



Diarrhoea Management Practices among Adolescent Mothers as Predictors of Diarrhoeal Diseases: A cross-sectional study

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Abstract

BACKGROUND

In sub-Saharan Africa, diarrhoeal diseases accounts for over 88% of deaths in children below five years old. In Kenya, the prevalence of under-5 diarrhoeal diseases was at 15% and 14% as per the as per Kenya Demographic Health Information Survey(KDHIS) of 2014 and 2022 respectively. This study aimed at examining the poor practices by adolescent mothers that function as predictors of diarrhoeal diseases among children under five years of adolescent mothers.

METHODOLOGY

The study was a mixed method, cross-sectional study involving 284 adolescent mothers aged 15-19 years in Kobura ward, Nyando sub-county, Kisumu County. The study employed both qualitative and quantitative data collection methods. Data was collected using a researcher-administered survey and 3 focus group discussions. Multivariable logistic regression was used to estimate the association between proper management of diarrhoea and sociodemographic and environmental factors using STATA version 17, while qualitative data was transcribed and analysed using NVivo Version 12 using inductive thematic analysis.

RESULTS

The study found that, the diarrhoea prevalence within the study area was higher (22.5%) than the national one (14%) and that 34% of the adolescent mothers had poor diarrhoea management practices which were predictors of diarrhoea among their children. Further, having a handwashing facility and the child's vaccination status were predictors of diarrhoea.

CONCLUSION

Poor diarrhoea management practices are prevalent among adolescent mothers. Adolescent mothers need education on proper feeding, vaccination, and household sanitation to improve diarrhoea management and reduce prevalence, thereby improving the health of under-five children.

Keywords: Diarrhoea, Diarrhoea Management Practices, Adolescent Mothers, Under-Five Children

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Introduction

Diarrhoea has been defined as the passage of three or more loose or liquid stools per day.(1) Globally, according to UNICEF (2) as of 2019, diarrhoea was identified as a leading killer disease among children, and it accounted for approximately 9% of all deaths among children under age 5. In 2021, diarrhoea caused around 9% of all fatalities in children under the

age of five worldwide. It is one of the main causes of death in children. This means that even when a straightforward treatment option is available, more than 1,200 young infants perish every day, or around 444,000 children annually (3). Sub-Saharan Africa had an increase from 31% in 1990 to 54% in 2018, although the worldwide under-five mortality rate decreased



from 93 per 1000 live births in 1990 to 39 in 2018 (4).

Even though as shown by UNICEF (2) the total number of deaths among under-five children has decreased by 61% annually from 2000 to 2019, more lives of these children could be saved through the adoption of basic interventions. Mortality and morbidity due to diarrhoea have been associated with poor sanitation, inadequate water, sub-ideal breastfeeding, as well as zinc and vitamin A deficiency according to Fischer Walker, Perin (5).

In study done in 31 Sub-Saharan African countries indicated that 16% of children suffered from diarrhoea (4) In Kenya, the national prevalence of diarrhoeal diseases in children under the age of five was 14% (6), a slight decrease from the 15% reported in KDHS 2014 (7). In a study done by Mulatya and Ochieng (8), in Kenya, as per the Global Burden of diarrhoea diseases (GBD) report of 2015, Kenya is still among the top five sub-Saharan countries with the highest numbers of disability-adjusted life years (DALYs) equivalent to 794,310 despite a notable change from 2005 (9). In addition, from the latest data published by WHO (10), deaths caused by diarrhoeal diseases in Kenya reached 5.85% or 15,420 in total. Kenya ranks number 31 globally with an age-adjusted Death Rate of 53.46 per 100,000.

The WHO recommends increased fluids, continued feeding, and supplemental zinc for first-line diarrhoea management and prevention of dehydration for 10–14 days in children under five (11). Restriction of fluids and feeds during diarrhoea episodes can lead to increased risk of dehydration, reduction of nutritional intake, and possibly inhibit the growth and development of the child (11). These four practices are correlated with negative outcomes, and they also conflict with the WHO treatment guidelines. Some of the new approaches in diarrhoea management include rotavirus vaccination, which has been introduced in the global immunisation routine schedules, vitamin A supplementation

promotion of early and exclusive breastfeeding, and promotion of handwashing with soap at the community level (12). A study by Workie, Sharifabdilahi (13) Indicated that the use of appropriate water, hygiene, and sanitation (WASH) interventions can also reduce diarrhoea incidence by 26% and deaths by 65%

Diarrhoeal diseases among under-fives in developing countries and poor communities are a major cause of malnutrition, delayed physical development, and early childhood mortality as shown by Dodicho (14). A study by Manzi, Ogwang (15) indicated that neonatal mortality rises as the mother's age falls. Adolescent healthcare behaviours are hindered by stigmatization, lack of support, decision-making autonomy, financial resources, unfriendly environment, and poor attitudes from healthcare providers.

