Association between Maternal Education Level and Diarrheal Disease among Under-Two Children in Nigeria

[1]**Dr. Oviemova Nathan Agoro.,** [2]**Dieprebi, Agnes Aladeh**

[1]**Department of Public Health, Bayelsa Medical University, Amarata,Yenagoa, Bayelsa State**

[2]**Diete Koki Memorial Hospital, Opolo Yenagoa, Bayelsa State**

ABSTRACT

Diarrheal disease is a major contributor to child morbidity and mortality in Nigeria and children under the age of two years are highly susceptible. Maternal education is an important social determinant of health, and the particular role of maternal education with diarrheal disease in this age group demands modern national data. This paper analysed the correlation between the level of maternal education and diarrheal disease among children under two years old in Nigeria with the 2023-24 Nigeria Demographic and Health Survey (NDHS). There were 8,742 children at the age of 0-23 months. All analyses accounted for the complex survey design using Stata 18.0. The resultant effect was a caregiver reported diarrhoea within the two weeks before the survey. Mother education was divided as no education, primary, secondary, or higher. Adjusted odds ratios (AORs) of multivariate logistic regression controlled the age, sex, household wealth, residence, region, water source, sanitation, and breastfeeding status of the child. The prevalence of the two-week diarrhoea was 9.1%, there was a definite gradient; 13.5% (no education), 9.8% (primary), 7.2% (secondary), and 5.1% (higher). In the adjusted model, children of mothers who had no education were also 2.8 times more likely to have diarrhoea than their counterparts whose mothers had higher education (AOR=2.81, 95% CI: 2.12–3.72). Other significant risk factors were primary (AOR=1.92, 95% CI: 1.45-2.54) and secondary education (AOR=1.48, 95% CI: 1.14-1.92). Independent predictors were poverty, rural living, and lack of sanitation and water. The results reveal a high, progressive negative relationship between maternal education and childhood diarrhoea, which highlights the necessity of integrated policies that foster the education of females, poverty alleviation as well as greater water and sanitation infrastructure to limit the burden of the disease.

Keywords: Maternal Education, Diarrhea, Under-Two Children, Nigeria, Social Determinants of Health

INTRODUCTION

Diarrheal disease has been a continuous public health menace in low- and middle-income countries (LMICs), claiming the lives of about 525,000 children under five years old all over the planet on an annual basis (World Health Organisation, 2024). Diarrhoea has been a major cause of morbidity and mortality in children in Nigeria which is the most populous country in Africa. The latest statistics is the 2023-24 Nigeria Demographic and Health Survey (NDHS) which shows that in the two weeks before conducting the survey, 9 percent of children under five years of age had diarrhea (Nigeria Demographic and Health Survey, 2025). Among children under two years old, who are underdeveloped in terms of immune system and have high levels of exploratory behaviours and lack of hygiene and nutrition in the caregivers, the burden is particularly high, which exposes them to dehydration and malnutrition due to the incidence of diarrheal episodes (Yirsaw, Gebremariam, and Demissie, 2025).

Childhood diarrhea has a multifactorial etiology that encompasses pathogens, environmental exposures as well as socioeconomic factors. Maternal education has always been ranked among the social determinants of health and has been listed as one of the basic determinants of child health outcomes (Ashaolu, Ibekwe, and Adebowale, 2025). Mothers who have a high education level tend to possess more health knowledge, embrace preventive hygiene services, seek health services in a more appropriate way, and have more agency when it comes to making

decisions at home (Kompat, Alhassan, and Appiah, 2024). As a result, the morbidity and mortality rates of children to diseases that have preventive measures are generally low in relation to children of mothers who are educated, such as diarrhoea (Desmennu, Opeyemi, and Oluwasanu, 2017).

Despite the existing body of literature on the protective role of maternal education across the world, there is an urgent need to have modern and country-representative evidence that specifically captures the group of children below two years of age, which is the most vulnerable in Nigeria. The current literature is either localised, dated, or brings together all under-five children and this may blur the risks of infants and young toddlers (Azanaw, Malede, Yalew, and Worede, 2024). Also, mechanisms by which education affects diarrheal risk, frequently moderated by household wealth, water, and sanitation availability, and health-seeking behaviour, should be better explained in the Nigerian context (Demoze, Shibre, and Assefa, 2024).

This paper examines the experience of diarrheal disease and the maternal education level and is informed by the latest nationally representative statistics on the topic in 2023-24 as outlined by the NDHS. The specific objectives include: to find out the prevalence of diarrheal disease according to maternal education level; to test whether maternal education has an independent relationship with diarrheal disease after controlling the possible confounders; and to test the mediating effects of household wealth level, place of residence, and water, sanitation and hygiene variables on the diarrheal disease. The results will inform current evidence to enhance integrated policy and programmatic interventions to reduce the burden of childhood diarrhoea in Nigeria by means of strategies that reduce the disparity in educational levels and impact on child health.

