DISPOSAL METHODS OF SOILED DIAPERS IN LOW-INCOME HOUSEHOLDS OF NAIROBI COUNTY IN KENYA

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ABSTRACT

The increased use of disposable diapers in Kenya is placing a heavy load on already strained waste management sectors, which are battling with management of huge piles of solid wastes in towns and cities. This study was aimed at determining the soiled diaper disposal methods used by care givers in low income areas of Nairobi County, Kenya, and assessing the level of awareness on the environmental risks associated with improper disposal of soiled diapers. Cross sectional survey design was used to collect data for this study. Semi-structured questionnaires were administered to a sample population of 87 respondents who were selected using simple random sampling method. The study established a high use of disposable diapers as opposed to recyclable cloth diapers. The results from this study also indicate that the most prevalent method of soiled diaper disposal is together with household garbage which present significant health risks due to the risk of contracting communicable diseases and also exposure to e coli and other associated diseases. Regarding the level of awareness on the environmental risks associated with poor soiled diaper disposal, most people had no information of the health risks they get exposed to when handling these soiled diapers. The study therefore, recommends that the public should be sensitized on the appropriate means of handling soiled diapers and also the need to embrace safer alternatives like elimination communication which involves observing baby excretion signals in order to know when they need to defecate or urinate hence reduce the use of disposable diapers. Policy makers also need to develop and implement policies that aim at controlling improper soiled diaper disposal and enhancing the efficiency in the collection and handling of these diapers.

Key terms: ***reusable diapers, disposable diapers, environmental risks, elimination communication***

1.0 INTRODUCTION

The use of disposable diapers dates back to 1940s after World War II when women joined the workforce and thus, had limited time to wash and manage cloth diapers (Krafchik, 2016). In developed countries, disposable diaper use has been a common practice since then both among children and the elderly. In developing countries, this trend is slowly growing as women adopt the practice due to its convenience and ease of use. According to Smedly, (2014), a child uses an average of 6000 diapers before reaching an age where they can use potties. This generates a significant disposal challenge especially in developing countries where solid generation from other sectors is already a burden. In the US, it is estimated that 27.4 billion disposable diapers are

used every year creating more than 3.4 million tons of soiled diaper waste each year (Bender &She, 2017).

According to Shin and Jin, (2018), 240, 000 tons of used diapers are generated in Korea every year leading to increased methane production and leaching of organic compound into the soil and ground water. In Europe, 95% of families prefer disposable baby diapers with an estimation of about eight million disposable diaper use every day, accounting for about 3% of total household waste generated on a daily basis (Lauren & Lawrence, 2014). In Mexico where the population of babies under the age of 2 years is beyond 5million, more than 32million diapers are discarded on a daily basis and this accounts for 6.5% of the urban waste that is sent to landfills each day (Valdemar *et al*., 2014).

In developing countries, the use of disposable diapers is steadily increasing posing a big challenge in management of the associated waste since these countries lack the expertise and financial resources that can help in adoption of state of art technologies to deal with solid waste. In African countries, disposable diapers seem to have overtaken the recyclable cloth diapers possibly due to their convenience and attached level of sophistication and affluence. According to Magadza (2016), 28% of mothers in Zimbabwe exclusively use disposable diapers while 58% combine both disposable and reusable cloth diapers with only a fraction of 22% relying exclusively on cloth diapers. A study by Eke (2013), revealed that 45% of mothers in Nigeria use disposable diapers compared to 10% that use cloth diapers. Africa's population growth rate remains very high at 2.5% and is expected to persist for the next ten years (UNFPA, 2016). With the developing world adopting the use of disposable diapers (Rai *et al*, 2009), increasing growth rate in African countries translates to continued use of disposable diapers. The continued reliance on disposable diaper use will soon reach a critical environmental point if not checked owing to the fact that they take more than 500 years to degrade and thus there is need for a paradigm shift so that caregivers understand the importance of other options like reusable diapers and also elimination communication where caregivers use infant's natural timing and signals to determine when they need to defecate or urinate (Bender &She, 2017).

