik Hospital, Medan.
Methods : This study is an analytic study with cross-sectional design at Division of Pediatric Surgery, Department of Surgery, USU Medical Faculty, H. Adam Malik Hospital, Medan after proposal was approved by USU Medical Faculty research ethics committee. The study sample was children with phimosis who used or did not use disposable diapers, used technique total sampling. All results are displayed in tabulation. For inferential analysis of hypothesis testing, chi square test is used.
Results: There are 24 children (33.3%) who use less than 6 diapers per day, 16 of them (22.2%) have pathological phimosis. 48 children (66.7%) who use more than 6 diapers per day, 18 of them (25%) had pathological phimosis. Based on analysis, there is a statistically significant effect between disposable diapers on phimosis incidence in children with $p>0.025$.
Conclusion: There was a significant correlation between use of disposable diapers and phimosis incidence in children at H. Adam Malik Hospital Medan

Keywords : phimosis; disposable diapers; children; pathological phimosis

1. Introduction

Phimosis is a disorder in which penis foreskin cannot be retracted (pulled) proximally to glans corona. The incidence of phimosis is 8% in children aged 6-7 years, 1% in children aged 16-18 years. Research in China stated that phimosis was most commonly found at age of 3 to 6 years. Some studies also found phimosis incidence at birth is only 4% of babies whose prepuce can be fully retracted therefore penis head looks intact. Gradually, desquamation causes decrease attachment. Until 1 years old, 50% of which can not be fully withdrawn. The treatment of phimosis until now is still by circumcision (Daryanto, 2016).

The phimosis prevalence is increasing every year. The exact cause is unclear, but it is closely linked to use of disposable diapers. In recent years, disposable diapers have become very widely used. Disposable diapers are introduced to public as diapers that can absorb a lot of urine and aim to avoid changing diapers too often. In the end, as can be seen in everyday life, parents do not change their children's disposable diapers even though the child has urinated many times. One of using disposable diapers side effects is phimosis. The correlation between phimosis and use of disposable diapers is thought to have caused an infection on child's prepuce skin (Daryanto, 2016).

Until now there we don't found any research that discusses correlation between use of disposable diapers and phimosis incidence. Where use of disposable diapers can cause repeated infections and an inflammatory process occurs which will trigger prepuce scarring resulting in pathological phimosis. Based on this reason, authors are interested in further researching about correlation between phimosis incidence and use of disposable diapers in children at H. Adam Malik Hospital, Medan.

2. Material and methods

This study is an analytic study with cross-sectional design at Division of Pediatric Surgery, Department of Surgery, USU Medical Faculty, H. Adam Malik Hospital, Medan after proposal was approved by USU Medical Faculty research ethics committee. The study sample was children with phimosis who used or did not use disposable diapers who met inclusion criteria, namely boys with a diagnosis of phimosis aged < 15 years and had a family/guardian of a male child whose can answer questionnaire completely; and does not include exclusion criteria, namely children with other comorbidities. This study used a total sampling technique of sampling. Data were collected from a questionnaire that will be given to all parents of children. Data taken from this study included age, chief complaint, risk factors, family history, history of using disposable diapers, and other diseases. The collected data is processed and presented with statistical software. For descriptive analysis, numerical data is displayed in mean value and standard deviation, while categorical data is displayed in percentage value. All results are displayed in tabulation. For inferential analysis of hypothesis testing, chi square test is used.

3. Results

This study was followed by 72 research subjects presented in table 1. The mean age of children in this study was 4 years old. Prevalence of physiological phimosis in children in RSUP. H. Adam Malik Medan was 52.8% and prevalence of pathological phimosis was 47.2%. The use of <6 diapers/day was found in 24 children (33.3%) and use of 6 diapers/day was found in 48 children (66.7%).

