

**FACTORS ASSOCIATED WITH DIAPER DERMATITIS
AMONG CHILDREN AGED 0-24 MONTHS ADMITTED IN
MBAGATHI SUB COUNTY HOSPITAL, NAIROBI
COUNTY, KENYA**

NG'ANG'A ANN WANJIKU

MASTER OF SCIENCE

(Public Health)

**JOMO KENYATTA UNIVERSITY OF
AGRICULTURE AND TECHNOLOGY**

2019

**Factors Associated with Diaper Dermatitis among Children Aged 0-24
Months Admitted in Mbagathi Sub County Hospital, Nairobi County,
Kenya**

Ng'ang'a Ann Wanjiku

**A Thesis Submitted in Partial Fulfillment for the Degree of Master of
Science in Public Health in the Jomo Kenyatta University of
Agriculture and Technology**

2019

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

Signature.....

Date.....

Ann Wanjiku Ng'ang'a

This thesis has been submitted for examination with our approval as university supervisors.

Signature.....

Date.....

Prof. Charles FL Mbakaya, PhD

RONGO UNIVERSITY, Kenya

Signature.....

Date.....

Prof. Zipporah Ng'ang'a, PhD

SEKU, Kenya

DEDICATION

This thesis is dedicated to my parents,

Bernard & Jacinta

Who have been my best cheerleaders.

It is their unconditional love that motivates me to set higher targets.

ACKNOWLEDGEMENTS

I thank the almighty God for giving me courage and the much needed strength in conducting this research study despite all difficulties. His grace has been sufficient for me.

I wish to express my thanks to my supervisors Dr. Charles Mbakaya and Prof. Zipporah Ng'ang'a; who have been so wonderful to me. This thesis would not be complete without their expert advice and unfailing patience. I am most grateful for the confidence they had in me and for their faith in this study especially in the sometimes-difficult circumstances in which it was written.

I would like to express my thanks to my friends who tirelessly listened to my ideas and offered encouragement when it was most needed. I thank you for patiently assisting with words of assurance and the much needed cup of coffee. Your friendship makes my life a wonderful experience. I cannot list all the names here, but you are always on my mind. I especially thank Michael H. Fissehaye for his undoubted help in referencing and proof reading.

My deepest gratitude goes to the managers of the pediatrics and MCH departments at Mbagathi hospital for their cooperation and granting me the approval to conduct my research in their respective departments. I also sincerely wish to thank all mothers who participated in this study for their time and willingness.

Last but not least, I thank my parents and brothers for their love and support throughout my life. Thank you all for giving me the motivation to chase after my dreams

TABLE OF CONTENTS

DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENTS	iv
LIST OF TABLES.....	ix
LIST OF FIGURES.....	x
LIST OF APPENDICES	xi
ABBREVIATIONS AND ACRONYMS	xii
DEFINITIONS OF OPERATIONAL TERMS	xiii
ABSTRACT	xiv
CHAPTER ONE.....	1
INTRODUCTION	1
1.1 Background Information.....	1
1.2 Statement of the problem.....	3
1.3 Justification.....	4
1.4 Research Questions.....	5
1.5 Objectives	5
1.5.1 General Objective	5
1.5.2 Specific Objectives	5
CHAPTER TWO.....	6
LITERATURE REVIEW	6
2.1 Pathophysiology of DD	6

2.2 Epidemiology of diaper dermatitis	6
2.3 Etiology of Diaper dermatitis	8
2.4 Factors contributing to Diaper dermatitis.....	8
2.5 Clinical presentation of diaper dermatitis.....	9
2.6 Prevention for diaper dermatitis	10
2.6.1 Frequency of diaper change.....	10
2.6.2 Diaper absorption capability.....	10
2.7.3 Daily hygiene and preparations	11
2.7.4 Type of diaper use (disposal versus cloth diapers).....	11
CHAPTER THREE.....	13
MATERIALS AND METHODS.....	13
3.1 Study area	13
3.2 Study design	13
3.3 Dependent variables.....	13
3.4 Independent variables	13
3.5 Study population.....	14
3.5.1 Inclusion criteria	14
3.5.2 Exclusion criteria	14
3.6 Sample Size Determination	15
3.7 Sampling Procedure.....	15
3.8 Data Collection Tools and Data Collection.....	16
3.8.1 Semi structured questionnaire.....	16
3.8.2 Observation Checklist.....	17

3.9	Data Management and Analysis	17
3.10	Ethical Considerations	18
	CHAPTER FOUR	19
	RESULTS	19
4.1.	Socio-Demographic Characteristics of Mothers	19
4.2	Selected socio-demographic characteristics of the children.....	21
4.3	Socio-economic characteristics of mothers	22
4.4	Obstetric history of mothers	24
4.5	Medical history of the infant	26
4.6	Knowledge of the mothers on diaper dermatitis.....	28
4.6.1	Knowledge on signs of diaper rash among the mothers.....	30
4.7	Protective genital care practices	30
4.8	Prevalence of diaper dermatitis among children aged 0-24 months.....	33
4.9	Relationship between socio-economic characteristics of mothers and diaper dermatitis in children.....	36
4.10	Relationship of protective diaper care practices of mothers with diaper dermatitis ..	38
4.11	Association between obstetric history of the mother and diaper dermatitis.....	40
4.12	Association between medical history of the child and diaper dermatitis	41
4.13	Factors associated with diaper dermatitis among children aged 0-24 months	42
	CHAPTER FIVE	44
	DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.....	44
5.1	Discussion.....	44
5.1.1	Socio-demographic/economic characteristics of mother/child pairs.....	44

5.1.2 Breastfeeding Practices	46
5.1.3 Diaper Care Practices	46
5.1.4 Health Condition of the Child	47
5.2 Conclusions	49
5.3 Recommendations	49
REFERENCES	50
APPENDICES.....	56

LIST OF TABLES

Table 4.1: Socio-demographic characteristics of mothers	20
Table 4.2: Selected socio-demographic characteristics among children.....	22
Table 4.3: Socio-economic characteristics of mothers.....	23
Table 4.4: Obstetric history of the mother and medical history of the infant	25
Table 4.5: Medical history of the infant.....	27
Table 4.6: Knowledge of the mothers on diaper dermatitis	29
Table 4.7: Protective diaper care practices among mothers.....	32
Table 4.8: Association between socio-demographic characteristics of mothers and DD	35
Table 4.9: Relationship between socio-economic characteristics of mothers and diaper dermatitis.....	37
Table 4.10: Relationship of protective diaper care practices among mothers of children with DD.....	39
Table 4.11: Association between obstetric history of the mother and diaper dermatitis	40
Table 4.12: Association between medical history of the child and diaper dermatitis.....	41
Table 4.13: Factors associated with diaper dermatitis among children aged 0-24 months.....	43

LIST OF FIGURES

Figure 4.1: Number of children living in the household.....	21
Figure 4.2: Knowledge on signs of diaper rash among the mothers.....	30
Figure 4.3: Prevalence of diaper dermatitis among children aged 0-24 months.....	33

LIST OF APPENDICES

Appendix I: Informed Consent Form (English Version)	56
Appendix II: Informed Consent Form (Swahili Version)	61
Appendix III: Questionnaire (English Version)	66
Appendix IV: Observation Checklist.....	82
Appendix V: Questionnaire (Swahili Version)	84
Appendix VI: Approval Letter by Ethics and Research Committee –KNH/UON	99

ABBREVIATIONS AND ACRONYMS

ANC	Antenatal care
CI	Confidence Interval
DD	Diaper dermatitis
ERC	Ethics and Research Committee
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KNH	Kenyatta National Hospital
MCH	Maternal and Child Health
MOH	Ministry of Health
OR	Odds Ratio
PI	Principal Investigator
PNC	Postnatal care
SAP	Sodium Polyacrylate
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
UK	United Kingdom
UON	University of Nairobi
US	United States
WHO	World Health Organization

DEFINITIONS OF OPERATIONAL TERMS

Awareness: Having the information, skills and understanding the prevention of diaper dermatitis by the mother/guardian.

Cotton cloth diapers- All diapers made of cotton cloth that can be reusable through laundering.

Diaper dermatitis/ diaper rash/ napkin dermatitis/ nappy rash - It is a skin inflammatory reaction localized to an area usually covered by the diaper. In this study, it refers to inflammation of the skin with redness, well defined edges and beefy red appearance seen only in the diaper area.

Disposables (disposable diapers) - All throw away or compostable diapers. Also known as single use diapers

ABSTRACT

Diaper dermatitis (DD) is a highly prevalent condition in infants and toddlers. Globally, the reported prevalence of DD varies ranging from 15% in Italy, 16% in UK, 43.8% in China, 75% in US and 87% in Japan. Although diaper technology has evolved to substantially lessen the severity of DD, its prevalence and burden still remains high. In Sub-Saharan Africa (SSA), prevalence has been variably reported between 4%-35%. Currently, there is no scientific report of local prevalence of diaper dermatitis in Kenya. Understanding the factors associated with diaper dermatitis is vital in its prevention and in the promotion of good quality care for children. The aim of this study was to determine the factors associated with DD among children aged 0-24 months at Mbagathi sub-county hospital. The study was a descriptive cross sectional study conducted among 384 mother/child pairs. Systematic sampling was used to select participants for the study. The sampling frame was estimated from the hospital by calculating the average number of children seen daily. Based on the sampling interval every 5th child coming to the hospital of the outpatient pediatric department was included in the sample until the desired sample size was attained. The first child to be included in the sample was randomly chosen by blindly picking one of two pieces of paper one with Y/N for the first two patients daily. Data was collected using a pre-tested semi-structured questionnaire administered to mothers at the pediatric department. Physical examination of the children to assess for DD was also done by trained nurses working at the pediatric department. Data was analyzed using SPSS v20. Descriptive analysis using means, frequency and proportions were computed. Chi-square tests and odds ratio, CI 95% were computed to establish the association between the dependent variable; diaper dermatitis and independent variables; socio-demographic characteristics, breast feeding practices, diaper care practices and health seeking behaviour at P-value < 0.05. Multivariate logistic regression using adjusted odds ratio with corresponding 95% CI was estimated to examine independent association of factors with DD. Multiple logistic regression revealed the following factors as independently associated with diaper dermatitis: maternal level of education [AOR=3.77; 95%CI=1.36-10.46; P=0.011], type of diaper [AOR=5.46; 95%CI: 1.21-24.54; P=0.027], diaper cleansing practice [AOR=2.90; 95%CI: 1.56-5.40; P=0.001], presence of oral thrush [AOR=2.94; 95%CI: 1.53-5.67; P=0.001]. The study findings concluded that DD is a common problem for children and its prevalence and burden still remains high at 27.3%. In addition, the study findings showed that risk factors for DD are multi factorial and their significance varies. Low levels of maternal education, diaper cleansing agents such as cotton and water, cloth diapers and presence of oral thrush were identified as being predictive of DD. It was recommended that more attention needs to be given to awareness programs presented by health staff regarding protective genital care practices for mothers with lower education levels. A prevention- focused approach that encourages the use of disposable diapers and frequent diaper changes is important. Further, the study recommends that children presented with diaper dermatitis should be examined for coexisting oral thrush as this may result in the recurrence of diaper dermatitis.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Diaper dermatitis, diaper rash, napkin dermatitis or nappy rash is an inflammatory eruption involving the napkin area. It refers to any eruption that occurs in areas covered by the diapers caused by either direct effect of wearing diapers or indirectly as an exacerbation of a rare underlying condition (Kenneth *et al.*, 2007). Diaper dermatitis is a highly prevalent condition in infancy. Pediatricians and parents report diaper dermatitis to be one of the most common skin diseases that affect almost every child at some point during the early months and years of their life (Georgios *et al.*, 2014)

The prevalence of diaper dermatitis in a study conducted in the US among infants has been estimated to be 7% to 35%, with a peak in incidence between ages 9 and 12 months. Pediatricians treat approximately three-quarters of all children for diaper dermatitis and diaper dermatitis is considered the most common dermatologic disorder of infancy (Daniel *et al.*, 2000). The reported prevalence of diaper dermatitis varies greatly from various studies. For example, one large UK population study showed that 25% of children had experienced nappy rash during the first 4 weeks of life (CH LI, 2012). In the United States, it is the most common skin disease affecting the infants accounting for greater than 1 million hospital visits per year. Less than 10% of those affected suffer from severe diaper dermatitis (Rashmi *et al.*, 2014)

Diapered skin is exposed to friction and excessive hydration, it has a higher pH than non-diapered skin, and is repeatedly soiled with feces that contains enzymes with high irritation potential for the skin (Georgios *et al.*, 2014). A combination of these factors results in skin damage leading to lesions that can be painful to the child. Although not life

threatening, diaper dermatitis raises concerns for parents who result to seek medical advice on how best to manage it and ease their babies' discomfort.

Diaper dermatitis is a geographic diagnosis, encompassing a range of dermatoses of various risk factors (Daniel *et al.*, 2000). Although diaper technology has improved in recent years, resulting in a decrease in both incidence and severity of DD, this condition remains a common problem (Fernandes *et al.*, 2009). The following factors all compromise the barrier function of the stratum corneum, making the skin more susceptible to DD: ammonia levels, friction, levels of skin hydration (influenced by the type of diaper), pH level, proteolytic and lipolytic enzymes contained in the urine and feces, micro-organisms present, diet (which has an effect on the alkaline levels), and skin maturation (Fölster-Holstet *et al.*, 2011). In the United States (US), the prevalence of nappy rash has been associated with maturity of the infant, bottle formula feeding, intestinal carriage of *Candida albicans*, and the frequency and duration of contact between infant skin and excreta (Benjamin, 1987). A longitudinal study conducted in UK showed that current diaper dermatitis was associated with oral thrush, diarrhea, and frequency of diaper changes (Ferrazzini, 2003). In a Japanese study, mothers associated the following factors as having the greatest effect on provoking nappy rash in order of decreasing likelihood: delayed changing of nappies after evacuation, decreased frequency of bathing because of common cold, less frequent nappy changes, disposable nappies, many humid and damp days in the rainy season, common cold, insufficient rinsing of nappies, exacerbation of eczema, nappy cover made of synthetic fiber, changed detergents for nappy washing, cloth nappies and friction caused by new cloth nappies (Philipp *et al.*, 1997)

There is little published information on the prevalence and risk factors associated with diaper dermatitis in Kenya.

1.2 Statement of the problem

Mbagathi sub-county hospital mainly serves the urban poor population within and outside of Nairobi. Although not documented in literature, a majority of mothers attending at this facility use cloth diapers in the care of their infants as they are washable and cheaper than the disposable diapers. However, cloth diapers are not specialized to absorb urine and keep the baby's skin dry resulting in dermatological health implications such as diaper dermatitis. Diaper dermatitis typically lasts approximately 3 days (Neild & Karma, 2007) and is easily treated using home remedies such as use of creams. As such the actual incidence of this condition remains unknown. Severe diaper dermatitis requires hospital visits in order to decrease inflammation, repair the damage to the skin and prevent reoccurrence. According to Mbagathi hospital records, the number of DD cases remains high with a third of 700 hospital visits daily being pediatric visits presenting with DD. Though the condition is not serious from a medical stand point, it can cause substantial discomfort for the infant and anxiety to the parents.

Diaper usage has benefited from the widening availability of single unit packs which target low to mid income consumers who use nappies and diapers at night or when travelling. However, for mothers in this study area who are struggling with tight budgets and competing priorities, the use of disposable diapers is not consistent. The frequency of diaper changes is also low. One practical consequence of this approach has been the prolonged exposure of baby's skin to wet diapers resulting in an increase in diaper dermatitis.

The increase in use of both cloth and disposable diapers interchangeably as is the case in this population, demands that knowledge on prevention of diaper dermatitis and its associated factors be made available.

1.3 Justification

Mbagathi Sub county hospital serves a diverse population of mainly the urban poor, both within and outside Nairobi. On average, the hospital attends to about 700 patients daily a third of whom are pediatric patients presenting with dermatological conditions such as diaper dermatitis. Based on reports from the Kenya demographics profile on the expected increase in child birth rate, this number of pediatric hospital visits is expected to increase. DD is a mild dermatological condition that is treated at the outpatient clinic in Mbagathi district hospital. Despite the large number of patients presenting with DD at the facility, the causes of DD in the county have received very little research and attention. The number of hospital visits resulting from DD in the county continues to be high, yet these are easily preventable.