In Kenya like in most African countries, the use of disposable diapers is on the rise. However, managing and handling soiled diapers is an important challenge in the country with most caregivers unaware of the environmental and health risks associated with improper management of this waste and also the safe methods of disposing soiled diapers. It is therefore, against this background that the study sought to assess soiled diaper disposal practices among caregivers in the low income urban settings of Nairobi County and to determine the level of awareness on the environmental and health risks associated with poor disposal of soiled diapers.

2.0 MATERIALS AND METHODS

The study was carried out in two high density suburbs of Nairobi County (Kasarani and Zimmerman) and employed cross sectional survey research design to obtain data on disposal of diapers at the household level and awareness level on the associated health and environmental risks. Self- administered semi structured questionnaires were completed by 87 respondents who were selected using random sampling. The sample size of 87 was arrived at using Cochran (1977) formula of sample size determination:

$$n_0 = \frac{Z^2 pq}{e^2}$$

where n_0 = required sample size

Z= confidence level at 95% (standard value of 1.96)

P= the estimated proportion of the population which has the attribute in question (94%)

q= 1-p

e= the margin of error at 5% (standard value of 0.05)

n= $\frac{(1.96)^2(0.94)\ (0.06)}{0.05^2}$

=87 individuals

Data obtained was analysed using descriptive and inferential statistics.

3.0 RESULTS AND DISCUSSIONS

Table 1: Socio-demographic data

Variable	Mean	Std. Dev.	Min	Max
Age	38.0	8.3	27	52
Education	12.8	3.3	6	19
Income	29252.9	13870.9	5000	60000
Number of Kids	2.7	1.1	1	4
Daily usage	7.7	3.1	3	12
Observations		87		

According to the results of the study, the respondents are averagely aged 38.0 years. This implies that many households in the study area are headed by middle-aged individuals. The mean education level of the respondents is 12.8 school years implying that the interviewees are literate and can give reliable information on the use, disposal and management of soiled diapers. According to the study, the average monthly income per household in the study area is Ksh. 29252.3 with a maximum of Ksh. 60000 and a minimum of Ksh 5000. The average number of children using diapers per household in the study area is 2.7 with a daily usage of 7.7 diapers per household. This is a clear implication that huge volumes of waste from disposable soiled diapers are produced on daily basis and this is a common trend in both developed and developing countries. In Korea, a life cycle assessment conducted on disposable diapers found out that, a child between the age of 0-2 years uses 5.7 diapers on a daily basis (Kim & Cho, 2017) and in a year, estimated diaper generation is 240, 000 tons (Kyung & Kyoung, 2018). According to Dey, *et al*., (2016), the frequency of diaper use per day is 5.5 in Japan, 5 in UK, 4.7 in both France and Germany, 5.9 in the US, 4 in Saudi Arabia, 3.2 in Russia, and 2.3 in Philippines.

Table 2: Socio-demographic data continued

Variable	Proportion	Std. Err.
Gender		
Female	71.26%	0.049
Male	28.74%	0.049
Type		
Recyclable	13.79%	0.037
Disposable	86.21%	0.037
Observations	87	

As far as gender is concerned, this study established that 71.26% of the caregivers are women majority being mothers to the babies while 28.74% are male caregivers and this was witnessed in instances where either female parents have died or go to work at distant places. According to the study, majority of the respondents (86.21%) use disposable diapers as opposed to 13.79% who use cloth diapers since disposable diapers are seen to be more convenient and easier to use. These findings correspond with those of Kim & Cho (2017), in Korea where they established that over 90% of caregivers use disposable diapers and they attribute their choice of these diapers to the factors that they are hygienic, comfortable and convenient. According to Mangizvo (2014), most care givers in Zimbabwe, prefer disposable diapers because they are perceived to be more convenient, more absorbent and therefore better for use during night time.

Table 3: Methods of disposing soiled diapers

Disposal method	Proportion	Std. Err.
With household garbage	35.63%	0.052
In latrine	3.45%	0.020
In pails	4.60%	0.023
Open fields	8.05%	0.029
Road sides	3.45%	0.020
Compost pit	16.09%	0.040
Burying	4.60%	0.023
Burning	10.34%	0.033
Recycling	13.79%	0.037

The study sought to establish the methods used by caregivers to dispose of soiled diapers in the study area and as per the results, majority (35.63%) were found to be disposing soiled diapers together with household waste. 16.09% of the respondents reported to be disposing soiled

diapers in compost pits, 10.34% burned used diapers, and 8.05% dump the diapers on open fields. 13.79% of the respondents reported to be recycling the diapers and these are the caregivers who were using the recyclable cloth diapers. The findings of this study correspond with other research findings where most soiled diapers are found to be disposed of in the wrong places leading to risks of environmental contamination and human health effects.