LITERATURE REVIEW

The Burden of Childhood Diarrhea in Nigeria

Diarrhoea is a chronic public health issue in Nigeria, and there is high regional inequality. According to the 2023-24 NDHS, the two-week prevalence was 9% among under five children nationally. The young under-two cohort who are more vulnerable has risk factors that include incomplete immunisation, exploratory behaviours which result in faecal oral contamination, and reliance on caregivers to provide hygiene and nutrition. A systematic review on the determinants of diarrheal diseases in Africa has shown that in Nigeria, the burden of the diarrheal disease is always driven by poor sanitation, unsafe water, and low education of mothers (Azanaw, Malede, Yalew, and Worede, 2024). The review observed that the prevalence of diarrhoea is higher in the northern regions where maternal education level is usually lower than in the southern regions. According to recent multi country studies, sub Saharan Africa, including Nigeria, still has the greatest rate of childhood diarrheal diseases in the world, where mortality and morbidity rates have not declined despite development at the global level (Yirsaw, Gebremariam, and Demissie, 2025).

Maternal Education as a Determinant of Child Health

Protective role of maternal education on children is a global phenomenon that is not new. Educated mothers have the opportunity to be health literate; hence, they can comprehend and act upon information about disease prevention, the symptoms of danger, and treatment. In the case of diarrhoea, it would translate to proper handwashing, safe preparation of complementary foods, prompt administration of oral rehydration solution and visiting health facilities. A Nigerian study identified maternal education as an important predictor of diarrhoea in children aged 0 24 months, and the risks of diarrhoea were much higher in children of mothers who were uneducated (Desmennu, Opeyemi, and Oluwasanu, 2017). Recent multi country studies attest to the fact that lower maternal education is one of the key socio demographic variables that are linked with increased odds of diarrheal diseases among under-five children in Sub Saharan Africa (Worede, Azanaw, and Tiruneh, 2025; Ashaolu, Ibekwe, and Adebowale, 2025). The processes are complex; education enables the women by making them more familiar with health information, more autonomous in decision-making at homes, and more financially promising, which leads to the establishment of a healthier environment in which children live (Kompatsu, Alhassan, and Appiah, 2024).

Theoretical Underpinning: Andersen Behavioural Model

This paper will be based on the Andersen Behavioural Model of Health Services Use modified to fit health outcomes (Andersen, 1995). This model assumes that health behaviour and outcomes are determined by three sets of factors predisposing factors, enabling factors, and need factors. Demographics, social structure and health beliefs are some of the predisposing factors. Facilitative factors include family and community resources. Need factors are associated with perceived or assessed health status.

Regarding childhood diarrhoea, the maternal education is a central element of social structure, a predisposing factor. It influences health beliefs, knowledge and attitudes towards hygiene and healthcare. Education is also associated with an empowering factor, the household wealth, which helps to obtain better water sources, sanitation, healthy food, and medical services. The place of residence is an enabling factor, on the community level. The age and sex of the child is a need factor. This model offers a powerful model of the control variables to be selected and the indirect and direct mechanisms by which the maternal education can have an effect on diarrheal disease.

Conceptual Framework Diagram (Based on an adaptation of Andersen Model):
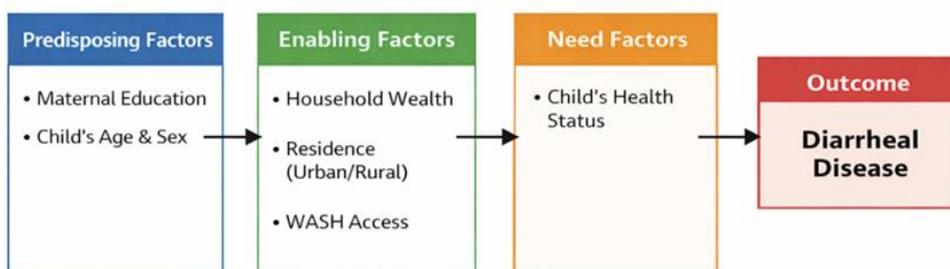

Figure 1: Conceptual Framework Diagram

The model explains the effects of maternal education in both direct and indirect ways on the incidence of diarrheal disease due to health behaviours and the enabling resource of wealth and access to WASH. This theoretical prism assists in unravelling the intricate diagram of causation and locating possible areas of intervention.

Gaps in Existing Literature

Though the relationship between maternal education and child diarrhoea is proved, there are still a number of gaps in the Nigerian situation. First, most of the sources mentioned rely on the data of previous rounds of NDHS. The recent 2023-24 NDHS analysis is important to monitor the progress and comprehend the dynamics of the fast-evolving society. Second, most studies have been lumping all under-five children, which waters down the risks that are posed to the more vulnerable under-two group, which has a different stage of development and exposure risks. Third, limited literature conducts a concurrent study of the interrelations between maternal education, household wealth, WASH, and diarrhoea in a single theoretical framework such as the Andersen framework. This paper seeks to address these lapses by offering a current, nationally representative analysis of under-two children based on a theoretical framework to define the pathways of influence.