There is no current information on DD prevalence in the County. Additionally, there is no documented data on the actual situation and impact of DD on the quality of life of infants and its burden to parents in the county. This study was therefore necessary to determine the prevalence and risk factors contributing to diaper dermatitis among children aged 0-24 months attending at Mbagathi hospital. The findings of this study would be important to various stakeholders such as parents and health care staff in developing evidence based recommendations for the prevention of diaper dermatitis. Prevention strategies for minimizing DD will consequently reduce the stress and anxiety caused to parents and provide good quality life for the children.

1.4 Research Questions

- 1) What is the prevalence of diaper dermatitis among children aged 0-24 months at Mbagathi sub-county hospital?
- 2) What are the factors contributing to diaper dermatitis among children aged 0-24 months at Mbagathi sub-county hospital?
- 3) What are the diaper care practices of mothers with children aged 0-24 months attending at Mbagathi sub-county hospital?

1.5 Objectives

1.5.1 General Objective

To determine the factors associated with diaper dermatitis among children aged 0-24 months attending at Mbagathi District Hospital.

1.5.2 Specific Objectives

- 1) To determine the prevalence of diaper dermatitis among children aged 0-24 months at Mbagathi sub county hospital.
- 2) To determine the factors associated with diaper dermatitis among children aged 0-24 months
- 3) To assess diaper care practices of mothers for children aged 0-24 months

CHAPTER TWO

LITERATURE REVIEW

2.1 Pathophysiology of DD

Diaper dermatitis also known as nappy (diaper) rash refers to any eruption that occurs in areas covered by diapers caused by either direct effect of wearing diapers or indirectly as an exacerbation of a rare underlying condition (Kenneth *et al.*, 2007). DD is a generic term that encompasses a variety of types and severities of skin breakdown in the diaper area (Ai-Lean Chew, 2006). The anatomical area for nappy dermatitis encompasses the lower abdomen, lower lumbar region, gluteal area, genitalia and inner aspects of the thighs, the areas of the skin in closest contact with the nappy (Borkowksi, 2004).

The majority of diaper rash cases fall into the category of contact irritant dermatitis. Irritant diaper dermatitis is the end result of constant exposure to an adverse local environment particularly exposure to moisture (Kenneth *et al.*, 2007). Other irritants include urine, feces, and fecal enzymes. Skin contact with urine and feces plays an integral role as moisture trapped against the skin causes increased permeability and susceptibility to damage from friction (Berg, 1994). Urine contact with diapered skin causes an increase in skin pH thus increasing skin permeability and activating fecal enzymes further subjecting it to irritation with loss of its barrier function.

2.2 Epidemiology of diaper dermatitis

Diaper dermatitis is one of the most common skin disorders of infants and children. The reported incidence and age of onset vary worldwide, related to differences in diaper use, toilet training, hygiene, and child-rearing practices in different countries (Levy, 2001; Ward *et al.*, 2000; Scheinfeld, 2005). Diaper dermatitis is uncommon during the first few months of life as fecal enzymes are present in low levels during this period. More than 50% of the infants have one or more episodes of irritant diaper dermatitis during the diaper-wearing phase (Adalat *et al.*, 2007). Moreover, some studies have shown that at

any given time as many as 30% of infants' experience mild diaper dermatitis, with 6% experiencing moderate to severe cases (Akin *et al.*, 2001).

The prevalence of DD in infants has been estimated to be 7% to 35% among children (Daniel *et al.*, 2000). DD can develop as early as one week of age, but the peak incidence occurs between 9 and 12 months (Brookes *et al.*, 2001). In the United States, DD has been classified as the most common skin disorder in infancy (Nield *et al.*, 2006; Noonan *et al.*, 2006). It represents 10 to 20 percent of all skin disorders evaluated by the general pediatrician. According to the 2001 National Ambulatory Medical Care Survey, there were 8.2 million pediatric visits for diaper dermatitis and the calculated risk of developing diaper dermatitis throughout childhood was one in four (Ward *et al.*, 2000; Brookes *et al.*, 2001).

In a recent UK study that included the parents of 532 hospitalized children in diapers, 52% of families reported a history of diaper dermatitis (Adalat *et al.*, 2007). Similarly, in studies of hospitalized children, a prevalence of DD is reported between 14% and 42% (Noonan *et al.*, 2006). In a prospective study, 15.2% of healthy Italian infants wearing superabsorbent diapers experienced diaper dermatitis (Kazaks *et al.*, 2000). In a study by Akin *et al.*, (2001), almost one third of 1500 infants examined in a 5-year period were diagnosed with DD in varying degrees of severity.

In India, diaper rash is the most common dermatitis found in infancy. Prevalence has been variably reported from 4-35% in the first 2 years of life. Incidence triples in babies with diarrhea (Li *et al.*, 2012). It is not unusual for every child to have at least 1 episode of diaper rash by the time he or she is toilet-trained. Because fewer than 10% of all diaper rashes are reported by the family, the actual incidence of this condition is likely underestimated, if clinic visits are used as the screening (Merril, 2015). However, there is no scientific report of local prevalence in Kenya and incidence of diaper dermatitis.

2.3 Etiology of Diaper dermatitis

Several features of the diaper environment predispose the skin to damage. The skin is not made to resist the irritating action of urine and feces. When diapered skin is frequently exposed to friction, excessive hydration, feces containing enzymes and increased pH, it results in skin damage, leading to visible erythematous lesions that can be irritating and painful to the child. The first step is usually contact of the baby's skin with irritating substances which rub against the skin causing friction. Increasing warmth and humidity have the urine and stool incubated against the skin. This creates a suitable environment for the proteolytic enzymes that convert the urine into ammonia which causes skin irritation. The feces contain *Candida albicans* and other proteolytic enzymes that combine to break down the skin's resistance (Ward *et al.*, 2000).

2.4 Factors contributing to Diaper dermatitis

For years it has been believed that ammonium the product of bacterial breakdown of urea in the child's urine is the cause of diaper dermatitis. Recent studies have however shown that DD is initiated upon exposure to excessive moisture, friction, excessive hydration from long time contact of skin with urine and faeces, fungus infections, bacterial infections, the type of diaper used, skin damage from the orally taken drugs which pass unabsorbed through the intestines, feeding style and skin pH (Akin *et al.*, 2001; Concannon *et al.*, 2001; Herbst, 2003). These factors weaken the epidermal barrier, facilitate penetration of irritants and trigger the inflammatory and repair mechanisms that bring about the clinical presentation of DD (Oodio *et al.*, 2000).

Excessive moisture and wetness creates a warm and humid environment that makes infant skin more susceptible to breakdown and more permeable to irritants. Friction may also play a role, though this is likely a predisposing or exacerbating rather than dominant factor. An elevated pH results when bacterial ureases split urea in the urine to release ammonia, and this predisposes infant skin to dermatitis. Faecal enzymes including proteases and lipases have direct irritant action on the skin and their effects are increased by an alkaline environment. Microorganisms, particularly candida and dermatophytes can

worsen irritant diaper dermatitis (Prasad *et al.*, 2003; Wolf *et al.*, 2000). The use of oral antibiotics, gastrointestinal surgical procedures, and a change in usual urine or stool content or pattern are commonly identified as risk factors in children with DD (Noonan *et al.*, 2006; Nield & Kamat, 2006). In addition, there has been some discussion regarding the role of formula versus breast milk in the contribution to development of DD. It was noted that a higher pH in formula-fed babies causes more enzyme activity and permeability of the perineal skin (Rusk, 2006)

Frequent diarrhoea in children aged 0 - 18 months increases the development of diaper dermatitis (Akin *et al.*, 2001). Diarrhoeic condition leads to increase bowel movements and frequent exposure of the child's skin to faeces with large amount of proteolytic enzymes. 0 - 18 month old children's skin contact with the faeces increase accordingly and thereby faecal enzymes such as protease and lipase lead to destruction of skin's stratum corneum and therefore diaper dermatitis development risk easily occurs (Akin *et al.*, 2001)

The peak for incidence of diaper dermatitis is in the second half of the individual's first year through about 18 months of age. Increased mobility of the child accounts for the friction that contributes to diaper dermatitis (Atherton, 2004). It is also assumed that changes in diet through the second half of the child's first year may also modulate fecal pH, thus influencing the contribution of fecal skin exposure to the formation of dermatitis.

Mother's educational status and 0 - 18 months old children's age differences in the family affect the occurrence of the diaper dermatitis, that is, high educational level mothers and the first new born babe were found with low rate of diaper dermatitis development (Borkowksi, 2004).

2.5 Clinical presentation of diaper dermatitis

Clinical manifestations of diaper dermatitis can range from asymptomatic erythema to painful scaling papules and superficial erosions. DD manifests as an erythematous rash or

papules associated with edema and mild desquamation occurring on the convex surfaces of skin under the nappy (Prasad *et al.*, 2003). DD normally affects the regions of greater contact with the diaper and it is characteristically known as "dermatitis in W". Folds are normally spared and the most affected areas are convex surfaces of buttocks, thighs, lower portion of abdomen, pubic region, labia majora, and scrotum (Juliana *et al.*, 2009).

Initial clinical symptoms of diaper dermatitis may be skin dehydration. In the early period, erythema, slight maceration and oedema are observed. The lesion tends to spread in time, with aggravated erythema and maceration. In the severe phase, ulcerations and erosions develop in erythematic areas. Secondary infections may develop involving bacteria such as *Candida albicans* in the late period (Scheinfeld, 2005; O'nder *et al.*, 2007). In more severe cases, eruption may affect areas not covered by the diaper. If there is no treatment, or if it gets infected, it may progress to maceration and exudation, forming papules, vesicles or blisters, erosion or skin ulceration, infection of the penis, vulva or urinary tract (Cohen, 2000)

2.6 Prevention for diaper dermatitis

2.6.1 Frequency of diaper change

Urine diapers should be frequently changed so that the absorption capacity is not exceeded, avoiding contact of the urine with the skin. Diapers with faeces should be immediately changed. In new-born's, the change should be every hour, whereas in older children it can have a 3-4-hour interval (Wolf *et al.*, 2000)

2.6.2 Diaper absorption capability

Currently most commonly sold diapers contain superabsorbent acrylic gel material, effective to maintain the diaper area dry and in an acid media. Some modern diapers include substances capable of sequestering the liquid in up to 80 times its molecular weight, such as sodium polyacrylate, which is transformed into gel (Eichenfield &

Hardaway, 1999); Rocha *et al.*, 2004; Orange , 2000). Despite these specifications, disposal diapers have an occlusive effect that is greater than cloth diapers. (Virgili *et al.*, 1998). Recently, single unit pack diapers have been introduced to allow mothers with little income to use disposable diapers which are much cheaper.

2.7.3 Daily hygiene and preparations

Hygiene of the diaper region skin should be made with lukewarm water and cotton balls, without soaps, which is enough for daily hygiene of urine. Thus, there is no need to use soap every time the child urinates, which happens many times during the day, because it may lead to contact dermatitis with the soap. To clean faeces, mild soaps are recommended. The use of baby wipes may be useful only when the baby is not at home. Bear in mind that they have soap in their content and continuous contact with the skin may damage the skin barrier and cause contact dermatitis. Ideally, the region should be rinsed after wipes use (Scheinfeld, 2005; Adam, 2008).

2.7.4 Type of diaper use (disposal versus cloth diapers)

Superabsorbent disposable diapers are the ones that have the greatest capacity to maintain the diaper area always dry (Orange, 2000). Previous studies have compared superabsorbent disposal diapers with regular cloth diapers and have demonstrated that the former produced significant less erythema (Orange, 1991) and less dermatitis. There have been no allergic reactions to absorbent diaper material ever described (Orange, 2000; Runeman, 2008). Despite the advanced techniques in manufacturing disposal diapers, there are some authors that prefer cloth diapers because they cause less occlusion (Wong *et al.*, 1992). To reduce local temperature, diapers should be smaller and more anatomical (Orange, 1991).

Currently there are two types of diapering systems: reusable cloth diapers and single use (disposable) diapers. Cloth diapers provide containment through multiple layers of cotton fabric, usually aided by the use of plastic or cloth over pants. Nearly all disposable paper

diapers now contain an absorbent gelling material within the cellular core. Disposable diapers have the advantage of having an ability to absorb and retain moisture thus keeping the baby's skin dry. These do not require washing and are more effective than the cloth diapers. Recent technologies have led to the development of super absorbent diapers which have been shown to reduce the incidence of diaper dermatitis (Prasad, 2004)

Superabsorbent disposable diapers are the most significant developments in diaper technology, where sodium polyacrylate polymers are used as the main absorbent component in the diaper core (Odio *et al.*, 2000). These diapers are thinner and more absorbent due to the use of a highly absorbent substance known as Sodium Polyacrylate (SAP). The SAP absorbs, and retains under a slight mechanical pressure, about 30 times their weight in urine (Graham *et al.*, 1998).

When saturated with a liquid, the SAP prevents movement of the liquid by forming a gel. The swollen gel holds the liquid in a solid, rubbery state and prevents the liquid from leaking onto the baby's skin and clothing (Buchholz *et al.*, 1994). A more recent, significant development has been the introduction of disposable diapers with an inner liner designed to deliver a petrolatum-based formulation to the child's skin continuously moist during use (Odio *et al.*, 2000)

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study area

The study was carried out at Mbagathi Sub-county hospital in Nairobi. The hospital is located in Kenyatta Golf Course location, Dagoretti sub-county of Nairobi County. The hospital is situated along Mbagathi Road. The Armed Forces Memorial Hospital is also located within close proximity to the hospital. The hospital also neighbors KEMRI and the sprawling Kibera slums. The facility is the only established sub-county hospital within Nairobi county with a large catchment area of about 1 million people because of its accessibility and affordable healthcare. The hospital serves diverse population, both within and outside Nairobi, with a bulk of mostly the urban poor.

Mbagathi sub-county hospital offers a full range of comprehensive health services. Currently, the facility offers a range of services (both in-patient and out-patient) such as pediatrics, theatres, and imaging services, Maternal and Child Health (MCH), HIV care and other medical services. On average about 700 patients are attended to daily at the busy outpatient department.

3.2 Study design

This was a cross sectional study that included children aged 0-24 months and their mothers attending at pediatrics and Maternal and child health (MCH) departments at Mbagathi Sub-County Hospital.

3.3 Dependent variables

Diaper Dermatitis

3.4 Independent variables

1. Demographic characteristics - age, sex, education level, home setting,

2. Socio-economic characteristics
3. Breastfeeding practices
4. Diaper care practices
5. Health Seeking behavior

3.5 Study population

Mother-child pairs attending at the pediatrics and MCH departments in Mbagathi Sub-County Hospital

3.5.1 Inclusion criteria

1. Children aged between 0-24 months.
2. Children presented with their mothers/legal guardians only.
3. Mothers/legal guardians who gave consent

3.5.2 Exclusion criteria

1. Mothers/legal guardians who refused to give consent
2. Children presented by house helps.
3. Children aged above 24 months.

3.6 Sample Size Determination

The sample size was determined using the formula Fisher Exact formula

$$n = \frac{z^2 pq}{d^2}$$

Where;

n= sample size

z= confidence interval at 95% (standard value of 1.96)

p= Prevalence will be taken as 50% since the proportion of diaper dermatitis is not known.

q= 1-p

d= degree of accuracy which is 0.05 at 95% confidence interval

$$n = \frac{(1.96)^2 \times 0.50 \times 0.50}{(0.05)^2}$$

n=384 participants

3.7 Sampling Procedure

Linear systematic sampling was used to select study participants in the pediatric department of the hospital. The sampling frame was estimated from the hospital by calculating the average number of children seen monthly. On average, Mbagathi sub-county hospital attended to 700 patients in the outpatient department a third of who were patients attending the pediatrics department. A minimum of 2000 patients are attended to in the pediatrics department every month. From this sampling frame, 384 participants were randomly selected to participate in the study. A sampling interval ($K=N/n$) of $(2000/384=5)$ was used. The first mother-child pair to be included in the sample was chosen

randomly by blindly picking one of two pieces of paper one with “Yes” and another one “No” for the first two clients seen daily. The one that picked the “Yes” paper then became the first participant of the day based on the sampling interval. After that, every 5th mother-child pair coming to the hospital of the outpatient paediatric department was included in the sample until the desired sample size was attained. Recruitment of the study participants took place at the waiting room of the hospital within the pediatric out-patient department. After mothers agreed to participate, having duly filled and signed the consent form, they were interviewed by a trained research assistant by use of a questionnaire. The interviews took place in a private room of the hospital and lasted approximately 1 hour. On average 20 participants were interviewed daily for one month.