According to a study by Tembo and Chazireni (2017), 50% of care givers in Mberengwa district, Zimbabwe, dispose of soiled diapers in open places especially in bushes and on road sides while 25% burn the used diapers. A study conducted by Majorin *et al.*, (2014) revealed that in rural Orissa, India, most child faeces (67.5% and 58.1%) of pre-ambulatory and ambulatory children respectively were deposited with other household waste. In Kenya, a study by Kimani, Muchiri, and Makindi (2015) established that in Nakuru county, 73.6% of caregivers dispose of soiled diapers with other household garbage while 18.9% dispose of in pit latrines with 0.7% disposing of in compost pits. Poor disposal of soiled diapers which contain urine and faecal matter pose threat to human health and the environment through pollution of valuable resources like air, water and soil.

Table 4: Level of awareness on the environmental effects of poor soiled diaper disposal

Variable	Proportion	Std. Err.
Air pollution		
Strongly disagree	20.93%	0.044
Disagree	17.44%	0.041
Unsure	30.23%	0.050
Agree	27.91%	0.049
Strongly agree	3.49%	0.020
Water pollution		
Strongly disagree	3.49%	0.020
Disagree	17.44%	0.041
Unsure	19.77%	0.043
Agree	39.53%	0.053
Strongly agree	19.77%	0.043
Soil pollution		
Strongly disagree	25.58%	0.047
Disagree	31.40%	0.050
Unsure	17.44%	0.041
Agree	24.42%	0.047
Strongly agree	1.16%	0.012
Respiratory infections		
Strongly disagree	8.14%	0.030

Variable	Proportion	Std. Err.
Disagree	17.44%	0.041
Unsure	45.35%	0.054
Agree	23.26%	0.046
Strongly agree	5.81%	0.025
Skin infections		
Strongly disagree	13.95%	0.038
Disagree	29.07%	0.049
Unsure	34.88%	0.052
Agree	22.09%	0.045
Communicable diseases		
Strongly disagree	9.30%	0.032
Disagree	24.42%	0.047
Unsure	38.37%	0.053
Agree	25.58%	0.047
Strongly agree	2.33%	0.016

Data on the level of awareness on the environmental risks of poor soiled diaper disposal was analysed using a 5-point Likert Scale: 1 = strongly disagree, 2 = disagree, 3 = unsure, 4 = agree, 5 = strongly agree. According to the results of the study, most respondents had little or no information on the likelihood of poor soiled diaper disposal causing air pollution, soil pollution, skin infections, and communicable diseases. However, as far as water contamination is concerned majority of the sampled population agreed to knowing that soiled diapers may lead to water contamination. With increased use of disposable diapers, there is need for sensitization on the environmental and health risks of poor soiled diaper handling and disposal so that people take the necessary measures and precautions to ensure that public health and the health of the environment is safe guarded during the entire life cycle of disposable diapers.

Table 5: Logistic regression on the factors that determine the choice of disposable diapers

Variable	Coef.	Std. Err.	t -Test	p -Value
Constant	-0.962	2.614	-0.37	0.713
Education	0.067	0.105	0.64	0.523
Gender	0.867	0.978	0.89	0.375
Income	0.000	0.000	1.93	0.054
Number of kids	0.017	0.313	0.05	0.956
Age	0.005	0.055	0.09	0.925

According to the table, the level of income and choice of diaper type were significant at 5% level while other factors (education, gender, number of kids, and age) although not statistically significant were found to correspond positively to the type of diaper used.