Table 1. Characteristics of Research Subjects

Characteristics	n=72
Age, (years old)	4,6 ± 3,1
Number of diaper usage/day	
6 diapers/days, n(%)	24 (33,3)
≥ 6 diapers/days, n(%)	48 (66,7)
Diaper Rash (%)	31(43,1)
Phimosis, n(%)	
Physiological	38 (52,8)
Pathological	34 (47,2)

All respondents stated that children's diapers were changed regularly. There are 62 children (86.1%) who wear diapers all the time. A total of 6 children (8.4%) had experienced diarrhea. A total of 11 children (27.2%) felt itching and children often scratched their pubic area. There was redness on child's penis skin was observed by 23 subjects (48.2%). There was pus on penis on 10 subjects (15.3%). Five children (7%) had a fever accompanied by urinary abnormalities before. There is no history of allergies in family, either father, mother, or siblings as many as 64 people (88.8%). None of children had history of urinary catheter insertion or certain medical procedures. It was found that only 11 children had swelling on groin (9.6%) and only 7 children (6.1%) had experienced trauma on penis tip.

There are 24 children (33.3%) who use less than 6 diapers per day, 16 of them (22.2%) have pathological phimosis. 48 children (66.7%) who use more than 6 diapers per day, 18 of them (25%) had pathological phimosis. Based on analysis, there is a statistically significant effect between disposable diapers on phimosis incidence in children with $p>0.025$.

Table 2. Correlation between use of disposable diapers and phimosis incidence in children at H. Adam Malik Hospital Medan

	Phimosis		Total	P value*
	Physiological	Pathological		
< 6 diapers per day	8 (11,1%)	16 (22,2%)	24 (33,3%)	0,025
≥ 6 diapers per day	30 (41,7%)	18 (25%)	48 (66,7%)	
Total	38 (52,8%)	34 (47,2%)	72 (100 %)	

**Chi Square test*

4. Discussions

Physiological phimosis is result of epithelial layer adhesion between inner prepuce and glans penis. These adhesions spontaneously and intermittently disappear during erection and foreskin retraction, with age (puberty) physiological phimosis will disappear. Poor hygiene in penile area and presence of repeated balanitis or balanophostitis triggers scar tissue formation in prepuce orifice resulting in pathological phimosis. Forced retraction of the foreskin can also result in minor injuries to prepuce orifice which can lead to scarring and further phimosis. Adults who have not been circumcised are also at risk of secondary phimosis due to loss of skin elasticity (Fahmy, 2017)

Diapers are divided into 2 types, cloth diapers and disposable diapers. Disposable diapers are equipped with absorbent materials such as SAP (Super Absorbent Polymer), which do not leak easily, suitable for traveling to faraway places, but are more expensive than cloth diapers. According to research survey results, that about 90% of American parents use disposable diapers and are at risk of developing urinary tract infections. A study states that in healthy children with a child's voiding pattern every 4 hours, use of diapers can increase risk of leukocyturia compared to those who do not use it. It is suspected that type of diaper used in children with positive leukocyturia is a disposable diaper equipped with a super absorbent (Sompotan, Umboh and Wilar, 2014). The use of disposable diapers in children is a trend nowadays because it is considered practical as compared to cloth diapers. Indonesia represents fourth largest consumer after China, India and the United States (Tri Puji Lestari, 2014).

In this study, 72 parents of subject stated that their children's diapers were changed regularly. There are 41 children (57%) who wear diapers all the time where 11 children (27.2%) feel itchy and children often scratch their pubic area. There was redness on child's penis skin was observed on 23 subjects (48.2%). There was pus on penis by as many as 10 subjects (15.3%). In this study, number of diaper rash cases occurred in 31 children (43.1%). This is in line with Daulay study which examined 80 children aged 2 months to 2.5 years, it was found that 30 children used diapers throughout the day with a frequency of changing >6 times per day and there was a significant correlation between a lower frequency of changing disposable diapers and incidence of UTIs higher in children. (Meirina et al., 2013). A standardized disposable diaper consists of a top sheet, absorbent core, collector and breathable sheet. When using this type of diaper, skin can become moist with sweat or urine and can irritate skin, causing a diaper rash (diaper dermatitis) (Yuan et al., 2018).

Diaper dermatitis or diaper rash is a skin eruption in diaper area caused by wearing diapers so diapers must be changed frequently at least every 3-4 hours to prevent rashes. The prevalence of diaper dermatitis varies greatly from 4-35% in children aged 2 years old. In a study by Roy et al mentioned among infants with diaper dermatitis, 84.6% used a single diaper continuously for more than 4 hours without changing, 15.4% and 0% of infants developed diaper rash after using one diaper for 3-4 hours and 1 -2 hours (Roy et al., 2017). In our study, 10 subjects (15.3%) complained that their child had pus on penis and 5 people (7%) had a fever with other urinary disorders. This is one sign of infection that can put you at risk for phimosis. Fahimzad et al reported that disposable diapers were a risk factor for urinary tract infections compared to standard type.