3.8 Data Collection Tools and Data Collection

The study employed a semi structured questionnaire (appendix III) for data collection.

3.8.1 Semi structured questionnaire

A pre-tested semi-structured questionnaire was used to collect the data at the waiting area of the pediatric department of the hospital. The questionnaire was translated into kiswahili. A pre-test of the questionnaire was done with a sample of 20 participants to determine the validity and reliability of the tool. Pre-testing also helped the researcher to modify the questionnaire to ensure the data collected answered the research questions and met the study objective. The questionnaire was administered by trained nurses working at the pediatric department. Training for the nurses was conducted by the researcher to provide them with knowledge on the purpose of the study, research questions, research ethics, quality standards and interviewing skills. The questionnaire was administered to a total of 384 select participants recruited for the study. Parental consent was obtained prior to starting the interviews and examination of the child. Data collected from the instrument included; socio-demographic and economic characteristics, diaper care practices, breastfeeding practices and health seeking behaviour.

3.8.2 Observation Checklist

In clinical practice diagnosis of diaper dermatitis is made based on the physical examination by inspecting the skin of the diaper region (buttocks, thighs and genitals) (Juliana *et al.*, 2009). A full general examination was conducted on selected children by a trained nurse working at the pediatric department. This involved the nurses observing characteristics of diaper dermatitis, using the physical assessment checklist in the questionnaire (see appendix IV). The presence or absence of oral thrush was also noted. Diaper dermatitis refers to inflammation of the skin with redness, well defined edges (rash) and beefy red appearance seen only in the diaper area where the skin folds which is the one differential characteristic of DD to other skin conditions. Skin conditions appearing in the diaper region and presenting with a rash similar to DD will often spread to other areas of the infant's body such as face and arms. To differentiate DD from other skin conditions, the nurses observed the type of rash and also checked if the rash was present in the diaper region only or was present in other body parts as well. In this study diaper dermatitis was defined as beefy red appearance (redness) and rash (inflammatory eruption of the skin) in the diaper region.

3.9 Data Management and Analysis

Every questionnaire was checked by the researcher at the end of the day during the data collection so as to ensure completeness of data. All questionnaires were stored in locked cabinets all throughout the study and accessed only by authorized persons so as to ensure confidentiality and to avoid data loss. After data collection, double entry of the same data was done for accuracy purposes. Coding and verification of the data was also done for easy manipulation, analysis and presentation.

The data was analyzed using SPSS version 20. Descriptive statistics to obtain frequencies, means, and proportions were computed. Pearson's chi-square test and odds ratio (OR) with corresponding 95% confidence intervals (CI) were computed to find the association between independent variables and the dependant variable (diaper dermatitis).

Multivariate logistic regression analysis (with a backward elimination model) was then used to examine the independent association of the factors with diaper dermatitis, while simultaneously controlling for potential confounders. A *P*-value < 0.05 was considered to be statistically significant.

3.10 Ethical Considerations

This protocol was approved by the Kenyatta National Hospital/University of Nairobi (KNH/UON) Ethics and Research Committee (ERC) (Appendix VI)

The purpose of the study was made clear to mothers of children aged 0-24 months who would be required to give informed consent prior to their voluntary participation in the study. As a study participant one could choose to participate or not to, in this study without any consequences against them (See Appendix I).

Emphasis on the issue of privacy and confidentiality were made clear at the time of consenting to participate in the study. Participants' confidentiality with regard to individual identifiable information collected during this study was available only to the study personnel and not made available to the public. Identifying information was not entered into the electronic datasets and no participants' names were entered into analysis databases. Research documents and data collected was maintained in databases that were password protected and only authorized study personnel had access. The original questionnaires were kept in safe custody for reference purposes and would be disposed three years after publishing the study findings.

CHAPTER FOUR

RESULTS

4.1. Socio-Demographic Characteristics of Mothers

A total of 384 mothers with a mean age of 26.7 (± 4.5), years participated in the study. The respondents were grouped into four age categories of 22-26 years (46.1%), 27 to 31 years (31.3%), 17 to 21 years (9.4%) and 32 years and above (13.3%). 96.6% of the mothers were Christians while the remaining (3.4%) were Muslims. 82.3% of the mothers were married and 81.8% were staying with their partners/spouses.

With respect to level of education, (47.1%) had secondary level of education and (32.0%) primary level of education. 44.9% of their spouses had secondary level of education and 21.2% had primary level of education. 57.0% and 61.5% of the mothers indicated that they involve with most of the decisions in the household related to regular expenditures and purchasing assets respectively.

Table 4.1: Socio-demographic characteristics of mothers

Socio-demographic characteristics	Frequency n=384	Percentage%
Mean age (\pm SD) of mother/guardian =26.7(\pm 4.5)		
Age in years		
17-21	36	9.4
22-26	177	46.1
27-31	120	31.3
32 and above	51	13.3
Religion		
Christian	371	96.6
Muslim	13	3.4
Marital status		
Single	63	16.4
Married	316	82.3
Widowed/separated	5	1.3
Whether spouse/partner is living in the same household		
Yes	314	81.8
No	70	18.2
Level of education		
Non formal education	4	1.0
Primary	123	32.0
Secondary	181	47.1
Tertiary	76	19.8
Level of education of spouse		
Non formal education	68	17.7
Primary	67	21.2
Secondary	142	44.9
Tertiary	107	27.9
Whether head of household		
Yes	26	6.8
No	358	93.2
Total number of other people living in the household		
Two	9	2.3
Three	147	38.3
Four	109	28.4
Five	81	21.1
6 and above	38	9.9

4.1.1 Number of children living in the household

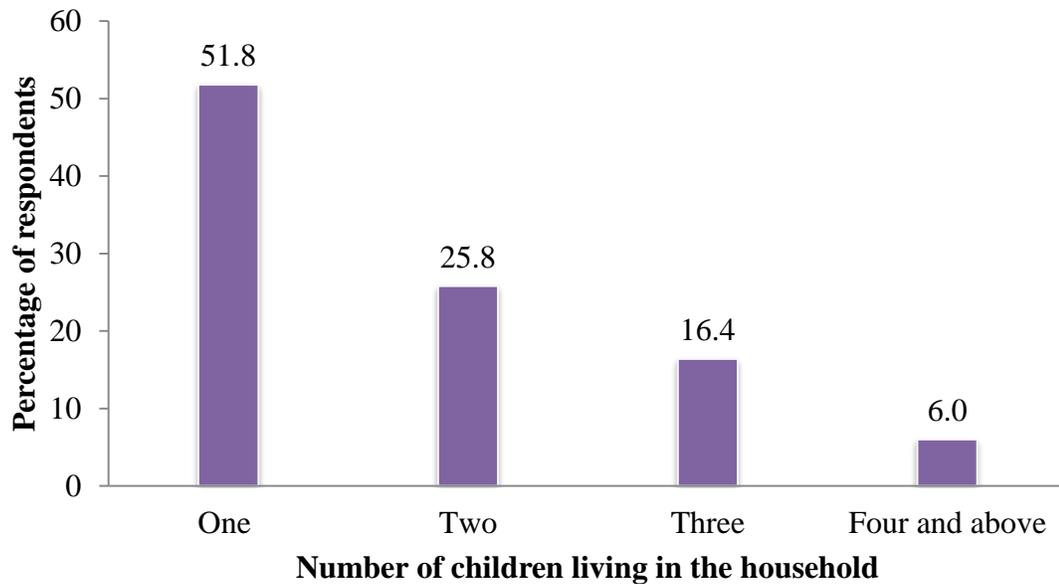


Figure 4.1: Number of children living in the household

4.2 Selected socio-demographic characteristics of the children

The distribution of socio-demographic characteristics of children who participated in this study is shown in Table 4.2. The findings show that the highest percentage (46.1%) were less than 7 months followed by 7-12 months (26.8%).

Table 4.2: Selected socio-demographic characteristics among children

Variables	Frequency n=384	Percentage %
Age of child in months		
< 7 months	177	46.1
7-12 months	103	26.8
13-18 months	68	17.7
19-24 months	36	9.4

4.3 Socio-economic characteristics of mothers

Table 4.3 presents the socio-economic characteristics of the mothers. 53.1% of mothers were not engaged in any activity that earns money compared to those who earned income (46.9%). In regard to the mothers' spouse/partners occupation, 45.6% were salaried employees and 27.9% were self-employed while 9.1% were casual workers. 54.9% of mothers did not contribute any household income. The main income earners in the households were spouses/partners 81.5%. In response to the question on total monthly household income, 28.8% had \$51-\$100 and 21.4% had \$101 - \$200. 95.6% of the respondents were staying in a rental house.

Table 4.3: Socio-economic characteristics of mothers

Variables	Frequency n=384	Percentage %
Mother engaging in any activity that earns income		
Yes	180	46.9
No	204	53.1
Employment status of spouse/partner		
Salaried employee	175	55.4
Self-employed	107	33.9
Casual wage	34	10.7
Total household income contributed in household		
None	211	54.9
Less than half	77	20.1
Around half	61	15.9
More than half	15	3.9
All	20	5.2
Main income earner in household		
Self	23	6.0
Spouse	313	81.5
Others	48	12.5
The total household income for all members in the household per month		
<\$50	30	7.8
\$51-100	109	28.4
\$101 - 200	82	21.4
\$201 - 300	63	16.4
>300	100	26.04
Ownership of the house of residence		
Owned	17	4.4
Rented	367	95.6

4.4 Obstetric history of mothers

The distribution of the obstetric factors for mothers and medical condition of the children ascertained by the trained nurses are summarized in Table 4.4. 99,7% of the mothers attended ANC during their pregnancy and with 79.2% attending ANC for at least 4 times which is recommended. With respect to initiation of breastfeeding after delivery, 87.2% of the children started within 6 hours after delivery while 8.3% initiated between 7-24 hours and 3.1% initiated after 25-72 hours and 1.3% within 7 days. 97.7% of mothers breastfed their children for more than 6 months. 88.9% of mothers who breastfed their children for less than 6 months has insufficient milk while 11.1% has breast infection. 40.4% of mothers introduced solid foods to their children at 6 months while 37% introduced solid foods to their children at more than 9 months.

Table 4.4: Obstetric history of the mother and medical history of the infant

Variables	Frequency n=384	Percentage %
Mother's ANC attendance during pregnancy		
Yes	383	99.7
No	1	0.3
Frequency of ANC		
less than 4	79	20.6
4 times and above	304	79.2
Initiation of breast feeding		
Within 6hrs	335	87.2
7-24hrs	32	8.3
25-72hrs	12	3.1
< 7 days	5	1.3
Duration of breastfeeding		
Less than 6 months	9	2.3
More than 6 months	375	97.7
Reasons for breastfeeding for less than 6 months		
Insufficient milk	8	88.9
Weaning	0	0
Breast Infection	1	11.1
Pregnancy	0	0
Baby's illness	0	0
Age of introducing solid foods		
Less than 6 months	30	7.8
6 months	155	40.4
7-9 months	57	14.8
More than 9 months	142	37

4.5 Medical history of the infant

The distribution of the medical history of the children as ascertained by the trained nurses and reported by the mothers are summarized in Table 4.5. 31.0% of the mothers reported their children to have experienced an episode of diarrhea in the last 2 weeks with 44.5% reporting their children to have experienced diarrhea twice in the last 2 weeks. 46.1% of the children had ever used antibiotics. 97.9% of the mothers reported that their children did not experience any drug hypersensitivity. Nurses ascertained that 79.7% of the children did not have oral thrush while the remaining 20.3% presented with oral thrush at the time of the study. 97.9% of mothers reported that their children had not suffered any chronic disease. Nurses ascertained that 19% of the children had presented with concomitant skin conditions at the time of the study.

Table 4.5: Medical history of the infant

Variables	Frequency n=384	Percentage %
Diarrhea in the last 2 weeks		
Yes	119	31
No	265	69
Frequency of diarrheal episodes per day in the last 2 weeks		
Once	27	22.7
Twice	53	44.5
Thrice	27	22.7
4 times and above	12	10.1
Ever used antibiotics		
Yes	177	46.1
No	207	53.9
History of drug hypersensitivity		
Yes	8	2.1
No	376	97.9
Presence of oral thrush		
Yes	78	20.3
No	306	79.7
Child suffered chronic disease		
Yes	8	2.1
No	376	97.9
Concomitant skin conditions in child		
Yes	73	19.0
No	311	81.0
Family history of skin conditions		
Yes	5	1.3
No	379	98.7

4.6 Knowledge of the mothers on diaper dermatitis

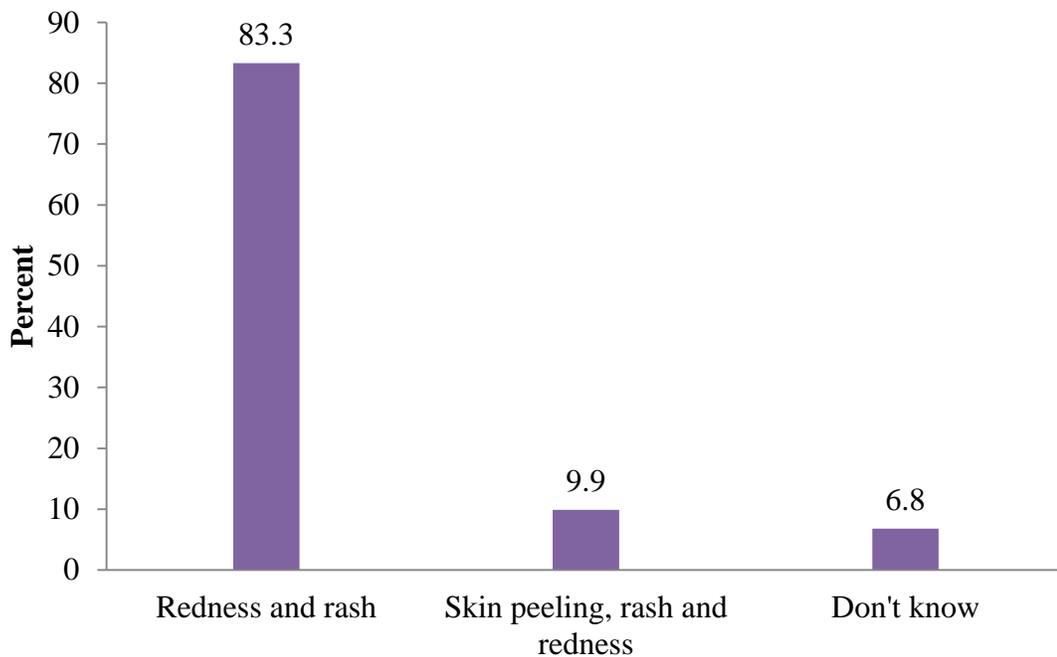
83.1% of the mothers thought that using creams in the diaper area may affect the child's skin causing rash. Even though, 64.1% of the mothers felt that it is necessary to visit a pediatrician when the child has rash, 35.9% felt otherwise. 77.1% of the mothers reported that they use home remedies to treat rash for their child. It was indicated that the main causes of diaper rash were overstayng with soiled diaper (38.5%), overstayng with wet diapers (23.3%) and failure to change wet diapers (31.2%). The highest percentage (23.7%) indicated that they would apply Vaseline if they noticed diaper rash. However, 48.7% did not know what to apply if the child would develop rash.