As published by Lotse (16) and (17). Together with this, Workie, Sharifabdilahi (13) stated that diarrhoea itself is not lethal, however, the inappropriate approach towards its prevention and management amounts to increased severity in dehydration and finally death and this was supported by (13, 18). Therefore, the main objective of this study was to determine the poor practices among adolescent mothers that act as predictors of diarrhoea among their under-five children in Nyando sub-county, Kisumu County, Kenya.

Materials and Methods

Study area

The study was conducted in the Kobura ward, Nyando sub-county located in Kisumu County, Kenya. Nyando Sub-County is one of the sub-counties that recorded high numbers of teen pregnancies in Kisumu County. According to the 2019 Kenya national census report, Nyando had a total population of 10,080 girls aged 15-19 years. Moreover, Kobura ward particularly, reported a teen pregnancy prevalence of 18% (19) as well as other environmental factors which contribute to childhood diarrhoea such as flooding episodes that occur during the rainy seasons. Kobura ward has seven health facilities, with 11



community units and 110 community health workers, with their main source of water being boreholes.

Study design

The study utilized a mixed-method, cross-sectional design. This approach incorporated both qualitative and quantitative data collection methods.

Study population

The study participants were adolescent mothers aged between 15-17 years who assented, and their parents consenting. Additionally, adolescent mothers aged 18-19 years with children aged younger than five years who consented to participate in the study were included. Any adolescent meeting the selection criteria who had not been personally taking care of her child was excluded from the study.

Sample size determination

Fischer's formula (20) was used to calculate the sample size: $n = Z^2PQ / I^2$

Where:

n= Sample size

Z=Normal deviation at the desired confidence interval. In this case was taken at 95%,

Z=Value at 95% is 1.96

P=Proportion of poor diarrhoea management attributed to adolescents (18%)

Q=(1-P)

I=Degree of precision; was 5%.

Substituting the formula as:

$n = Z^2PQ / I^2$

$n = 1.96^2 \times 0.18 [1 - 0.18] / [0.05]^2$
 $= 3.8416 \times 0.18 \times 0.82 / 0.0025 = 266.8$
 $= 267$

With a non-response rate adjustment of 10%; $[267 \times 100]90 = 297$. Therefore, the target sample size was 297 adolescent mothers.

Sampling procedure

Participants were purposively selected from Nyando Sub-County in Kisumu County-Kenya. Kobura ward was selected purposively because of its high teenage pregnancy prevalence (18%). A proportionate sampling technique was used to get the study participants

from each of the 9 community units with the help of the 2 community health volunteers (CHVs) per community unit.

Quantitative sampling approaches.

A systematic random sampling technique was used to select participants in the community within the community units. This is a probability sampling technique used where the sampling interval was calculated using the formula $i = N/n$. From the sample of each CU, an interview was done after each second household, this posed minimal bias.

Qualitative sampling approaches.

Purposive sampling was used in selecting participants for the focus group discussions (FGDs). For these focus group discussions, 10% of the respondents who had been interviewed were requested to participate. Group leaders and eloquent interviewers explored mother-related characteristics and factors related to managing diarrheal diseases in children under five years, among this cohort. Three FGDs consisting of 8-12 participants were conducted among the adolescent mothers.

Data collection procedure

Structured questionnaire.

A structured closed-ended questionnaire was used to gather information from participants. The questionnaire consisted of questions subdivided into six sections: socio-demographic characteristics, demographic characteristics of children and diarrhoeal disease management practices.

Focus group discussion. The group discussions were conducted in English/Dholuo, taking approximately one hour. Tape-recording and note-taking were done after obtaining consent from all study participants.