Table 6: Marginal effects of the factors that determine the choice of disposable diapers

Variable	dy/dx	Std. Err.	t -Test	p -Value
Education	0.0064	0.010	0.630	0.527
Gender	0.0724	0.072	1.010	0.312
Income	0.0019**	0.063	2.120	0.030
Kids	0.0016	0.030	0.050	0.956
Age	0.0005	0.005	0.090	0.925

According to the results of the study, a unit increase in education increases the probability of using disposable diapers by 0.64%. This is probably due to the fact that as people get more educated and exposed, they tend to abandon traditional cloth diapers since with education and acquisition of jobs, one can afford to buy the disposable diapers. The male headed households are more likely to use disposable diapers than the female headed households in the study area by 7.24%. This may be attributed to the fact that culturally men are not accustomed to handling children faeces and will therefore prefer disposable diapers which are more convenient, and easy to use and handle. The study results also show that a unit increase in income significantly raises the probability of using disposable diapers by 0.19%. This may be readily explained by the fact that with increased income, chances are that people will be able to afford the disposable diapers. As far as number of kids is concerned, a unit increase in number of children per household increases the probability of adopting disposable diapers by 0.16% probably due to the fact that they are easier to manage and use as opposed to cloth diapers since one doesn't have to wash huge volumes of cloth diapers. A unit increase in age increases the probability of disposable diaper use by 0.05%. As people age, they are more likely not to engage in tedious activities associated with changing and washing cloth diapers and therefore, may prefer disposable diapers.

Table 7: Logistic regression on the factors that determine the level of awareness on the health and environmental consequences of poor disposal of soiled diapers

Variable	Coef.	Std. Err.	t -Test	p -Value
Constant	-2.732	2.218	-1.230	0.218
Age	-0.038	0.043	-0.880	0.378
Education	0.189	0.097	1.940	0.050
Gender	0.603	0.743	0.810	0.418
Income	0.000	0.000	-0.160	0.877
Number of kids	0.090	0.258	0.350	0.726

According to the results of the study, education level was found to statistically influence the level of awareness on the environmental consequences of poor soiled diaper disposal at 5% significant

level. Other factors apart from age positively influence the level of awareness on environmental effects of poor soiled diaper disposal although not statistically significant.

Table 8: Marginal effects of the factors that determine the level of awareness on the health and environmental consequences of poor disposal of soiled diapers

Variable	dy/dx	Std. Err.	t -Test	p -Value
Age	-0.0059	0.007	-0.890	0.374
Education	0.0289**	0.014	2.060	0.039
Gender	0.0997	0.131	0.760	0.447
Income	0.0000	0.000	-0.160	0.877
Number of kids	0.0138	0.040	0.350	0.726

According to the table, a unit increase in education raises the probability of increased environmental awareness by 2.89% since in school people obtain knowledge on the environmental implication of poor waste management and are therefore able to understand and comprehend the negative effects associated with poor disposal of soiled diapers. As far as gender is concerned, men in the sampled population seemed to be more aware of the environmental risks associated with poor disposal of soiled diapers than women by 9.97%. However, the difference is not statistically significant. A unit increase in age lowers awareness by 0.59%. This means the young respondents in the sample were more aware of the health and environmental consequences of poor disposal of soiled diapers. A unit increase in number of kids increases the probability of improved environmental awareness by 1.38% probably due to the fact that as diaper users increase in number, there is consequent increase in the volumes of diaper waste generated.

4.0 POLICY RECOMENDATIONS

The use of disposable diapers is common among care givers in the low-income households of Nairobi County in Kenya. This contributes to the high volume of domestic solid waste discharged daily to the environment in the county. The poor disposal methods of soiled diapers by most interviewed caregivers signifies lack of awareness about appropriate methods. The results further, imply that most people are unaware about the environmental and health risks associated with poor disposal of soiled diapers. The results show that households with high income are more likely to use disposable diapers compared to low income households in the county. In addition, the educated caregivers were found to be more aware about the impact of poor disposal methods on the health and environment.

Therefore, sensitization strategies on the appropriate methods of disposing diapers should be designed to target high income households. In order to reach the low-income households, a pricing mechanism that ensures increased uptake should be developed. This can be achieved through zero-rating taxes on disposable diapers in order to significantly lower their prices. Since only the educated caregivers were found to be significantly aware of the negative impacts of poor diapers' disposal methods, there is a need to device alternative and effective sensitization strategies appropriate for those with low education. This may include awareness campaigns in the residential estates to reach the target caregivers.

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