Table 4.6: Knowledge of the mothers on diaper dermatitis

Variables	Frequency n=384	Percentage %
Do you think creams may affect your child's skin causing rash?		
Yes	319	83.1
No	65	16.9
Do you feel it is necessary to visit a pediatrician when your child has rash?		
Yes	246	64.1
No	138	35.9
Do you use home remedies to treat rash for your child?		
Yes	88	22.9
No	296	77.1
Causes diaper rash		
Overstaying with soiled diaper	132	38.5
Overstaying with diapers	80	23.3
Failure to change wet diapers	107	31.2
Not cleaning the baby well	13	3.4
Not keeping baby dry	7	1.8
Tightening of diaper	13	3.4
Type and quality of diaper used	17	4.4
Type of baby's skin	8	2.1
Urine	9	2.3
Washing nappy with Jik	17	4.4
Failure to apply jelly	20	5.2
Too much heat	9	2.3
Don't know	24	7.0
What remedies would you take if you noticed your child has a rash?		
Vaseline	91	23.7
Powder	10	2.6
Jelly	10	2.6
Glycerin	5	1.3
Expose the child	26	6.8
Apply salty water	14	3.6
Take the child to hospital	36	9.4
Change diaper frequently	5	1.3
Don't know	187	48.7

4.6.1 Knowledge on signs of diaper rash among the mothers

83.3% of the mothers mentioned that redness and rash was the main sign of diaper dermatitis while only 6.8% said that they did not know the signs of diaper rash (Figure 4.2).



Knowledge on signs of diaper rash

Figure 4.2: Knowledge on signs of diaper rash among the mothers

4.7 Protective genital care practices

Table 4.7 summarizes the distribution of diaper care practices. 58.9% of the mothers used both cloth and disposable diapers. 37.2% used disposable diapers only and only 3.9% used cloth diapers. 67.5% used disposable diaper most of the time compared to cloth diaper (34.3%). The highest percentage (40.4%) and (28.1%) of the mothers used to change the diaper four times and three times per day respectively. 99.2% used skin cleaning agents

before diapering and 49.1% were using water as skin cleaning agent. Similarly, 98.4% of the mothers were using barrier creams when diapering.

52.9% of the mothers were cleaning the diaper region by wiping with water and cotton wool while 47.1% used wet large napkin. 86.2% of the mothers were ventilating the diaper region. 90.9% of mothers did not observe diaper tightening condition in their children. 98.2% of the mothers were using products like creams to keep the baby dry after bathing

Table 4.7: Protective diaper care practices among mothers

Variables	n=384	%
Type of diaper use		
Disposable diapers	143	37.2
Cloth diapers	15	3.9
Both	226	58.9
Most Common type of diaper used		
Disposable diapers	252	65.7
Cloth diapers	132	34.3
Frequency of changing diaper in a day		
Once	37	9.6
Twice	37	9.6
Thrice	108	28.1
Four times	155	40.4
More than 5 times	47	12.2
Using skin cleaning agents before diapering		
Yes	381	99.2
No	3	0.8
Using barrier creams when diapering		
Yes	378	98.4
No	6	1.6
Diaper region cleaning style		
Wiping with water and cloth with water	203	52.9
Wet large napkin	181	47.1
Whether ventilating the diaper region		
Yes	331	86.2
No	53	13.8
Diaper tightening condition		
Yes	35	9.1
No	349	90.9
Frequency of bathing the child		
Once a day	259	67.4
Twice a day	69	18
2-3 times a week	56	14.6
Using products like creams to keep the baby dry after bathing		
Yes	377	98.2
No	7	1.8

4.8 Prevalence of diaper dermatitis among children aged 0-24 months

Figure 4.3 shows the distribution of diaper dermatitis among the children aged 0 to 24 months. The prevalence of diaper dermatitis was 27.3%.

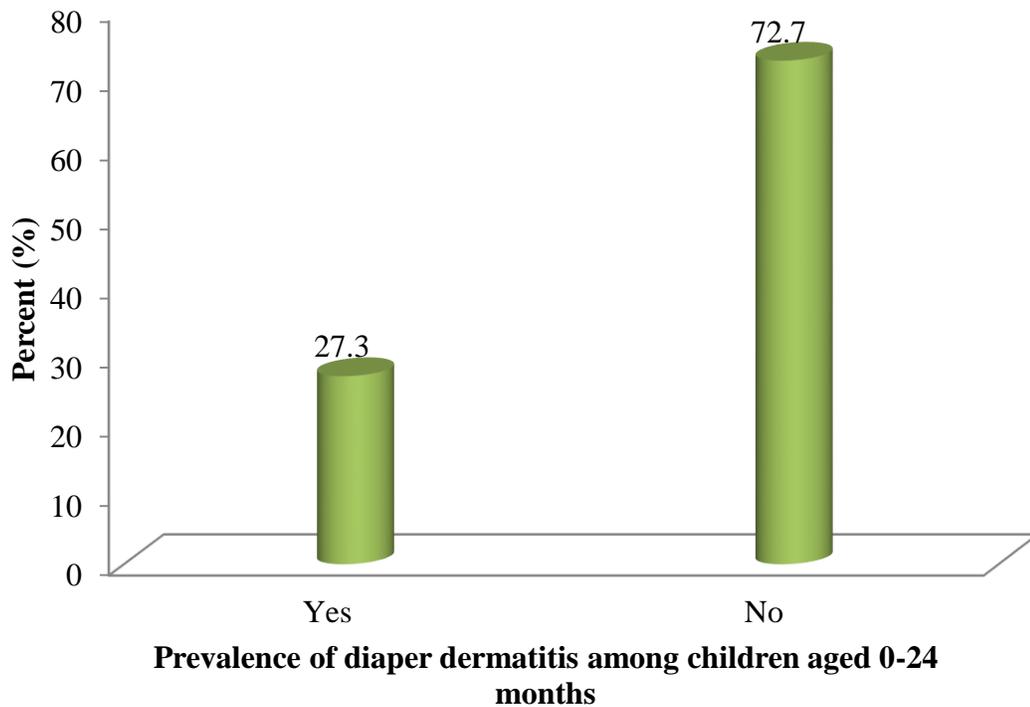


Figure 4.3: Prevalence of diaper dermatitis among children aged 0-24 months

4.8 Association between socio-demographic characteristics of mothers and diaper dermatitis among children aged 0-24 months

The relationship between socio-demographic characteristics of the mothers-child pairs and diaper dermatitis among children is presented in Table 4.8. Children aged 7 to 12 months were significantly more likely to develop diaper dermatitis (41.7%) [OR=3.01; 95%CI=1.75-5.18; P=0.000] compared to those children aged less than 6 months and below (19.2%). There was a statistically significant association between the

mother's/father's level of education and occurrence of diaper dermatitis. Mothers with primary level of education had significantly increased proportion of babies with diaper dermatitis (40.7%) [OR=4.52; 95%CI=2.12-9.63; P=0.000] compared to those with tertiary education (13.2%). Similarly, diaper dermatitis was associated with fathers who had primary level of education (50.7%) [OR=6.84; 95%CI=3.27-14.32; P=0.000] and secondary school (30.3%) [OR=2.89; 95%CI=1.48-5.62; P=0.002] than those who had tertiary level of education (13.1%).

However, there was no significant association between the child having diaper dermatitis and the other socio-demographic characteristics i.e gender of the child (26.6%) [OR=0.92; 95%CI=0.59-1.45; P=0.731, maternal marital status (20.6%) [OR=0.64; 95%CI=0.34-1.21; P=0.168, and religion (27.8%) [OR=2.11; 95%CI=0.46-9.7; P=0.325].

Table 4.8: Association between socio-demographic characteristics of mothers and diaper dermatitis

Socio-demographic characteristics	Diaper dermatitis		OR	(95%CI)		χ^2 test * P value
	Yes, n (%)	No, n (%)		Lower	Upper	
Age of child in months						
< 7 months	34(19.2%)	143(80.8%)	1			
7-12 months	43(41.7%)	60(58.3%)	3.01	1.75	5.18	0.000
13-18 months	19(27.9%)	49(72.1%)	1.63	0.85	3.12	0.139
19-24 months	9(25.0%)	27(75.0%)	1.4	0.6	3.25	0.432
Gender of the child						
Male	51(26.6%)	141(73.4%)	0.92	0.59	1.45	0.731
Female	54(28.1%)	138(71.9%)	1			
Mother's age in years						
17-21	7(19.4%)	29(80.6%)	0.71	0.25	1.99	0.510
22-26	53(29.9%)	124(70.1%)	1.25	0.62	2.53	0.537
27-31	32(26.7%)	88(73.3%)	1.06	0.5	2.25	0.873
32 and above	13(25.5%)	38(74.5%)	1			
Mother's religion						
Christian	103(27.8%)	268(72.2%)	2.11	0.46	9.7	0.325
Muslim	2(15.4%)	11(84.6%)	1			
Mother's marital status						
Single/widowed/separated	14(20.6%)	54(79.4%)	0.64	0.34	1.21	0.168
Married	91(28.8%)	225(71.2%)	1			
Mother's level of education						
Primary	50(40.7%)	73(59.3%)	4.52	2.12	9.63	0.000
Secondary	41(22.7%)	140(77.3%)	1.93	0.91	4.1	0.085
Tertiary	10(13.2%)	66(86.8%)	1			
Father's level of education						
Primary	34(50.7%)	33(49.3%)	6.84	3.27	14.32	0.000
Secondary	43(30.3%)	99(69.7%)	2.89	1.48	5.62	0.002
Tertiary	14(13.1%)	93(86.9%)	1			
Whether the mother is the head of household						
Yes	7(26.9%)	19(73.1%)	0.98	0.4	2.4	0.960
No	98(27.4%)	260(72.6%)	1			
None	19(28.8%)	47(71.2%)	1			
Number of children living in the household						
One	52(26.1%)	147(73.9%)	0.66	0.27	1.66	0.379
Two	23(23.2%)	76(76.8%)	0.57	0.21	1.51	0.255
Three	22(34.9%)	41(65.1%)	1.01	0.37	2.74	0.991
Four and above	8(34.8%)	15(65.2%)	1			

Abbreviations: OR= Odds Ratio, CI= Confidence Interval, *Significant P Value Bolded

4.9 Relationship between socio-economic characteristics of mothers and diaper dermatitis in children

Table 4.9 shows the bivariate analysis of relationship between socio-economic characteristics of mothers and diaper dermatitis. Mothers who were not engaged in any activity that earns income had significantly more children with diaper dermatitis (31.9%) [OR=1.64; 95%CI: 1.04-2.59; P=0.035] than to those who earned income (22.2%). Occurrence of diaper dermatitis was significantly higher among children whose fathers were casual workers (57.1%) [OR=4.81; 95%CI: 2.25-10.28; P=0.000] compared to those whose fathers were salaried (21.7%).

Households whose income was less than \$50 per month (50.0%) [OR=9.00; 95%CI: 3.42-23.72; P=0.000], \$51-\$100 (39.4%) [OR=5.86; 95%CI: 2.75-12.51; P=0.000], \$101-\$200 (26.8%) [OR=3.30; 95%CI: 1.46-7.46; P=0.004] and \$201-\$300 (23.8%) [OR=2.81; 95%CI: 1.17-6.74; P=0.020] were significantly more likely to have a child with diaper dermatitis than households with income of above \$300 (10.0%) respectively.

Table 4.9: Relationship between socio-economic characteristics of mothers and diaper dermatitis

Variable	Diaper dermatitis		OR	(95%CI)		χ^2 test * P value
	Yes, n (%)	No, n (%)		Lower	Upper	
Engaging in any activity that earns income						
Yes	40(22.2%)	140(77.8%)	1.00			
No	65(31.9%)	139(68.1%)	1.64	1.04	2.59	0.035
Employment status of spouse/partner						
Salaried employee	38(21.7%)	137(78.3%)	1.00			
Self-employed	33(30.8%)	74(69.2%)	1.61	0.93	2.77	0.088
Casual wage	20(57.1%)	15(42.9%)	4.81	2.25	10.28	0.000
The main income earner in the household						
Self (mother)	7(30.4%)	16(69.6%)	2.19	0.70	6.84	0.179
Spouse/partner	89(29.0%)	218(71.0%)	2.04	0.96	4.35	0.065
Others (parents/relatives and equal partners)	9(16.7%)	45(83.3%)	1.00			
The total household income for all members in the household per month						
< \$50	15(50.0%)	15(50.0%)	9.00	3.42	23.72	0.000
\$50-\$100	43(39.4%)	66(60.6%)	5.86	2.75	12.51	0.000
\$101-\$200	22(26.8%)	60(73.2%)	3.30	1.46	7.46	0.004
\$201-\$300	15(23.8%)	48(76.2%)	2.81	1.17	6.74	0.020
> \$300	10(10.0%)	90(90.0%)	1.00			
Ownership of the house residing in						
Self-owned	5(29.4%)	12(70.6%)	1.11	0.38	3.24	0.845
Rental	100(27.2%)	267(72.8%)	1.00			

Abbreviations: OR= Odds Ratio, CI= Confidence Interval, Significant P Value Bolded

4.10 Relationship of protective diaper care practices of mothers with diaper dermatitis

Analysis of the relationship between diaper care practices of mothers and diaper dermatitis in children is summarized in Table 4.10. There was significantly increased occurrence of diaper dermatitis among children using both cloth and disposable diaper (31.9%) [OR=2.72; 95%CI: 1.58-4.67; P=0.000] and using cloth diapers only (80.0%) [OR=23.24; 95%CI: 6.04-89.39; P=0.000] compared to those using disposable diapers only (14.7%). Similarly, mothers who used cloth diaper on their children for most of the time were 2 times more likely to have their children contracting diaper dermatitis (40.2%) [OR=2.58; 95%CI: 1.62-4.10; P=0.000] than those who used disposable diaper most of the time (20.6%).

There was also significantly more diaper dermatitis among children whose mothers changed their diaper once a day (40.5%) [OR=2.88; 95%CI: 1.08-7.66; P=0.034] compared to those whose mothers changed their diapers more than four times (19.1%). Children whose mothers used water and cotton to clean the diaper area had significantly more proportion of diaper dermatitis (38.4%) [OR=3.56; 95% CI: 2.17-5.85; P=0.000] than those whose mothers were using wet large napkin (14.9%).

Table 4.10: Relationship of protective diaper care practices among mothers of children with diaper dermatitis

Variable	Diaper dermatitis		OR	(95%CI)		χ^2 test * P value
	Yes, n (%)	No, n (%)		Lower	Upper	
Type of diaper use						
Both	72(31.9%)	154(68.8%)	2.72	1.58	4.67	0.000
Cloth diapers	12(80.0%)	3(20.0%)	23.24	6.04	89.39	0.000
Disposable diapers	21(14.7%)	122(85.3%)	1.00			
Type of diaper used the most						
Disposable diapers	53(40.2%)	79(59.8%)	2.58	1.62	4.10	0.000
Cloth diapers	52(20.6%)	200(79.4%)	1.00			
Frequency of changing diaper in a day						
Once	15(40.5%)	22(59.5%)	2.88	1.08	7.66	0.034
Twice	13(35.1%)	24(64.9%)	2.29	0.85	6.17	0.102
Thrice	36(33.3%)	72(66.7%)	2.11	0.92	4.84	0.077
Four times	32(20.6%)	123(79.4%)	1.10	0.48	2.50	0.823
More than 5 times	9(19.1%)	38(80.9%)	1.00			
Using barrier creams when diapering						
Yes	102(27.0%)	276(73.0%)	0.37	0.07	1.86	0.210
No	3(50.0%)	3(50.0%)	1.00			
Diaper region cleaning style						
Wiping with water and cotton	78(38.4%)	125(61.6%)	3.56	2.17	5.85	0.000
Wet large napkin	27(14.9%)	154(85.1%)	1.00			
Whether mothers were ventilating the diaper region						
Yes	88(26.6%)	243(73.4%)	0.77	0.41	1.43	0.405
No	17(32.1%)	36(67.9%)	1.00			
Whether mothers were using diaper tightening condition						
Yes	13(37.1%)	22(62.9%)	1.65	0.80	3.41	0.172
No	92(26.4%)	257(73.6%)				
Using products like creams to keep the baby dry after bathing						
Yes	103(27.3%)	274(72.7%)	0.94	0.18	4.92	0.941
No	2(28.6%)	5(71.4%)	1.00			
Frequency of bathing						
Twice a day	16(23.2%)	53(76.8%)	0.83	0.37	1.86	0.643
Once a day	74(28.6%)	185(71.4%)	1.09	0.57	2.09	0.788
2-3 times a week	15(26.8%)	41(73.2%)	1.00			

Abbreviations: OR= Odds Ratio, CI= Confidence Interval, *Significant P Value Bolded

4.11 Association between obstetric history of the mother and diaper dermatitis

Table 4.11 shows the association between medical/obstetric history of children and diaper dermatitis. There was increased proportion of diaper dermatitis among children who initiated breastfeeding after 24 hours (41.2%) than those who initiated within 6 hours (26.0%) of birth. However, this difference was not statistically significant [OR=2.00; 95%CI: 0.74-5.40; P=0.174]. Children who were breastfed for less than 6 months had significantly higher proportions of diaper dermatitis (18.5%) [OR=0.43; 95%CI: 0.27-0.70; P=0.001] compared to those who breastfed for more than 6 months.