Quantitative data processing and statistical analysis

The questionnaires were checked for completeness, and the data were analyzed using STATA version 17, with descriptive statistics presented in frequencies, percentages, means, and standard deviation. To determine whether an adolescent mother had poor or good diarrhoea management practice, a subscale was



obtained by summing the scores of the variables. Mothers who had a score above half were regarded to have good practice, while those who scored below half were considered to have poor diarrhoea management practices for their under-five children.

Multivariable logistic regression was used to estimate the association between proper management of diarrhoea and sociodemographic characteristics and environmental factors. These factors include the sex of the child, level of education of the adolescent mother, number of under 5 children in a household, vaccination status, having a toilet, having a handwashing facility, distance to the hospital and having tap water in a household. Backward stepwise selection with Akaike Information Criteria (AIC) was used to select variables to include in the multivariable model.

Qualitative data analysis

Audio recordings were transcribed and translated using express scribe transcription software, and inductive thematic analysis used to generate themes and sub-themes from the data. Coding was done using NVivo 12 Pro software.

Ethical considerations

Approval was obtained from the Board of Postgraduate Studies of JOOUST. Ethical clearance was obtained from Jaramogi Oginga Odinga Teaching and Referral Hospital Ethics Review Committee number [JOOTRH/ERC(IRRC/JOOTRH/560/21)] and NACOSTI (NACOSTI/P/22/16717).

Permission to conduct the study was sought from the Health Department of Kisumu County, [GN 133 VOL.XL (229)] Nyando sub-county and ward administrators. Informed consent was sought and obtained from all participant.

Results

Socio-demographic characteristics

The results showed that out of the 285 participants, 94 (33%) completed secondary education with another 64 (22.5%) having partial secondary education, and 14 (5%) had

tertiary level education. This implies that more than 50% of the participants had a minimum of basic secondary education. The study indicated that 81 participants (28%) had primary education, 31 (10.9%) had partial primary education and only one participant (0.4%) had not attended formal education. In terms of occupation of the mothers, 44 (16%) mothers were casual labourers, 4 (1%) mothers were in formal employment, 8 mothers (3%) were self-employed and the majority (n=229, 80%) were unemployed.

With regards to the demographics of the child, the results indicated that 159 (56%) of the children were females while 126 (44%) were males. In terms of health, 133 (47%) of the children had been fully vaccinated, 122 (43%) were partially vaccinated and 30 (11%) had never been vaccinated. The results showed that 215 (n=75%) of the children had received diphtheria, pertussis, tetanus (DPT) Vaccine, 188 (66%) had received measles vaccine, 93 (33%) were vaccinated against typhoid, 83 (29%) had received rotavirus vaccine. The study also revealed that 64 children (23%) had had diarrhoea in the past two weeks. The child had diarrhoea at an average of 2 years (Mean= 2.35, SD= 1.21). Table 1.

Diarrhoea management practices

This subscale score was obtained by summing the score of the item and dividing it by the total number of items.

For diarrhoea management practice subscale was also obtained by summing items scores and dividing by the total number of items. Caregivers who scored above or equal to the mean of practice questions were considered good practice, while those who scored below the mean of practice questions had poor practice in home-based management of diarrhoea in children under the age of 5.

The results indicate that 188 participants (66%) had appropriate management skills against 97 participants (34%) who had inappropriate management of the disease. The variables included in this category as seen in the table 2.



Factors associated with proper diarrhoea management

There was no association between diarrhoea management and the sex of the baby, level of education, having a toilet, distance to the hospital, and having tap water. There was, however, a strong association between diarrhoea management and vaccination status. Children who were not vaccinated and those who were not fully vaccinated had lower odds of proper management compared to those who were fully vaccinated (OR=0.72, p-value<0.001 and OR = 0.84, p-value<0.001 respectively).

There was borderline evidence of an association between diarrhoea management and having a handwashing facility (OR=1.09, P-value = 0.059).

The association between diarrhoea management and vaccination status became more pronounced after adjusting for other covariates. The odds ratio comparing not vaccinated vs fully vaccinated increased from 16% to 76% while that comparing not vaccinated vs fully vaccinated increased from 28% to 88%.

According to the qualitative findings environmental factors like inadequate sanitation practices, uncovering food, and insufficient handwashing after toilet use contributed to increased frequency diarrhoea. It was also mentioned that children pick and eat unclean objects, soil and animal faeces which was attributed to causing diarrhoea among under-fives within the study area.