Lestari et al themselves found that use of disposable diapers >4 hours (mean subjects used >12 hours) increased UTI 2.89 times compared to using diapers <4 hours (Tri Puji Lestari, 2014)

The prevalence of pathological phimosis in children at H. Adam Malik Hospital Medan in this study was 47.2% and prevalence of physiological phimosis was 52.8%. Phimosis is a clinical condition in which foreskin cannot be retracted so that glans is not visible. About 75% of men under 3 years tend to experience imperfect prepuce skin retraction (Rendy, Rodjani and Wahyudi, 2020). However, primary physiological phimosis usually resolves spontaneously until adolescence (Falcão, Stegani and Matias, 2018). Gairdner et al. observed resolution in 90% of patients up to three years of age and 99% up to 17 years of age. Similar results were also stated by Kayaba et al on 603 Japanese boys showed that prevalence of completely retractable prepuce gradually increased from 0% of six months baby to 62.9% of child 11 to 15 years old. The study by Laurencao et al observed normal retractions in 45% patients (Lourenção et al., 2017). The study by Tekgul et al found phimosis incidence was 8% at the age of 6-7 years and only 1% in adolescents aged 16-18 years (Tekgul et al., 2014).

Our study found that of 72 children, 34 pathological phimosis were found, of which 16 were using diapers <6 times a day, 18 of whom were wearing 6 diapers a day. The remaining 38 people with physiological phimosis, 8 of whom use diapers <6 times a day and 30 people use diapers 6 diapers a day. There is a significant correlation between two groups ($p = 0.025$). The phimosis incidence with risk factors for use of disposable diapers is not known with certainty, but it may be due to infection risk in urinary tract which can increase risk of phimosis, and vice versa. Phimosis allows uropathogens to enter prepuce and contributes to increased risk of UTI. As boys age, physiological phimosis resolves and foreskin or tip penis becomes retractable, further reducing risk of UTI in uncircumcised men. A prospective study by Holzman et al of 105 male infants with VUR (Vesicoureteral reflux) found that boys with VUR who had a retractable prepuce and visible meatus (grade 0-3) had lower rates of UTI, similar to circumcised boys (Holzman et al., 2021).

Hiraoka et al studied using four-point rating scale for phimosis and found that pediatric patients with severe phimosis are at risk of developing UTI compared to infants with mild phimosis (Lee et al., 2006). Several factors can cause the foreskin cannot be fully retracted, including persistence preputial adhesions or adhesions of fused layer between the glans and prepuce. Boys with recurrent balanitis or balanoposthitis are at risk for preputial scarring orifice, which also contributes to pathological phimosis. Balanitis can result from poor hygiene and is common in boys who still wear diapers (McGregor, Pike and Leonard, 2007).

The weakness in this study is occurrence of recall bias, where this study uses a questionnaire given to parents who have children under 15 years with phimosis diagnosis. Some of respondents' parents find it difficult to recall frequency of using diapers, clinical symptoms that occurred when respondents were still children. So that prospective research is also needed so that data obtained is more accurate. The study also did not examine types of disposable diapers. Fahimzad et al found that frequency of changing disposable diapers did not affect UTI incidence in children. What affects are disposable diapers types, namely superabsorbent disposable diapers, standard disposable diapers, and disposable diapers made of washable cloth. There were significant results that UTIs were more common in children who used disposable diapers with best absorption. This is due to the lack of ventilation in diaper so that anaerobic bacteria easily colonize. Robson et al revealed that "jelly beads" found in disposable diapers also cause UTIs to occur in children easily.

5. Conclusion

The majority of respondents regularly change diapers, and do not use diapers all the time. The majority of respondents had never experienced diarrhea before, did not experience itching or scratching the genital area. The majority of respondents also did not experience redness penis skin, swelling, fever or pus. In addition, there was no history of allergies in family or history of trauma to prepuce. There was a significant correlation between use of disposable diapers and phimosis incidence in children at H. Adam Malik Hospital Medan

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