Table 4.11: Association between obstetric history of the mother and diaper dermatitis

Variable	Diaper dermatitis		OR	(95%CI)		χ^2 test * P value
	Yes, n (%)	No, n (%)		Lower	Upper	
Initiation of breast feeding						
Within 6hrs	88(26.0)	248(74.0)	1.00			
7-24hrs	11(34.4%)	21(65.6%)	1.49	0.69	3.22	0.307
> 24 hrs.	7(41.2%)	10(58.8%)	2.00	0.74	5.40	0.174
Duration of breastfeeding						
Less than 6 months	31(18.5%)	137(81.5%)	0.43	0.27	0.70	0.001
More than 6 months	74(34.3%)	142(65.7%)	1			
Age of introducing solid foods						
Less than 6 months	9(30.0%)	21(70%)	2.43	0.97	6.09	0.058
6 months	53(34.2%)	102(65.8%)	5.07	0.45	57.08	0.189
7-9 months	21(36.8%)	36(63.2%)	5.79	0.52	64.62	0.153
More than 9 months	22(15.5%)	120(84.5%)	1			

Abbreviations: OR= Odds Ratio, CI= Confidence Interval, Significant P Value Bolded

4.12 Association between medical history of the child and diaper dermatitis

Children who experienced diarrhea in the last 2 weeks had significantly higher proportion of diaper dermatitis (38.7%) [OR=2.20; 95%CI: 1.38-3.52; P=0.001] compared to those who did not (22.3%). A higher prevalence of diaper dermatitis was observed among children who had ever taken antibiotics (37.9%) [OR=2.71; 95%CI: 1.70-4.31; P=0.000] than to those who had never used antibiotics (18.4%). There was significantly increased proportion of diaper dermatitis among children who had oral thrush (52.6%) [OR=4.19; 95%CI: 2.48-7.07; P=0.000] compared to those who indicated otherwise (20.9%).

Table 4.12: Association between medical history of the child and diaper dermatitis

Variable	Diaper dermatitis		OR	(95%CI)		χ^2 test * P value
	Yes, n (%)	No, n (%)		Lower	Upper	
Diarrhea in the last 2 weeks						
Yes	46(38.7%)	73(61.3%)	2.20	1.38	3.52	0.001
No	59(22.3%)	206(77.7%)	1.00			
Ever used antibiotics						
Yes	67(37.9%)	110(62.1%)	2.71	1.70	4.31	0.000
No	38(18.4%)	169(81.6%)	1.00			
History of drug hypersensitivity						
Yes	4(50.0%)	4(50.0%)	2.72	0.67	11.09	0.146
No	101(26.9%)	275(73.1%)	1.00			
Presence of oral thrush						
Yes	41(52.6%)	37(47.4%)	4.19	2.48	7.07	0.000
No	64(20.9%)	242(79.1%)	1.00			

Abbreviations: OR= Odds Ratio, CI= Confidence Interval, Significant P Value Bolded

4.13 Factors associated with diaper dermatitis among children aged 0-24 months

Multiple regression analysis was performed in order to identify factors independently associated with diaper dermatitis. Thirteen (13) factors that associated with diaper dermatitis at $P < 0.05$ during bivariate analysis were subjected all together in a multiple regression analysis. Upon fitting these factors using binary logistic regression and by specifying '*backward LR*' method with removal at $P < 0.05$, five (5) factors remained in the final analysis or reduced model (Table 4.13).

Children whose mothers attained primary school level of education were 3.6 times more likely to develop diaper dermatitis [**AOR=3.65; 95%CI: 1.52-8.77; P=0.004**] compared to those children whose mothers had attained tertiary education. Mothers who were not engaged in any activity that earns income had about 2 fold more likely to have children with diaper dermatitis [**AOR=1.95; 95%CI: 1.06-3.58; P=0.032**] than to those who engaged any activity that earns income. Children using cloth diapers had 6 times chance of developing diaper dermatitis [**AOR=6.15; 95%CI: 1.42-26.71; P=0.015**] compared to those using disposable diapers. Children who used water and cotton to clean the diaper area were about 2.7 times more likely to have diaper dermatitis [**AOR=2.70; 95%CI: 1.44-5.05; P=0.002**] than those who were using wet large napkin. Similarly, children with oral thrush had 3.2 times more likely to acquire diaper dermatitis [**AOR=3.25; 95%CI: 1.68 6.28; P=0.000**] compared to those without.

Table 4.13: Factors associated with diaper dermatitis among children aged 0-24 months

Reduced model				
Mother's level of education				
Primary	3.65	1.52	8.77	0.004
Secondary	2.03	0.66	5.13	0.141
Tertiary	1			
Engaging in any activity that earns income				
Yes	1			
No	1.95	1.06	3.58	0.032
Type of diaper use				
Cloth diapers	6.15	1.42	26.71	0.015
Disposable diapers	1			
Both	1.08	0.55	2.12	0.824
Diaper region cleaning style				
Wiping with water and cotton/cleaning with water	2.7	1.44	5.05	0.002
Wet large napkin	1			
Presence of oral thrush				
Yes	3.25	1.68	6.28	0.000
No	1			

Abbreviations: AOR= Adjusted Odds Ratio, CI= Confidence Interval

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

Diaper dermatitis is a common condition among infants that can occur anytime during infancy. The prevalence of nappy rash has been found to vary worldwide, ranging from 16% in UK, 15% in Italy, 43.8% in China, 75% in US and 87% in Japan (Adalat *et al.*, 2007). There has been an increase in the prevalence of skin problems in developing countries with lack of published data on the prevalence of these skin problems among infants. The findings of this study showed that the prevalence of diaper dermatitis among children aged 0-24 months was 27.3%. The differences in prevalence in this study compared to the other studies may be attributed to the difference in sample sizes of participants in the different studies and their varying age groups. There is also no clear distinction made between common or generic diaper dermatitis and secondary diaper dermatitis in the different studies.

5.1.1 Socio-demographic/economic characteristics of mother/child pairs

Age of the infants was positively associated with DD. There was a higher proportion of children with DD aged 7-12 months [(41.7%), $P=0.000$] than 0-6 months (19.2%) at the time of the study. A slight decrease (27.9%) was also observed among children aged 13-18 months. This finding is similar to previous studies which have indicated a peak prevalence of DD at 9-12 months of age (Adalat, 2007). Philip *et al.*, reported a peak prevalence in the first four weeks after birth while another study indicated the highest prevalence in those between 3 and 12 months of age (Longhi *et al.*, 1992). The reason for the high prevalence of DD between ages 7-12 months has been associated with the shift from breast milk to bottle feeding and introduction of solid foods. This change in diet leads to increased fecal enzymes and may modulate the fecal pH contributing to DD. At this age, increased mobility of the child is also likely to cause friction that would also contribute to DD. This finding was however, not statistically significant at multivariate

analysis.

There was a statistically significant association between maternal level of education and DD ($P=0.011$). Children (40.7%) whose mothers attained primary school were 3.7 times more likely to develop diaper dermatitis compared to those children (13.2%) whose mothers attained tertiary education. Findings in this study were similar to a UK study which reported that the prevalence of DD decreased with increased maternal level of education (Phillip *et al.*, (1997). In an index study conducted in Mauritius, children of parents who had no formal school education had the highest prevalence of diaper dermatitis (Semra *et al.*, 2015). A Nigerian study conducted by Oyedeji *et al.*, (2006) found a correlation between education level of mothers and prevalence of DD with a statistically significant difference between the two variables with a very weak positive relationship between education level of parents and occurrence of DD. This could be attributed to the fact that educated mothers know the protective genital care practices and provide good genital care to their infants. In this study, mothers with a higher level of education could easily identify preventive genital care measures to avoid DD as opposed to mothers with no formal education. However, a study in Turkey by Parlak *et al.* (1995) found no statistical association between maternal education and DD. This variation may be attributed to the family medicine health law in Turkey that requires routine check-ups and follow up of infants up to 60 months.

There was a statistically significant association between engaging in an activity that earns income [$P=0.032$] and DD. The prevalence of DD increased with a decrease in income of mothers. This finding is similar to previous studies where the majority of skin problems were observed in families with low income. These studies reported 43% skin problem among low income earners as compared to 22.5% among high income earners (Oyedeji *et al.*, 2006). It was also reported that low socioeconomic status for example unemployment and low income are risk factors that have a negative impact on children's health (Ete-Rasch, 2009). In Iraq, a high prevalence of diaper rash was reported in regions of low socioeconomic status (Khalifa *et al.*, 2010). One major explanation for the

association between income, occupation and child health is that families with a high income are able to purchase disposable diapers and use them exclusively in the diaper care practice. While mothers with low income may afford the single unit pack diapers, they infrequently change the baby leading to prolonged exposure to urine and feces. Mothers with low income have also been seen to use cloth diapers which are not efficient in keeping the baby's skin dry.

5.1.2 Breastfeeding Practices

The study found a positive association between breastfeeding and DD. Children [(18.5%), $P=0.001$] who were breast fed for less than 6 months were 0.43 times more likely to get DD compared to those who breastfed for more than 6 months. This finding was similar to previous studies which found that breastfed children have a lower prevalence of DD (Neild 2007). In a study in Turkey by Parlak *et al.* (1995), moderate to severe DD prevalence was found to be lower in infants who were breastfed. This could be attributed to the fact that breast-fed children have lower fecal pH and contain fewer urease producing bacteria. This finding was not statistically significant at multivariate analysis. This finding was however not statistically significant at multivariate analysis.

5.1.3 Diaper Care Practices

This study showed a statistically significant association in the type of diaper used (cloth, disposable or both cloth and disposable) and DD following multivariate analysis. Children using cloth diapers [(80%), $P=0.000$] had 23 times likelihood of developing diaper dermatitis compared to those using disposable diapers. This finding is similar to a previous study which showed that superabsorbent diapers were associated with reduced diaper dermatitis compared with cloth diapers (Odio *et al.*, (2000). Disposable superabsorbent diapers are superior to cloth diapers in keeping the baby's skin drier and preventing DD. In a study conducted by Camilla *et al.* (2004) disposable superabsorbent diapers were shown to reduce the incidence of DD by 38% to 50% and to reduce the survival of *Candida* species by almost two thirds. Despite this, a review by Baer *et al.* 2006 failed to find

definitive evidence to support or refute the use and type of disposable diapers for prevention of DD.

There was a statistically significant association between the type of diaper used and DD. Children [(38.4%), P=0.000] who used water and cotton wool to clean the diaper area were 3 times more likely to have diaper dermatitis than those who were using wet large napkin. This finding is similar to a clinical trial in England that reported diaper dermatitis to be higher in the group that used water (P=0.025) compared to those using baby wipes (Priestley *et al.*, 1996). This could be due to the fact that in babies, water is rapidly absorbed into the skin which could potentially disrupt the barrier function. Tap water is more alkaline than that of a baby's skin (Nikolovski *et al.*, 2008). The use of water and cloth is therefore likely to compromise the skin integrity predisposing the child to developing diaper dermatitis.

This study found a positive association between the frequency of diaper changing and DD however there was no significant association at multivariate analysis. Children [(40.5%), P=0.034] who were changed once a day were 3 times more likely to have diaper dermatitis compared to those who were changed more than 5 times (19.1%). The commonly known traditional advice for preventing DD is changing diapers frequently and cleansing the skin (Adalat *et al.*, 2007). Adalat *et al.*, (2007) found a correlation between recurrent dermatitis and infrequent diaper change. Similarly, another study conducted by Borkowski (2004), showed that the prevalence of DD was significantly decreased with nappy changes of > 6 times/day compared with less frequent nappy changing. This supported the opinion that diapers should be changed every 2-3 hours (Atherton, 2004). The finding in this study could be attributed to infrequent diaper changes resulting in an increase in hydration and sensitivity of the baby's skin to friction due to prolonged exposure to feces and urine.

5.1.4 Health Condition of the Child

There was a positive association between diarrhea and DD. The prevalence of DD was higher in children [(38.7%0, P=0.001] who had had diarrhea in the last 2 weeks compared

to those who did not have diarrhea. This finding is similar to previous studies that showed increased bowel movement frequency was a significantly associated factor with current diaper rash (Adalat *et al.*, 2007). This can be attributed to an increase in the fecal lipase and protease activity which consequently causes friction resulting in diaper dermatitis. Unlike in previous studies, diarrhea was not found to be a significant factor on multivariate analysis in this study.

Use of antibiotics showed a positive association to DD. Children [(37.9%, P=0.000)] who had used antibiotics were 3 times more likely to have DD compared to children who had not used antibiotics. A study by Nield & Kamat, (2006) found that the use of oral antibiotics to be a risk factor in children with DD. Adalat *et al.*, (2007) found no significant association between the use of antibiotics and DD. This finding was not statistically significant at multivariate analysis.

Another important predicting factor for DD in this study was the presence of oral thrush. There was a significant association between oral thrush and DD (P= 0.001). The study results showed that 20% of children who had DD also had oral thrush at the time of the study. This finding was similar to a study conducted by Adalat *et al.* (2007) which concluded that children with oral thrush were more likely to acquire DD compared to those without. Children with diaper dermatitis need to be examined for any co-existing oral thrush as this may result to the recurrence of DD. This is because oral thrush is a yeast infection caused by the fungi *Candida albicans* which ultimately causes diaper dermatitis.

5.2 Conclusions

- The prevalence of diaper dermatitis among children aged 0-24 months was 27.3%.
- Risk factors for DD are multi factorial and their significance varies: Low levels of maternal education, diaper cleansing agents such as cotton and water, cloth diapers and presence of oral thrush were identified as being predictive of DD.
- Diaper care practices continue to vary greatly based on one's income, level of education and knowledge of diaper care practices. Disposable diapers are superior in keeping the child's skin dry and preventing DD. Use of cloth and disposable diapers interchangeably is a common diaper care practice however, frequent diaper changes is necessary. Changing diapers frequently >4 times daily is recommended to keep the child's skin dry.
- Skin cleansing practices that protect the diaper area are important. Some cleaning agents are likely to compromise the skin integrity predisposing the child to developing diaper dermatitis.

5.3 Recommendations

Based on the findings the following recommendations are made:

- **Awareness Programs:** Maternal education was positively correlated with diaper dermatitis. Awareness programs to help mothers with lower educational level to educate them on diaper care trends, and good protective genital care practices.
- **Facilitate informed choice:** Encourage the use of disposable diapers as these are superior to cloth diapers when it comes to keeping the child's skin dry. For mothers using cloth diapers, encourage frequent diaper changes (>4 times a day).
- **Infection Control:** Examine children with diaper dermatitis for any co-existing oral thrush as this may result to the recurrence of DD. Oral thrush is a yeast infection caused by the fungus *Candida albicans* which ultimately causes diaper dermatitis.