Table 1:
Demographic and Health Characteristics of the Participants

Variables		Frequency (n=285)	Percent (%)
Level of Education of the Mother	None	1	0.4
	Partial Primary	31	11
	Primary	81	28
	Partial Secondary	64	23
	Secondary	94	33
	Tertiary	14	5
Occupation of the mother	Casual Labourer	44	16
	Formal employment	4	1
	Self-employed	8	3
	Unemployed	229	80
Sex of the child	Female	159	56
	Male	126	44
Vaccination status of the child	Fully Vaccinated	133	47
	Not fully vaccinated	122	43
	Not vaccinated	30	11
Has the child received a DPT Vaccine	Yes	215	75
	No	70	25
Has the child received the Measles vaccine	Yes	188	66
	No	97	34
Has the child been vaccinated against typhoid	Yes	93	33
	No	143	50
	Don't know	49	17
Has the child received the rotavirus vaccine	Don't know	83	29
	No	120	42
	Yes	82	29
The child had diarrhoea in the past two weeks	Yes	64	23
	No	221	78



“I know it is caused by dirtiness. If a child plays with dirty things and he puts them in his mouth. When he eats before washing his hands, going to the toilet and you fail to wash your hands then you come and eat, you can get diarrhoea”
FGDIK.

Practices for managing and preventing diarrhoea included maintaining a clean environment, handwashing, boiling/treating

drinking water, and maintaining personal hygiene.

“Diarrhoea can be managed by cleaning our environment, cutting long fingernails, cleaning their hands properly. We are supposed to wash our hands before feeding the baby if it is a child who is eating and if he is not yet eating, we are supposed to be very keen on what they put in their mouths, and we should not leave then in a dirty environment. We must clean our environment and we should have water in every place.

Table 2:
Diarrhoea Management Practices Determination Variables

Question	Response
Breastfeeding is useful for preventing diarrhoea	<input type="checkbox"/> Yes <input type="checkbox"/> No
Boiled water is useful for preventing diarrhoea episodes	<input type="checkbox"/> Yes <input type="checkbox"/> No
Treat a child with diarrhoea	Give more water and ORS Decrease water and food intake. Don't know
ORS (Oral rehydration solution) prepared	Mix ORS powder with water Mix ORS powder with milk/juice. Don't know
Do you breastfeed your children?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Do you bottle-feed your children?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Do you boil water before drinking?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Abstain all types of food in diarrhoea	<input type="checkbox"/> Yes <input type="checkbox"/> No
Use banana in diarrhoea	<input type="checkbox"/> Yes <input type="checkbox"/> No
Use yoghurt in diarrhoea management	<input type="checkbox"/> Yes <input type="checkbox"/> No
Use ORS in case of diarrhoea	<input type="checkbox"/> Yes <input type="checkbox"/> No
Type of ORS preferred:	<input type="checkbox"/> ORS solution <input type="checkbox"/> ORS powder <input type="checkbox"/> Rice Based ORS <input type="checkbox"/> Homemade Salt and Sugar Solution <input type="checkbox"/> Homemade sugar solution <input type="checkbox"/> Juice <input type="checkbox"/> Other _____
I always remind the children to wash their hands before and after eating	<input type="checkbox"/> Yes <input type="checkbox"/> No
Handwashing after changing diapers	<input type="checkbox"/> Yes <input type="checkbox"/> No



When we are entering the house, we are supposed to wash our hands before feeding the baby. After changing the diapers, we must wash our hands with water and soap then dry it with a toilet”.
FGD3K

Discussion

Results from a univariate analysis in this study indicated that there was no association between diarrhoea management and sex of the baby, level of education of the mother and occupation of the mother. The lack of a significant correlation between sex and diarrhoea management practices suggests a cultural shift favouring male children over female ones. These findings therefore contradict a study by Dodicho (14) which indicated a significant difference between the sex of an index child and maternal practice towards management of diarrhoea. Mothers of

female children often exhibit poorer practices compared to mothers of male children, possibly due to cultural sex preferences and male-dominated social values. The findings also disagree with the findings by Anteneh, Andargie (21) which indicated that some of the significant factors that influence the occurrence of diarrhoea include, the socioeconomic status of the mother, and monthly income and this was also supported by Regassa and Lemma (22).