REFERENCES

- Adalat S., Wall D. & Goodyear H. (2007). Diaper dermatitis – frequency and contributory factors in hospital attending children. *Pediatric Dermatology* 24(5): 483-488.
- Adam R. (2008). Skin care of the diaper area. *Pediatric Dermatology* 25: 427-33.
- Akin F., Spraker M., Landin W., Aly R., Leyden J. & Raynor W. (2001). Effects of breathable disposable diapers: Reduced prevalence of *Candida* and common diaper dermatitis. *Pediatric Dermatology* 18: 282-290.
- Artherton, D. (2004). A review of the pathophysiology prevention and treatment of irritant diaper dermatitis. *Current Medical Research and Opinion* 20(5): 645–649.
- Baer E., Davies M. & Easterbrook K. (2006). Disposable nappies for preventing napkin dermatitis in infants. *Cochrane Database of Systematic Reviews* (3).
- Baldwin S., M. R., Odio S., Haines L., R. J., O'Connor J., Englehart S. & Lane A. T. (2001). Skin benefits from continuous topical administration of a zinc oxide/petrolatum formulation by a novel disposable diaper. *Journal of the European Academy of Dermatology and Venereology* 15: 5-11.
- Benjamin L. (1987). Clinical correlates with diaper dermatitis. *Pediatrician* 14: 21-26.
- Berg R.W. & Milligan C. (1994). Association of skin wetness and pH with diaper dermatitis. *American Journal of Contact Dermatitis* 1: 18-20.
- Biranjia-Hurdoyal SD and Pandamikum L. (2015). A Study to Investigate the Prevalence of Nappy Rash among Babies Aged 0 to 36 Months Old in a Tropical Country. *Austin J Dermatology*; 2(2): 1040
- Borkowski S. (2004). Diaper rash care and management. *Pediatric Nursing* 30: 467-470.
- Brookes B.D. (2001). Skin flora of infants with napkin rash. *British Journal Dermatology* 86(5): 458-462.

- Buchholz, F. (1994). *Superabsorbent Polymers, Science and Technology* (p. 573). Washington DC: American Chemical Society.
- Camila, K., Janniger, Richie L. & Tinkle L. (2004). Skin care of the healthy newborn. *New Jersey Journal Dermatology* 75(1): 25-30.
- Chew, A. & Maibach I.H. (2006). *Irritant Dermatitis*. (pp. 37-50). Germany: Springer Science & Business Media.
- Cohen B. (2016). *Dermatologia neonatal* (pp. 28-29). São Paulo: Editora Manole.
- Concannon P., Gisoldi E., Phillips S. & Grossman R. (2001). Diaper dermatitis: A therapeutic dilemma. Results of a double-blind placebo controlled trial of miconazole nitrate 0.25%. *Pediatric Dermatology* 18: 149-155.
- Daniel B.W., Alan B.F., Steven R.F. & Daniel P.K. (2000). Characterization of Diaper Dermatitis in the United States. *Archives of Pediatrics & Adolescent Medicine* 154(9): 943-946.
- Davis J. A., Leyden J. J., Grove G. L. & Raynor W. J. (1989). Comparison of disposable diapers with fluff absorbent and fluff plus absorbent polymers: effects on skin hydration, skin pH, and diaper dermatitis. *Pediatric Dermatology* 6(2): 102-108.
- Dore & A. J. (2004). Topical Vitamin A, or its derivatives, for the treatment of napkin dermatitis in infants. *Cochrane Database of Systematic Reviews* 4(12): 1-3.
- Eichenfield L.F. & Hardaway C.A. (1999). Neonatal dermatology. *Current Opinion Pediatrics* 11: 471-474.
- Fernandes J.D., De Oliveirall Z.N.P. & Machadoll M.C.R. (2009). Clinical presentation and treatment of diaper dermatitis – Part II. *Anais Brasileiros De Dermatologia* 84(1): 47-54.
- Ferrazzini G. (2003). Microbial aspects of diaper dermatitis. *Dermatology* 136-141.

- Fölster-Holst R. & Buchner M. (2011). Diaper dermatitis. *Hautarzt* 62(9): 699-708.
- Friedlander S., Eichenfield L., Leyden J., Shu J. & Spellman M. (2009). Diaper dermatitis: appropriate evaluation and optimal management strategies. *Medisys Health Communications* 116-117.
- Georgios N., Stamatias G. & Neena K. (2014). Diaper Dermatitis: Etiology, Manifestations, Prevention, and Management. *Pediatric Dermatology* 31(1): 1-7.
- Graham A., & Buchholz F. (1998). *Modern Superabsorbent Polymer Technology*. New York: Wiley-VCH.
- Herbst R. (2003). Perineal streptococcal dermatitis/disease: recognition and management. *American Journal of Clinical Dermatology* 4: 555-560.
- Juliana D.F., Maria C.R. & Zilda N.P. (2009). Clinical presentation and treatment of diaper dermatitis 84(1): 47-54
- Kamat K. & Malkani R. (2003). Disposable diapers: A hygienic Alternative. *Indian Journal of Pediatrics*. 70: 879-881
- Kazaks E.L & Lane A.T. (2000). Diaper dermatitis. *Pediatrics Clinical North American*. 47: 909-919.
- Kazzi A. Antoine, (2006). Pediatrics, Diaper Rash. *eMedicine dermatology*.
- Kenneth A., Arndt, Jeffrey T. & Hsu S. (2007). *Manual of Dermatologic Therapeutics*. Lippincott Williams & Wilkins.
- Kirstin K. & J. H. (2009). Safety evaluation of superabsorbent baby diapers 53(2): 81–89.
- Levy M. (2001). Diaper rash syndrome or dermatitis. 67: 37.

- Li C.H., Zhu Z.H. & Dai Y.H. (2012). Diaper Dermatitis: A Survey of Risk Factors for Children Aged 1 – 24 Months in China. *The Journal of International Medical Research* 40: 1752-1760.
- Longhi F, Carlucci G, Bellucci R, di Girolamo R, Palumbo G, Amerio P. (1992) Diaper dermatitis: a study of contributing factors. *Contact Dermatitis*. 26: 248-252.
- Maya K., Pai S. & Anjalin D. (2015). Effectiveness of awareness programme on prevention and management of diaper dermatitis among mothers of children of age 0 to 1 year. *Journal of Health Science* 5(3): 2249-7110.
- Merril L., (2015). *Nurses Womens Health*. Aug-Sept; 19(4): 324-336; quiz 337. doi:10.1111/1751-486X.12218
- Neild L. & Kamat D. (2007). Prevention, diagnosis and management of diaper dermatitis. *Clinical Pediatrics (Phila)* 46: 480-486.
- Nield L. & Kamat D. (2006). Diaper dermatitis: From “a” to “pee”. *Consultant for Pediatricians* 5: 373-380.
- O'nder M. & Ersoy E. (2007). *Diaper dermatitis* (pp. 129–135.). Istanbul: ,ocuk Sag̃ lıg̃ ı ve Hastalıkları Dergisi.
- Odio M. & Friedlander S. (2000). Diaper dermatitis and advances in diaper technology. *Current Opinion in Pediatrics* 12(4): 342–346,
- Orange A. (1991). Comparison of cloth and superabsorbent paper diapers for preventing diaper dermatitis. *European Journal of Pediatric Dermatology* 1: 225-32.
- Orange A. (2016). *Management of napkin dermatitis*. In: Harper J, Orange A, Prose N, eds. (p. 153). Oxford: Blackwell Sciences: Textbook of Pediatric Dermatology.
- Parlak M., Energin M., Selimoğlu M., Bitlisli H. & Alp H. (1995). Evaluation of 54 infants with diaper dermatitis. [In Turkish]. *T Klinik Dermatology* 5: 66–71.

- Philipp. R., Hughes A. & Golding J. (1997). Getting to the bottom of nappy rash. ALSPAC Survey Team. Avon Longitudinal Study of Pregnancy and Childhood. *The British Journal of General Practice* 47(421): 493-497.
- Pigatto P. & Alberto M. (2010). Contact dermatitis in children. *Italian Journal of Pediatrics* 13: 36.
- Pract B. (1997). Getting to the bottom of nappy rash. ALSPAC Survey Team. Avon Longitudinal Study of Pregnancy and Childhood. *The British Journal of General Practice* 47: 493-497.
- Prasad H. Srivastava P.& Verma K.K. (2003). Diaper dermatitis – An overview. *Indian Journal of Pediatrics* 70: 635-7.
- Prasad H., Srivastava P.& Verma K.K. (2004). Diapers and skin care: Merits and Demerits. *Indian Journal of Pediatrics* 71(10): 907-908.
- Rai P., Lee B., Liu T., Yuhui, Krause Q. & Marsman E. (2009). Safety evaluation of disposable baby diapers using principles of quantitative risk assessment. *Journal of Toxicology and Environmental Health, Part A* 72: 1262–1271.
- Rashmi S. & Arun C. (2014). *Advances in Pediatric Dermatology*. JP Medical Ltd.
- Rocha N., Horta M. & Selores M. (2004). Terapêutica tópica em der matologia pediátrica. *Nascer E Crescer* 13: 215-225.
- Runeman B. (2008). Skin interaction with absorbent hygiene products. *Journal of Clinical Dermatology* 26: 45-51.
- Rusk J. (2006). Appropriate diagnosis of neonatal skin disorders. *Infectious Diseases in Children* 19: 59.
- Scheinfeld N. (2005). Diaper dermatitis: a review and brief survey of eruptions of the diaper area. *American Journal of Clinical Dermatology* 6: 273-281.

- Semra K., Ilknur K. & Sezgi S. (2015). Diaper Dermatitis in Infants Admitted to Social Pediatrics Health Center: Role of Socio-demographic Factors and Infant Care, *The Indian Journal of Pediatrics* 82: 904-908
- Shin H. (2005). Diaper dermatitis that does not quit. *Dermatologic Therapy* 18(2): 124-135
- Smith W.J. & Jacob S.E. (2003). The role of allergic contact dermatitis in diaper dermatitis. *Journal of Pediatric Dermatology* 26: 369-370.
- Stamatas G. (2011). Documentation of impaired epidermal barrier in mild and moderate diaper dermatitis in vivo using noninvasive methods. *Journal of Pediatric Dermatology* 28(2): 99–107.
- Virgili A. (1998). Diaper dermatitis in an adult. A case of erythema papuloerosive of Sevestre and Jacquet. *Journal of Reproductive Medicine* 43: 949-51.
- Ward Daniel B., Fleischer, Alan B., Jr., Feldman, Steven R., Krowchuk & Daniel P. (2000). Characterization of diaper dermatitis in the United States. *Archives of Pediatric Adolescent Medicine* 154(9): 943–946.
- Weston William L., Alfred T. L. & Janet A. (1980). Diaper dermatitis: current concepts. *Pediatrics* 66: 532–536.
- Wolf R., Wolf D., Tuzun B. & Tuzun Y. (2000). Diaper dermatitis. *Journal of Clinics in Dermatology* 18: 657-660.

APPENDICES

Appendix I: Informed Consent Form (English Version)

STUDY TITLE: Factors associated with diaper dermatitis among children aged 0-24 months admitted in Mbagathi Sub-County Hospital, Nairobi county, Kenya

PART 1: Institutions and Investigators:

Researcher	Institution	Contact
Miss Ann W Ng'ang'a	Kenya Medical Research Institute	+254-718580678
Dr. Charles FL Mbakaya	Kenya Medical Research Institute	+254- 722846964
Prof. Zipporah Ng'ang'a	Jomo Kenyatta University of Agriculture and Technology	+254-722794883

1) Introduction

I am a 2nd year student from the Institute of Tropical Medicine and Infectious Diseases (ITROMID) at Kenya Medical Research Institute (KEMRI) in collaboration with Jomo Kenyatta University of Agriculture and Technology (JKUAT). I am determining the prevalence of diaper rash and the associated risk factors. Diaper rash is a common condition that causes discomfort for children and stress for parents and pediatricians. Recent studies have shown that many cases of diaper rash are often reported in the

first 4 weeks of a child's life. These studies provide reasons for concern about the factors associated with diaper rash and preventive approaches that are best preferred. You are being asked to participate in this survey because you are eligible to join the study. If you decide to join the study, you will be asked a series of questions regarding your socio-demographic information, health seeking behavior, knowledge on diaper use and diaper rash. The interview will last approximately 20 minutes only.

Before you decide if you wish to be in this study, you need to know about any good or bad things that could happen if you decide to join. This form tells you about the study. You can ask any questions you have at any time.

2) Being in the study is your choice

This consent form gives you information about the study, the risks and benefits, and the process that will be explained to you. Once you understand the study, and if you agree to take part, you will be asked to sign your name or make your mark on this form. You will be given a copy to take home.

Before you learn about the study, it is important that you know the following:

- Your participation in this study is entirely voluntary
- You may decide to withdraw from the study at any time, without facing any consequences

3) Purpose of the project

The purpose of this study is to measure the frequency of diaper dermatitis in children aged 0-24 months and to identify the factors associated with the condition. This will provide information that is relevant to create awareness for parents on the preventive measures that they need to take to protect their children against diaper rash.

4) Voluntary participation

As a study participant you can choose to participate or not to, in this study without any consequences to you. If you choose not to participate in this study or to leave the study during the interview process, you may do so freely without consequences against you.

5) Description of the process and procedures

The study participants will engage in face to face interviews with research assistants. Each face to face interview will be completed in approximately 20-30 minutes and the questionnaires cross checked for completion in about 5minutes. The study will employ structured questionnaires as the main tool for data collection, to capture data that will enable the establishment of factors associated with diaper dermatitis and the prevalence of the same. After the interview, there will be a physical examination of the child by a medical personnel, to establish if the child has any diaper rash at the time of the study.

6) Risks

I do not anticipate any risks or discomforts to you during this study. You will be requested to avail yourself for an interview at a time and place that you are most comfortable. Every effort will be made to protect your privacy and confidentiality while you are participating in the study. The interviews will take place in private.

7) Benefits

The study does not offer any benefits directly to the study participants. However, the results of this study will be instrumental in creating awareness to parents on the health risks associated with use of disposable diapers and enable them to make diapering choices that best suits their needs basing on the information they have.

8) Incentives

The study will offer no incentives to the study participants.

9) Confidentiality

Participants' confidentiality with regard to individual identifiable information collected during this study will be available only to the study personnel and not made

available to the public. Identifying information will not be entered into the electronic datasets and no participant's names will be entered into analysis databases. You will only be identified by a code and personal information from the interview will not be released without your written permission. Every effort will be made to keep the information you provide confidential. The information in the questionnaire cannot be identified as belonging to you neither will you be personally identified in any publication about this study. Your records may be reviewed by Ethics Committee at KEMRI.

10) Sharing the results

The results of this study may be presented during scientific and academic forums and may be published in scientific journals and academic papers.

11) Whom to contact

This has been reviewed and approved by the Kenya Medical Research Institute (KEMRI) scientific steering committee whose task is to provide scientific review of the proposal, and ethical approval granted by KNH/UoN-ERC whose task is to make sure study participants are protected from harm. You will be given a copy of this form to take with you. If you have any questions about this study and/or if there is anything not clear to you, please contact Miss Ann Wanjiku, 0718-580678, or e-mail to: annzinnette@gmail.com

If you have questions about this consent process or your rights as a subject, or if you feel that by participating in this study you have been harmed in any way, or you would like to know more about Kenyatta National Hospital/University of Nairobi (KNH/UON) Ethics and Research Committee, you may contact:

The Secretary, KNH/UON-ERC

P.O. Box 20723 Kenyatta National Hospital

Tel: 2726300-9, Extension 44102

E-mail: uonknh_erc@uonbi.ac.ke

12) Your statement of consent and signature:

If you have read the informed consent, or have had it read and explained to you, and you understand the information and voluntarily agree to join this study, please carefully read the statements below and think about your choice before signing your name:

- I have been given the chance to ask any questions I may have and I am content with the answers to all my questions.
- I know that any information I give will be kept confidential and that I may leave this study at any time.
- If I leave or refuse to be in the study, I understand that there will be no repercussions.
- The name, phone number and address of whom to contact in case of an emergency has been told to me and has also been given to me in writing.
- I agree to take part in this study as a volunteer, and will be given a copy of this informed consent form to keep.

Participant's name-----

Participant's signature and date-----

Interviewer's name-----

Interviewers' signature and date-----

Witness's name-----

Witness's signature and date-----

Appendix II: Informed Consent Form (Swahili Version)

MADA YA MRADI: FACTORS ASSOCIATED WITH DIAPER DERMATITIS AMONG CHILDREN AGED 0-24 MONTHS ADMITTED IN MBAGATHI SUB-COUNTY HOSPITAL, NAIROBI COUNTY, KENYA

HABARI RIDHAA YA WASHIRIKI KWA UTAFITI WA KIWANGO CHA UTUMIZI WA NAPI ZA ZIADA NA UHUSIANO WA HATARI ZA AFYA

PART 1: Institutions and Investigators:

Researcher	Institution	Contact
Miss Ann W Ng'ang'a	Kenya Medical Research Institute	+254-718580678

1)

2) Habari

Mimi ni mwanafunzi wa mwaka wa pili katika taasisi ya dawa za kitropiki na magonjwa yanayo ambukizanwa (KEMRI) tukishirikiana na Jomo Kenyatta University of Agriculture and Technology (JKUAT). Natafiti kiwango cha maambukizi ya upele wanapi za ziada na kuthibitisha hatari za afya zinazohusiana na upele wa sehemu zilizofunikwa na napi. Upele wa napi ni hali ya kawaida ambayo husababisha usumbufu kwa watoto na wasiwasi kwa wazazi na wahuduma wa afya ya watoto. Somo za hivi karibuni zimeonyesha kwamba matukio mengi ya upele husemekana katika wiki 4 za kwanza katika maisha ya mtoto. Somo hizi zinatupa sababu ya kuwa na wasiwasi kuhusu mambo yanayohusiana na hali hii ya upele wa napi na mbinu zilizo bora zaidi za kuzuia hali hii. Unaulizwa kushiriki katika utafiti huu kwa sababu umepita kigezo cha ushirikishwaji. Iwapo utakubali kushiriki, utaulizwa baadhi ya maswali kuhusu tabia yako ya kutafuta matibabu, ujuzi wako wa

napi za ziada, na magonjwa yanayosababishwa na utumizi wa napi hizi ambayo mtoto wako anaweza kuwa ameugua. Maswali yatachukua muda wa dakika ishirini tu.

Kabla ya kuamua kushiriki katika utafiti huu, unapaswa kujua mambo mazuriau mabaya yanayoweza kutokea ukiamua kushiriki. Fomu hii inakueleza zaidi kuhusu utafiti huu. Unaweza uliza maswali yoyote, wakati wowote.

3) Kushiriki ni kwa hiari yako:

Fomu hii inakupa maelezo kuhusu utafiti huu, madhara, faida na maelezo ya utaratibu utakao fuatwa. Ukisha elewa haya na kukubali kushiriki, utaulizwa kutia sahihi na kuandika jina lako kwenye fomu mbili, moja ambayo nitabaki nayo, kisha nyingine utaweza kwenda nayo nyumbani.

Kabla ya kujifunza utafiti huu, ni muhimu kujua mambo haya:

- Kushiriki ni kwa hiari yako kabisa.
- Unaweza kushiriki au kutoshiriki kwa utafiti huu bila matokeo yoyote yanayoweza kukusingizia.

4) Kusudi ya mradi

Lengo la utafiti huu ni kuchunguza ni mara ngapi hali hii ya upele wa napi huonekana katika watoto wa umri wa miezi kati ya 0-24 na pia kubaini sababu zinazohusishwa na hali hiyo

Hii itatoa habari iliyo muhimu kujenga ufahamu miongoni mwa watumizi kwa athari za uchaguzi wa napi kwa afya ya watoto wenu

5) Kushiriki kwa hiari

Unaweza kushiriki au kutoshiriki kwa utafiti huu bila matokeo yoyote yanayoweza kukusingizia. Utaendelea kopokea huduma zote za kawaida unazopata kwa kliniki bila kujali kama umekubali au umekataa kushiriki.

6) Muda

Kuhojiwa kwa kila mtu kutachukua muda wa dakika 20-30 na karatasi ya maswali kudhibitishwa ukamilifu kwa dakika tano.

7) Hatari

Somo hili halina madhara yoyote kwa wahiriki. Utaulizwa kushiriki katika utafiti huu kwa wakati na katika mahali ambao unajihisi kuwa huru. Maswali yataulizwa mahali pa siri na ujumbe utakao tupatia hautapatikana na watu wa ummambali tu na wanaofanya utafiti huu.

8) Faida

Somo halina faida yoyote ya moja kwa moja kwa washiriki. Hata hivyo matokeo ya somo hili yatakuwa ya muhimu kwa kuleta ufahamu kwa watumishi wa bidhaa kuhusu hatari za afya zinazohusika na maumizi ya napi za ziada, ili kuwawezesha kufanya uamuzi wa chaguo linalofaa kutokana na habari walio nayo.

9) Motisha

Kurudisha kwa pesa zilizotumika kwa matumizi kutokana na kushiriki kwa somo kama vile matumizi ya usafiri, kutatekelezwa.

10) Usiri

Usiri kwa washiriki unaohusiana na habari ya kujitambulisha iliyokusanywa wakati wa somo hili itapatikana tu na watafiti wa somo hili na hautapatikana na watu wa umma. Habari ya kujitambulisha haitahifadhiwa kwenye komputa na majina ya washiriki hayatarekodiwa katika kumbu kumbu zetu za uchambuzi.

11) Kugawa kwa matokeo

Matokeo ya somo hili yanaweza kuwasilishwa wakati wa vikao vya kisayansi na kitaaluma na yanaweza kuchapishwa kwa majarida ya kisayansi au kurasa za kitaaluma.

12) Kwa mawasiliano

Somo hili limepitishwa na kutathminiwa na Kenya Medical Research Institute (KEMRI) Scientific Steering Committee ambao kazi yao ni kutoa tathmini ya kisayansi na KNH/UON-ERC ambayo kazi yao ni kuhakikisha kwamba washiriki wa

somo hili wamelindwa kutokana namadhara yoyote. Kama una maswali yoyote kuhusu somo hili

ama kuna chochote ambacho hukuelewa, tafadhali wasiliana na Miss Ann Wanjiku, 0718-580 678, ama barua pepe: annzinnette@gmail.com

Iwapo unamaswali kuhusu swala la mawasiliano au haki zako kama mshiriki wa somo hili, au unahisi ya kwamba kushiriki kwako katika somo hili kuna madhara yoyote, au ungependa kujua mambo zaidi kuhusu KNH/UON, waweza kuwasiliana nasi kwa nambari zifuatazo:

The Secretary, KNH/UON-ERC

P.O. Box 20723 Kenyatta National Hospital

Tel: 2726300-9, Extension 44102

E-mail: uonknh_erc@uonbi.ac.ke

13) kauli yako ya ridhaa na saini:

Iwapo umesoma fomu hii, au umesomewa na ukaelezwa kuhusu utafiti huu, na umeelewa na kukubali kushiriki kwa hiari yako, tafadhali soma yafuatayo na utafakari haya kabla ya kutia sahihi na jina lako:

- Nimepewa muda wa kuuliza maswali niliyokuwa nayo, na nimeridhika na majibu niliyopata.
- Ninajua ya kwamba ujumbe nitakao patiana katika utafiti huu utawekwa siri, na niko huru kujiondoa katika utafiti huu wakati wowote..
- Nikijiondoa au nikatae kushiriki katika utafiti, ninaelewa ya kwamba sitaadhibiwa kwa njia yoyote.
- Nimepewa Jina, nambari ya simu na sanduku la posta ya mtu ambaye ninaweza kumpigia iwapo kunajambo la kutatanisha au nisilolielewa katika utafiti huu.
- Ninakubali kwa hiari yangu kabisa, kushiriki katika utafiti huu na nitapewa fomu hii nijiwekee.

Participant's name -----

Participant's signature and date-----

Interviewer's name-----

Interviewers' signature and date-----

Witness's name-----

Witness's signature and date-----

Appendix III: Questionnaire (English Version)

Title of the study: *Factors associated with diaper dermatitis among children aged 0-24 months admitted in Mbagathi Sub-County Hospital, Nairobi county, Kenya*

SECTION 1: BASIC BACKGROUND INFORMATION

No	Question	Possible responses	Instructions
1	Research Assistant ID		
2	Research Assistant Name		
3	Survey ID		
4	Survey Start Time		
5	Survey End Time		
6	Respondent Enumeration Area ID		

SECTION 2: Socio-demographic characteristics of mothers

First I would like to ask you a few questions about yourself and your background

No	Question	Responses	Instructions
10	Age in years		
	Location/address		
	Religion	1. Christian 2. Muslim 3. Buddhist 4. Hindu 5. Traditional 6. Other (specify): _____ _____	
11	Marital status	1. Single 2. Married 3. Cohabiting, but not married 4. Widowed 5. Relationship, but not cohabiting	
12	Does your spouse/partner live with you in the same household	1. Yes 2. No	

13	Can you tell me the total number of other people who live with you in the same household?		
14	What is the highest level of schooling that you have completed?	<ol style="list-style-type: none"> 1. No formal education 2. Primary Level 3. O-level 4. A-level 5. Undergraduate 6. Postgraduate 	
15	What is the highest level of schooling completed by your Spouse/Partner	<ol style="list-style-type: none"> 1. No formal education 2. Primary Level 3. O-level 4. A-level 5. Undergraduate 7. Postgraduate 	
16	Are you the head of the household?	<ol style="list-style-type: none"> 1. Yes 2. No 	
17	Are you involved with most, some or none of the decisions in the household related to regular expenditures and bills?	<ol style="list-style-type: none"> 1. Most 2. Some 3. None 	
18	Are you involved with most, some or none of the decisions in the household	<ol style="list-style-type: none"> 1. Most 2. Some 3. None 	

	related to purchasing assets and property?		
--	--	--	--

SECTION 3: CHILDREN			
<i>Now I am going to ask you a few questions about the rest of your family, particularly your children</i>			
19	How many children do you have?		
20	How many of these children are living with you now?		
<i>For question 21-24 kindly refer to your two youngest children</i>			
		Child 1(second last born)	Child 2 (Last born)
22	Age		
23	Gender	1. Male 2. Female	1. Male 2. Female
24	Are they currently living at home?	1. Yes 2. No	1. Yes 2. No

SECTION 4: LABOUR AND INCOME

<i>Now I want to talk a little about employment and earnings in your household</i>			
25	Are you currently engaged in any activity that earns income for you and your household?	<ol style="list-style-type: none"> 1. Yes 2. No 	
26	What best describes your employment status?	<ol style="list-style-type: none"> 1. Salaried employee 2. Self-employed 3. Casual wage 4. Unemployed 	
27	What best describes the employment status of your spouse/partner	<ol style="list-style-type: none"> 1. Salaried employee 2. Self-employed 3. Casual wage 4. Unemployed 	Skip if Single/widowed
28	Approximately what percentage of Household income do you think you contribute?	<ol style="list-style-type: none"> 1. None 2. A little 3. Around half 4. More than half 5. All 	
29	Who is the main income earner in your household?	<ol style="list-style-type: none"> 1. Self 2. Spouse/partner 3. Other (specify) 	<i>The main income earner brings in the largest share. Probe</i>

			<i>if answer to previous question was around half</i>
30	Which of these best describes the total household income for all members in your household per month?	<ol style="list-style-type: none"> 1. <\$50 2. \$51-\$100 3. \$101-\$200 4. \$201-\$300 5. >300 	

SECTION 5: HOME SETTING			
<i>Now I want to talk a little about your assets and home setting</i>			
31	Is the home you currently reside in	<ol style="list-style-type: none"> 1. Owner 2. Rented 3. Occupied but not being paid for by you 4. other 	
32	What material has been used to construct the roof?		
33	What material has been used to construct the walls?		

34	What is the nature of the floor?		
----	----------------------------------	--	--

SECTION 6: BREAST FEEDING PRACTICES			
<i>Now I want to talk a little breast feeding and other feeding practices for your child</i>			
36	Kindly tell me what type of delivery you underwent for your youngest child	<ol style="list-style-type: none"> 1. Normal Delivery 2. Caesarian section delivery 	
37	When did you initiate breast feeding?	<ol style="list-style-type: none"> 1. Within 6hrs 2. 7-24hrs 3. 25-72hrs 4. < 7 days 	
38	How long have you breastfed your baby?	<ol style="list-style-type: none"> 1. Less than 6 months 2. More than 6 months 	
39	If less than 6 months, kindly give reasons why?	<ol style="list-style-type: none"> 1. Insufficient milk 2. Weaning 3. Breast Infection 4. Pregnancy 5. Baby's illness 6. Other (specify) 	
40	At what age did you introduce solid foods to your child?	<ol style="list-style-type: none"> 1. Less than 6 months 2. 6 months 3. 7-9months 	

		4. More than 9 months	
41	Other than breast milk, what other foods have you fed your child before 6 months?		
42	Have you attended ANC during pregnancy	1. Yes 2. No	
43	If yes, how many times		
<p>SECTION 7: DIAPER CARE PRACTICES</p> <p><i>Now I am going to ask you a few questions about diapers</i></p>			
42	What type of diapers do you use?	<ol style="list-style-type: none"> 1. Disposable diapers 2. Cloth diapers 3. Both 4. Others (Specify) 5. Don't know 	Circle as many as possible

43	If you use disposable diapers or cloth diapers as indicated in previous question, which one do you use the most?	<ol style="list-style-type: none"> 1. Disposable diapers 2. Cloth diapers 3. Same frequency for both 	
44	For each type of diaper that you use, kindly indicate your reason for choice	<ol style="list-style-type: none"> 1. Cost 2. Convenient 3. Health reasons 4. Availability 5. Other (specify) 	
45	Did you at any time change the diaper you were using, say from cloth to disposable diapers or vice versa?	<ol style="list-style-type: none"> 1. Yes 2. No 	<i>If no, skip to 48</i>
46	If yes, please give reasons for changing your diapering choice	<ol style="list-style-type: none"> 1. Cost 2. Convenient 3. Health reasons 4. Availability 5. Other (specify) 	
47	If you have changed the type(s) of diapers you were using, what type of diaper were you using before?	<ol style="list-style-type: none"> 1. Cloth diapers 2. Disposable diapers 	
48	How frequent do you change your child's diaper in a day?	<ol style="list-style-type: none"> 1. Once 2. Twice 3. Thrice 4. More than 5 times 	

49	Approximately how many diapers do you use/dispose daily?		
50	Do you use skin cleaning agents? (E.g. wipes) before diapering your child?	<ol style="list-style-type: none"> 1. Yes 2. No 	<i>If no, skip to 52</i>
51	If yes, give examples		
52	Do you use barrier creams when diapering your child? (e.g. Vaseline, glycerin)	<ol style="list-style-type: none"> 1. Yes 2. No 	
53	If yes, give examples		
	Diaper region cleaning style	<ol style="list-style-type: none"> 1. Wiping with water and cotton/cleaning with water 2. Wet large napkin 	

	Frequency of ventilating the diaper region per day	1. Yes (5 times per day, 10 - 15 min) 2.No 3.Sometimes	
	Diaper tightening condition	1. Yes 2. No	

SECTION 8: AWARENESS AND KNOWLEDGE OF DIAPER DERMATITIS			
<i>Now I am going to ask you a few questions on how you diaper rash</i>			
54	How often do you bath your child in a day?	1. Once 2. Twice 3. Other (specify)	
55	Do you use products like creams to keep your baby dry after bathing them?	1. Yes 2. No	
56	Do you think these creams may affect your child's skin causing rash?	1. Yes 2. No	

57	Approximately how many times do you change your child's nappy in a day?		
58	Does increasing the number of times you change your child's diaper reduce or increase the chance of your child getting diaper rash?	<ol style="list-style-type: none"> 1. Increase 2. Reduce 	
58	In your opinion, what causes diaper rash?		
59	How do you think diaper rash can be managed in your child?		