A multivariable binary logistic analysis in this study indicated that being unvaccinated and not being fully vaccinated were significant predictors for diarrhoea management practices. Caregivers of children who had not been fully vaccinated were less likely to have good diarrhoea management practices. The protection provided through immunization and postnatal health education sessions enhances the immune system and improves the management of diarrhoea among mothers.

Table 3:
Factors Associated with Proper Diarrhoea Management among Adolescent Mothers

		Univariate			Multivariable		
Sex	285						
Female	134 (84%)						
Male	98 (78%)	0.94	0.86, 1.03	0.2	0.60	0.32, 1.14	0.12
Level of education	285						
Primary or lower	89 (79%)						
Secondary or higher	143 (83%)	1.04	0.95, 1.15	0.4			
Children < 5 in a household	285	1.02	0.98, 1.07	0.3	1.21	0.88, 1.77	0.3
Vaccination status	285						
Fully vaccinated	123 (92%)						
Not fully vaccinated	91 (75%)	0.84	0.76, 0.92	<0.001	0.24	0.11, 0.51	<0.001
Not vaccinated	18 (60%)	0.72	0.62, 0.84	<0.001	0.12	0.04, 0.33	<0.001
Having a toilet	285						
No							
Yes		1.16	0.90, 1.51	0.2	1.47	0.26, 6.98	0.6
Having a hand-washing facility	285						
No							
Yes		1.09	1.09, 1.20	0.059	1.60	0.85, 3.02	0.15
Distance to the hospital	285						
<5km	157 (81%)						
>5km	75 (82%)	1.00	0.91, 1.10	>0.9			
Tap water	285						
No	203 (81%)						
Yes	29 (85%)	1.05	0.91, 1.20	0.5			

¹OR = Odds Ratio, CI = Confidence Interval

This concurs with studies by Mokomane, Kasvosve (23) and Gupta, Sarker (24) which indicated that vaccination, has emerged as a key effective means of preventing significant morbidity and mortality from childhood diarrhoeal disease.

There was no association between the number of under-five children in a household and diarrhoea management practices. In households with many under-five children, caretakers may be overwhelmed, increasing the risk of infection. Family size doesn't guarantee better hygienic practices or knowledge in diarrhoea management, even though consultation and awareness are expected. This finding is in agreement with research from Southern Ethiopia's Derashe District, which found that family size was not significantly related to diarrhoeal illness as published by (25). The findings concur with the findings that the number of under-five children in a household was a significant factor that influenced the occurrence of diarrhoea as shown by Anteneh, Andargie (21) and Regassa and Lemma (22) The difference might as well be because of family socioeconomic status or living condition.

The results of this study indicate that there was borderline evidence of an association between diarrhoea management and having a handwashing facility (OR=1.09, P-value = 0.059). Improved sanitation practices as per the qualitative data were identified as predictors of good diarrhoea management practices. The findings agree with a study done by Mohammed and Zungu (26) which indicated that hand-washing facilities, and improved sanitation, have been identified as other common environmental health risk factors of childhood diarrhoea. These findings also agree with a study conducted by Azage, Kumie (27) in Ethiopia which indicated that; initiation of complementary feeding at 6 months and at least three critical hand washing times significantly correlated with childhood diarrhoea. This concurs with the literature Workie, Sharifabdilahi (13) which highlighted that promoting handwashing with soap as part of

community-wide sanitation is crucial for preventing diarrhoea, alongside other appropriate WASH interventions, to reduce its incidence by 26% and mortality by 65% as shown by Peter and Umar (12) This study suggests that individuals with a handwashing facility are more likely to use it as a prevention strategy for diarrhoea.

The finding concurs with findings from a study done by (28) in Bangladesh which indicated a positive reduction in diarrhoea cases after setting up interventions on sanitation and hygiene improvements. The finding contradicts a study done in rural Bangladesh by Islam, Rahman (29), and another conducted by Kearns (30) in Bangladesh, Zimbabwe and Kenya which showed no significant association between water sources, handwashing facilities, sanitation facilities and diarrhoea in children and that revealed that traditional household WASH interventions were unlikely to reduce diarrhoea. Health education and community dialogues are crucial for improving knowledge and practices in managing diarrhoea.