60	What are some of the symptoms of diaper rash?		
62	What remedies would you take if you noticed your child has a rash?		

<p>SECTION 9: HEALTH SEEKING BEHAVIOR</p> <p><i>Now I am going to ask you a few questions on how well you seek medical services for your child</i></p>			
63	Do you feel it is necessary to visit	<ol style="list-style-type: none"> 1. Yes 2. No 	

	a pediatrician when your child has rash?		
64	Do you use home remedies to treat rash for your child?	1. Yes 2. No	
65	If yes, which remedies do you use?		
66	Do you use over the counter drugs/cream to treat your child's rash as an alternative to seeking health services?	1. Yes 2. No	
67	How often do you visit the clinic for your child's general checkup?	1. Very often 2. Often 3. Never 4. Less often	

SECTION 10: HEALTH CONDITION OF THE CHILD

Now I am going to ask you a few questions about the health of your child

68	Has your child experienced a case of Diarrhea in the last 2 weeks	1. Yes 2. No	
----	---	-----------------	--

69	If yes, how many episodes per day?		
70	Has your child ever used antibiotics?	1. Yes 2. No	
71	If yes, for how long?		
72	Does your child have any history of drug hypersensitivity?	1. Yes 2. No	
73	Has your child had any term/preterm condition	1. Term 2. Preterm	
74	Presence of oral thrush	1. Yes 2. No	
75	Has your child suffered any chronic disease?	1. Yes 2. No	
76	Concomitant skin conditions in the child?	1. Yes 2. No	
77	Is there any family history of skin conditions?	1. Yes 2. No	

78	Has your child's diaper area ever appeared with rash	1. Yes 2. No	78
79	If yes, how many episodes of diaper rash have been experienced?		79

Appendix IV: Observation Checklist

PHYSICAL ASSESSMENT FOR DIAPER DERMATITIS			
1.	Status of the current diaper dermatitis assessed by the research assistant (nurse)	1. None 2. Present	
2.	Features of current napkin rash if present	1. Mild redness limited to only diaper region. 2. Evident redness, lesion or desquamation limited to the diaper region. 3. Redness spread from diaper region to me- dial part of thighs and abdomen. 4. Evident Redness, erosion and pustules spread from diaper region to medial part of	

		thighs and abdomen	
--	--	-----------------------	--

Appendix V: Questionnaire (Swahili Version)

SECTION 1: BASIC BACKGROUND INFORMATION			
No	Question	Possible responses	Instructions
1	Research Assistant ID		
2	Research Assistant Name		
3	Survey ID		
4	Survey Start Time		
5	Survey End Time		
5	Respondent Enumeration Area ID		

SECTION 2: SOCIO DEMOGRAPHIC CHARACTERISTICS OF THE MOTHERS			
<i>Mwanzo ningependa kukuuliza maswali machache kukuhusu</i>			

No	Maswali	Majibu	Maagizo
9	Jina ya mshiriki?		
10	Je, una miaka mingapi?		
11	Je, waweza kunieleza ni nini inafafanua vyema Kali yako ya ndoa?	<ol style="list-style-type: none"> 1. Single 2. Married 3. Cohabiting, but not married 4. Widowed 5. Relationship, but not cohabiting 	
12	Je, unaishi na mke/mme/mpenzi wako katika nyumba moja?	<ol style="list-style-type: none"> 1. Ndio 2. La 	
13	Je unaweza kuniambia jumia ya idadi ya watu wengine ambao unaishi nao katika nyumba		
14	Ni kiwango kipi cha juu cha masomo ambacho umekikamilisha?	<ol style="list-style-type: none"> 1. None 2. Primary Level 3. O-level 4. A-level 5. Undergraduate 6. Postgraduate 	

15	Ni kiwango kipi cha juu cha masomo ambacho mke/mme/mpenzi wako amekikamilisha?	<ol style="list-style-type: none"> 1. None 2. Primary Level 3. O-level 4. A-level 5. Undergraduate 6. Postgraduate 	
16	Je, wewe ndiye uliyechukuliwa kuwajibika zaidi katika nyumba hii?	<ol style="list-style-type: none"> 1. Ndio 2. La 	
17	Je, unahusika na zaidi, baadhi, au hakuna na maamuzi katika nyumba kuhusiana na ununuzi wa mali?	<ol style="list-style-type: none"> 1. Ndio 2. La 	
18	Je, unahusika na zaidi, baadhi, au hakuna na maamuzi katika nyumba kuhusiana na ununuzi wa mali?	<ol style="list-style-type: none"> 1. Ndio 2. La 	

SEHEMU 3: WATOTO			
<i>Sasa nitakuuliza maswali kuhusu familia yako haswa kuhusu watoto</i>			
19	Watoto wako ambao ni wako kibiolojia, ni wangapi		
20	Ni wangapi kati ya watoto hawa, wanaishi na wewe kwa sasa?		
<i>Maswali 21-24, tafadhali zingatia watoto wako wawili wa mwisho</i>			
		Mtoto 1(second last born)	Mtoto 2 (Last born)
21	Jina		
22	Umri		
23	Jinsia	1. Kiume 2. Kike	3. Kiume 4. Kike
24	Je, watoto hawa wanaishi na wewe kwa sasa?	1. Ndio 2. La	3. Ndio 4. La

SEHEMU 4: AJIRA NA MAPATO			
<i>Sasa ningependa tuzungumzie kidogo kuhusu ajira na mapato ya nyumba yako</i>			
25	Je, kwa sasa unajihusisha na kazi yoyote ambayo inaleta mapato kwako ama kwa nyumba yako?	<ol style="list-style-type: none"> 1. Ndio 2. La 	Does not include training sessions, meetings or obtaining stipends
26	Eleza hali yako ya ajira?	<ol style="list-style-type: none"> 1. Mfanyikazi wa kulipwa 2. Kujiajiri 3. Mfanyikazi wa kulipwa wa kawaida 	
27	Eleza hali ya ajira ya mme/mke wako	<ol style="list-style-type: none"> 1. Mfanyikazi wa kulipwa 2. Kujiajiri 3. Mfanyikazi wa kulipwa wa kawaida 	
28	Unachangia takriban kiasi gani cha	<ol style="list-style-type: none"> 1. Hakuna 2. Kidogo 	

	mapato katika nyumba yako?	<ol style="list-style-type: none"> 3. Karibu nusu 4. Zaidi ya nusu 5. Yote 	
29	Nani mwenye kuwapatia mapato kuu kwenye nyumba yako?	<ol style="list-style-type: none"> 1. Mimi 2. Mke/Mme 	<i>The main income earner brings in the largest share. Probe if answer to previous question was around half</i>
30	Ni gani kati ya idara hii inaeleza bora jumla ya mapato ya watu wote katika nyumba yako kwa mwezi?	<ol style="list-style-type: none"> 1. < \$50 2. \$51-\$100 3. \$101-\$200 4. \$201-\$300 5. >\$300 	<i>Household income will be used for demographic purposes only and will be reported in aggregate with data from other panel households.</i>

SEHEMU 5: UJUMBE KUHUSU MAZINGIRA

Sasa nitakuuliza maswali machache kuhusu mazingira yako

31	Je, mahali unapoishi kwa sasa ni	<ol style="list-style-type: none">1. Nyumba yako au unayotarajia kununua2. Una kodi3. Unaishi lakini hulipi kodi4. Nyingine (eleza)	
32	Ni vifaa gani vimetumiwa kutengeneza paa?		
33	Ni vifaa gani vimetumiwa kutengeneza paa?		
34	Asili ya sakafu ni nini?		

SEHEMU 6: MAZOEYA YA KUNYONYESHA

Sasa ningependa kukuuliza maswali kuhusu jinsi unavyo nyonyesha mtoto wako

36	Tafadhali nieleze ilijifingua kwa njia gani ulipopta mtoto wako wa mwisho?	<ol style="list-style-type: none"> 1. Kujifungua kwa njia ya kawaida 2. upasuaji 	
37	Je, ulianza kumnyonyesha mtoto wako lini?	<ol style="list-style-type: none"> 1. Within 6hrs 2. 7-24hrs 3. 25-72hrs 4. < 7 days 	
38	Je, umemnyonyesha mtoto wako kwa muda gani?	<ol style="list-style-type: none"> 1. <6 2. >6 	
39	Eleza sababu iwapo umemnyonyesha mtoto chini ya miezi sita	<ol style="list-style-type: none"> 1. Maziwa haitoshi 2. Unamlisha chakula 3. Ugonjwa kwa matiti 4. Ni mja mzito 5. Mtoto ni mgonjwa 6. Mengine(eleza) 	
40	Je, ulimwanzishia mtoto wako chakula akiwa na umri gani?	<ol style="list-style-type: none"> 1. Less than 6 months 2. 6 months 3. 7-9months 4. More than 9 months 	

41	Mbali na maziwa, je ni chakula kingine kipi umempa mtoto wako kabla ya kufikisha miezi sita?		
----	--	--	--

SEHEMU 7: MAZOEZI NA MATUMIZI YA NAPI			
<i>Sasa nitakuuliza maswali machache kuhusu kutumia napi</i>			
42	Wewe hutumia napi ya aina gani?	<ol style="list-style-type: none"> 1. Napi ya kutupa baada ya matumizi 2. Napi za nguo 3. Zingine (Eleza) 4. Sijui 	Circle as many as possible
43	Kama wewe hutumia napi za kutupa baada ya matumizi, au napi za nguo kama ilivyo ashiriwa kwa swali 33, ni zipi wewe hutumia zaidi?	<ol style="list-style-type: none"> 1. Napi ya kutupa baada ya matumizi 2. Napi za nguo 3. Natumia zote sawa na nyigine 	
44	Kwa kila aina ya napi ambayo unatumia kama ilivyo ashiriwa kwa swali la 34 tafadhali taja sababu za chaguo lako	<ol style="list-style-type: none"> 1. Bei (nafuu) 2. Urahisi wa matumizi 3. Afya 4. Hupatikana kwa urahisi 	

		5. Mengine (eleza)	
45	Je, umewahi badilisha aina ya napi uliyokuwa unatumia hapo awali?	1. Ndio 2. La	<i>If no, skip to 47</i>
46	Kama ndio, tafadhali toa sababu zako za kubadilisha chaguo lako la aina ya napi uliyokuwa unatumia hapo awali		
47	Kama umebadilisha chaguo lako la aina ya napi uliyokuwa unatumia, aina ya napi uliyoitumia hapo awali ni ipi?	1. Napi ya kutupa baada ya matumizi 2. Napi za nguo	
48	Je, huwa unabadilisha mtoto wako nepi mara ngapi kwa siku?	1. Moja 2. Mbili 3. Tatu 4. Zaidi ya tatu(taja)	
49	Je, huwa unatumia nepi ngapi kwa siku?	5.	
50	Wewe hutumia mbinu tofautiza kusafisha ngozi (mfano Wipes)	1. Ndio 2. La	<i>If no, skip to 52</i>

51	Kama ndio, tafadhali taja mifano		
52	Wewe hutumia mafuta za kuzuia ngozi unapo mfunga mtoto wako napi? (mfano Vaseline, glycerin)	1. Ndio 2. La	
53	Kama ndio, tafadhali taja mifano		

SEHEMU 8: UJUZI NA MAARIFA KUHUSU UPELE UNAOSABABISHWA NA UTUMIZI WA NEPI			
<i>Sasa ningependa kukuuliza maswali kuhusu upele wa ngozi iliyofunikwa na nepi</i>			
54	Je, huwa unamwosha mtoto mara ngapi kwa siku?	1. Moja 2. Mbili 3. Nyingine (eleza)	
55	Je, wewe hutumia bidhaa kama creams kumpaka mtoto wako baada ya kumwosha?	1. Ndio 2. La	
56	Je, unafikiria kwamba hizi cream zinaweza kusababisha upele kwa ngozi ya mtoto wako?	1. Ndio 2. La	
57	Huwa unabadilisha mtoto wako		

	nepi mara ngapi kwa siku?		
58	Je, unadhani kumbadilisha mtoto nepi mara nyingi inaweza punuguza au kuongeza uwezekano wa mtoto wako kupata upele ya ngozi?	1. Ongeza 2. Punguza	
59	Kwa maoni yako, nini husababisha upele wa ngozi?		
60	Je, unaonelea ugonjwa wa pele za ngozi unaweza kumbwa kwa njia gani?		
61	Je, dalili za upele wa ngozi ni gani kwa maoni yako?		
62	Je, ni hatua zipi ambazo ungechukua iwapo umegundua mtoto wako ana upele wa ngozi?		

SEHEMU 9: MAZOEJA YA KUTAFUTA MATIBABU

Sasa ningependa kukuuliza maswali kuhusu mazoeja yako ya kutafuta matibabu

63	Je, unaona umuhimu wa kumpeleka mtoto wako kwa daktari anapougua upele wa ngozi?	1. Ndio 2. La	
64	Je, wewe hutumia tiba za kinyumbani kumtibu mtoto wako iwapo ana upele wa ngozi?	1. Ndio 2. La	
65	Kama ndio, wewe hutumia tiba aina gani?		
66	Je, wewe hununua na kutumia dawa za kununua kwa famasia bila ya kuelezwa na daktari, iwapo mtoto wako ana upele wa ngozi?	1. Ndio 2. La	
67	Je, ni mara ngapi huwa unatembelea daktari kuangalia afya ya mtoto wako?	1. Mara nyingi sana 2. Mara nyingi 3. Hata kamwe 4. Chini ya mara nyingi	

SEHEMU 10: AFYA YA MTOTO

Sasa ningependa kukuuliza maswali macache kuhusu afya ya mtoto wako

68	Je, mtoto wako ameugua ugonjwa wa kuhara kwa wiki mbili zilizopita?	1. Ndio 2. La	
69	Iwapo jibu ni ndio, je amehara mara ngapi?		
70	Je mtoto wako ametumia madawa aina ya antibiotics?	1. Ndio 2. La	
71	Iwapo ndio, je amatumia dawa hizi kwa muda gani??		
72	Je, mtoto wako amekuwa na shida ya mwili kutosikizana na dawa zozote?	1. Ndio 2. La	
73	Je, mtoto wako ameugua ugonjwa wowote wa muda mrefu au mfupi?	1. Term 2. Preterm	
74	Je, mtoto anaonekana kuwa na pele mdomoni?	1. Ndio 2. La	
75	Je, mtoto wako ameugua ugonjwa	1. Ndio 2. La	

	wowote wa muda mrefu?		
76	Je, mtoto wako ameambatana na hali yoyote ya ngozi?	1. Ndio 2. La	
77	Je, kuna yeyote katika familia yako ambaye ameugua ugonjwa wa ngozi?	1. Ndio 2. La	

Appendix VI: Approval Letter by Ethics and Research Committee –KNH/UON



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254-020) 2726300 Ext 44355

KNH/UON-ERC
Email: uonknh_erc@uonbi.ac.ke
Website: <http://erc.uonbi.ac.ke>
Facebook: <https://www.facebook.com/uonknh.erc>
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSHEP, Nairobi

Ref: KNH-ERC/A/249

29th May, 2015

Nganga Ann Wanjiku
TM310-1483/2012
J.K.U.A.T

Dear Ann,

RESEARCH PROPOSAL: PREVALENCE OF DIAPER DERMATITIS AND ITS ASSOCIATED FACTORS AMONG CHILDREN AGED 0-24 MONTHS ATTENDING MBAGATHI DISTRICT HOSPITAL (P170/03/2015)

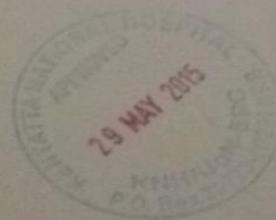
This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and **approved** your above proposal. The approval periods are 29th May 2015 to 28th May 2016.

This approval is subject to compliance with the following requirements:

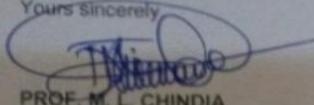
- Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
- Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
- Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
- Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
- Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
- Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website www.erc.uonbi.ac.ke

Protect to discover



Yours sincerely



PROF. M. L. CHINDIA
SECRETARY, KNH/UON-ERC

- c.c. The Principal, College of Health Sciences, UoN
 The Deputy Director CS, KNH
 The Chair, KNH/UoN-ERC
 The Assistant Director, Health Information, KNH
 Supervisors: Dr. Charles F.L. Mbakaya, Prof. Zipporah Ng'ang'a

Protect to discover