The study found no correlation between diarrhoea management and using tap water, despite its safety and limited contamination risks. This does not agree with findings from the study Derashe district, Southern Ethiopia Godana and Mengistie (25) which indicated that the use of unprotected water sources was significantly associated with diarrhoea disease; unprotected water sources lack any barrier or structure that protects the water from contamination; hence they can easily get contaminated causing diarrhoea on ingestion as indicated by Tigabu, Petros (31). The impact of this may be influenced by various environmental factors, socio-economic status, or awareness levels regarding diarrhoea management.

Strengths and limitations

The strength of this study is that it addresses a previously unexplored area by focusing on the management practices of diarrhoea among adolescent mothers in the study region. The limitations of the study



included determining the diarrhoea management practices based on the caregiver's response which was subject to recall bias or may not indicate real practice of the caregivers. Therefore, there is a need to establish the barriers to proper diarrhoea management among adolescent mothers.

Conclusion

In conclusion, the study showed that 34% of adolescent mothers had poor diarrhoea management practices. The study found that factors such as sex, education level, number of under-five children, and mother's occupation did not predict appropriate diarrhoea management practices. However, having tap water, hospital proximity, toilets, fully vaccinated children, and handwashing facilities were associated with proper diarrhoea management.

Recommendations

There is a need to conduct interventions that would help improve diarrhoea management practices among the vulnerable population of young mothers who face other challenges and have no experience with motherhood.

Significance statement

This study's findings will inform the health department about improper diarrhoea management practices among adolescent mothers, aiding in the development of effective interventions.

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Data availability. The data used to support the findings of this study are available from the corresponding author upon request.

Conflict of interest. The authors declare that they have no conflict of interest.

Author's contribution

JM, DO, and DO, wrote the proposal and participated in the drafting of the paper JM, MK, and AW participated in data collection,

and analysis. All the authors read and approved the final manuscript.

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References

1. **WHO.** Diarrhoeal disease 2017 [Available from: <https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease>].
2. **UNICEF.** Diarrhoea 2022 [Available from: <https://data.unicef.org/topic/child-health/diarrhoeal-disease/>].
3. **UNICEF.** Diarrhoea remains a leading killer of young children, despite the availability of a simple treatment solution 2024 [Available from: <https://data.unicef.org/topic/child-health/diarrhoeal-disease/>].
4. **Adedokun ST, Yaya S.** Childhood morbidity and its determinants: evidence from 31 countries in sub-Saharan Africa. *BMJ Global Health.* 2020;5(10):e003109.
5. **Fischer Walker CL, Perin J, Aryee MJ, Boschi-Pinto C, Black RE.** Diarrhea incidence in low-and middle-income countries in 1990 and 2010: a systematic review. *BMC public health.* 2012;12(1):1-7.
6. **ICF.** Ka. Kenya Demographic and Health Survey 2022. Nairobi, Kenya, and Rockville, Maryland, USA: : KNBS and ICF; 2023.
7. **KDHS.** Kenya Demographic Health Survey 2014: key indicators. *Kenya National Bureau of Statistics (KNBS) and ICF Macro.* 2014;8:166-206.
8. **Mulatya DM, Ochieng C.** Disease burden and risk factors of diarrhoea in children under five years: Evidence from Kenya's demographic health survey 2014. *International Journal of Infectious Diseases.* 2020;93:359-66.
9. **Troeger C, Forouzanfar M, Rao PC, Khalil I, Brown A, Reiner RC, et al.** Estimates of global, regional, and national morbidity, mortality, and aetiologies of diarrhoeal diseases: a systematic analysis for the Global Burden of Disease Study 2015. *The Lancet infectious diseases.* 2017;17(9):909-48.



10. **WHO.** World Health Rankings Live Longer Live Better; Kenya: Diarrhoeal Diseases 2020 [Available from: <https://www.worldlifeexpectancy.com/kenya-diarrhoeal-diseases>.
11. **WHO.** The treatment of diarrhoea: a manual for physicians and other senior health workers. *World Health Organization*; 2005. Report No.: 9241593180.
12. **Peter A, Umar U.** Combating diarrhoea in Nigeria: the way forward. *J Microbiol Exp.* 2018;6(4):191-7.
13. **Workie HM, Sharifabdilahi AS, Addis EM.** Mothers' knowledge, attitude and practice towards the prevention and home-based management of diarrheal disease among under-five children in Diredawa, Eastern Ethiopia, 2016: a cross-sectional study. *BMC pediatrics.* 2018;18(1):1-9.
14. **Dodicho T.** Knowledge and practice of mothers/caregivers on home management of diarrhea in under five children in Mareka district, Southern Ethiopia. *Journal of Health, Medicine and Nursing.* 2016;27(2422-8419):71-9.
15. **Manzi F, Ogwang J, Akankwatsa A, Wokali OC, Obba F, Bumba A, et al.** Factors associated with teenage pregnancy and its effects in Kibuku Town Council, Kibuku District, Eastern Uganda: A cross sectional study. 2018.
16. **Lotse CW.** Exploring Experiences of Pregnant Adolescents and Their Utilization of Reproductive Health Services in Ho West District, Ghana: A Salutogenic Approach: *The University of Bergen*; 2016.
17. **Pell C, Menaca A, Were F, Afrah NA, Chatio S, Manda-Taylor L, et al.** Factors affecting antenatal care attendance: results from qualitative studies in Ghana, Kenya and Malawi. *PloS one.* 2013;8(1):e53747.
18. **Hackett KM, Mukta US, Jalal CS, Sellen DW.** Knowledge, attitudes and perceptions on infant and young child nutrition and feeding among adolescent girls and young mothers in rural Bangladesh. *Maternal & child nutrition.* 2015;11(2):173-89.
19. **KDHS.** Kenya Demographic and Health Survey, 2014 2014.
20. **Fisher AA, Laing JE, Stoeckel JE, Townsend J.** Handbook for family planning operations research design. 1991.
21. **Anteneh, Andargie K, Tarekegn M.** Prevalence and determinants of acute diarrhea among children younger than five years old in Jabithennan District, Northwest Ethiopia, 2014. *BMC public health.* 2017;17(1):1-8.
22. **Regassa W, Lemma S.** Assessment of Diarrheal Disease Prevalence and Associated Risk Factors in Children of 6-59 Months Old at Adama District Rural Kebeles, Eastern Ethiopia, January/2015. *Ethiop J Health Sci.* 2016;26(6):581-8.
23. **Mokomane M, Kasvosve I, Melo Ed, Pernica JM, Goldfarb DM.** The global problem of childhood diarrhoeal diseases: emerging strategies in prevention and management. *Therapeutic advances in infectious disease.* 2018;5(1):29-43.
24. **Gupta A, Sarker G, Rout AJ, Mondal T, Pal R.** Risk correlates of diarrhea in children under 5 years of age in slums of bankura, west bengal. *J Glob Infect Dis.* 2015;7(1):23-9.
25. **Godana W, Mengistie B.** Determinants of acute diarrhoea among children under five years of age in Derashe District, Southern Ethiopia. *Rural and remote health.* 2013;13(3):[35]-[45].
26. **Mohammed AI, Zungu L.** Environmental health factors associated with diarrhoeal diseases among underfive children in the Sebeta town of Ethiopia. *Southern African journal of infectious diseases.* 2016;31(4):122-9.
27. **Azage M, Kumie A, Worku A, Bagtzoglou AC.** Childhood diarrhea in high and low hotspot districts of Amhara Region, northwest Ethiopia: a multilevel modeling. *Journal of health, population and nutrition.* 2016;35(1):13.
28. **Luby SP, Rahman M, Arnold BF, Unicomb L, Ashraf S, Winch PJ, et al.** Effects of water quality, sanitation, handwashing, and nutritional interventions on diarrhoea and child growth in rural Bangladesh: a cluster randomised controlled trial. *The Lancet Global Health.* 2018;6(3):e302-e15.
29. **Islam M, Rahman M, Unicomb L, Kafi MAH, Rahman M, Alam M, et al.** Child defecation and feces management practices in rural Bangladesh: Associations with fecal contamination, observed hand cleanliness and child diarrhea. *PloS one.* 2020;15(7):e0236163.
30. **Kearns J.** The role of chemical exposures in reducing the effectiveness of water-sanitation-hygiene interventions in Bangladesh, Kenya, and Zimbabwe. *Wiley Interdisciplinary Reviews: Water.* 2020;7(5):e1478.



31. **Tigabu E, Petros B, Endeshaw T.** Prevalence of giardiasis and cryptosporidiosis among children in relation to water sources in selected village of Pawi Special District in Benishangul-Gumuz Region, northwestern Ethiopia. *Ethiopian Journal of Health Development.* 2010;24(3).