METHODOLOGY

Data Source and Design

This secondary analysis relied on cross sectional data that was collected in the 20232024 Nigeria Demographic and Health Survey (NDHS), which is a nationally representative household survey based on two-stage stratified

cluster sampling. Probability was used in the selection of enumeration areas where the probability depends on the size and systematic household sampling of the enumeration areas was done. Women within the age 15-49 years were asked to fill in standardised maternal and child health questionnaires. The anonymised data is completely open through the DHS Programme.

Study Population

The participants who were included in the target population were children aged 0-23 months (less than two years) as a result of their physiological vulnerability, dependence on the caregiver, and specific patterns of exposure. Inclusion criteria: (1) 0-23 months of age; (2) alive at the time of the survey; (3) full data on all variables of the analysis. The last sample used in the analysis was 8,742 children.

Variables

Outcome: Diarrhoeal disease- binary (yes/no) according to the maternal/caregiver report on child diarrhoea of the two weeks before the survey. DHS describes the diarrhoea as 3 or more loose/watery stools in 24hours.

Primary Exposure: Maternal education-categorised into no education, primary, secondary, and higher (completed formal level of schooling).

Covariates: Chosen according to Andersen Behavioural Model and literature.

Predisposing: Age of the child (0-5 years, 6-9 years, 10 years-17 years, 18 years-23 years); sex of the child (male/female).

Enabling: Household wealth quintile (poorest to richest, based on principal component analysis of assets using DHS methodology); residence (urban/rural); geopolitical zone (six categories).

Need/environmental: Potable water supply (improved/unimproved according to the WHO/UNICEF JMP standards); sanitation facility (improved/unimproved according to JMP); up to date breast feeding (yes/no).

Data Analysis

Survey Design: All analyses were done in consideration of clustering, stratification, and sampling weights with svyset in Stata 18.0. Masses guaranteed national representation.

Descriptive: Frequencies and weighted percentages The sample characteristics were described using maternal education. Prevalence estimates of weighted diarrhoea including 95% CIs were computed in the totality and by covariates.

Bivariate: Design based Rao-Scott chi-square tests were used to test the association with diarrhoea.

Multivariate regression: Education and diarrhoea correlation was sequentially fitted using multivariate logistic regression:□

Model 1: Unadjusted.□

Model 2: Adapted to the age, sex, and breastfeeding factors on child level.□

Model 3: Controlled by all the covariates (predisposing, enabling, need, environmental).□

Findings are in the form of adjusted odds ratios (AORs) presented in 95% confidence intervals. Multi collinearity was measured by variance inflation factors (VIF) (cut-off VIF=10).

Stratified analysis: Urban and rural subsamples were fitted to fully adjusted models to analyze the effect modification. Wald tests were used to test interaction terms (education×residence).

Significance: $p<0.05$ (two-tailed). The study was reported according to the STROBE guidelines of cross-sectional studies.

Ethical Considerations

The NDHS was ethical and was approved by the National Health Research Ethics Committee and the ICF Institutional Review Board of Nigeria. They were informed consent and mothers/caregivers gave consent to children. This secondary analysis involved de-identified and public-use data that did not need additional review concerning ethics. Access and use of the dataset were in line with the DHS Programme.

RESULTS

Sample Characteristics

Table 1 shows the sample characteristics of the 8,742 under-two children by the education level of the mother. Among the total sample, 32.5% of mothers were not educated, 20.1% were educated to primary, 39.8% to secondary and 7.6% to higher education. There were very big disparities among various education groups. As an example, 68.4% of children whose mothers did not get any education resided in rural regions as contrasted to 24.1% of children with mothers of higher education. In the same way, a larger proportion of children of uneducated mothers were in the lowest two quintiles of wealth, which made 72.3% and only 2.8% of children of educated mothers respectively. No access to better water and sanitation was also significantly different, which again pointed to the interdependence of education, poverty and WASH infrastructure.

Table 1: Characteristics of Under-Two Children by Maternal Education Level, Nigeria 2023-24 NDHS

Characteristic	Total (N=8,742)	No Education (n=2,843)	Primary (n=1,756)	Secondary (n=3,482)	Higher (n=661)	p-value
Child's Age (months)						0.152
0-5	24.80%	25.10%	24.20%	24.70%	25.90%	
6-9	18.50%	18.90%	18.10%	18.30%	18.80%	
10-17	32.70%	32.10%	33.50%	32.90%	31.80%	
18-23	24.00%	23.90%	24.20%	24.10%	23.50%	
Child's Sex						0.874
Male	50.20%	50.50%	50.10%	50.00%	49.90%	
Female	49.80%	49.50%	49.90%	50.00%	50.10%	
Household Wealth Quintile						<0.001
Poorest	25.80%	45.20%	28.10%	12.30%	1.20%	
Poorer	24.20%	33.10%	30.50%	18.90%	1.60%	
Middle	20.10%	15.20%	23.40%	24.50%	10.50%	
Richer	16.50%	5.80%	13.50%	25.70%	32.70%	
Richest	13.40%	0.70%	4.50%	18.60%	54.00%	
Place of Residence						<0.001

Urban	44.70%	31.60%	38.90%	52.10%	75.90%	
Rural	55.30%	68.40%	61.10%	47.90%	24.10%	
Water Source						<0.001
Improved	67.30%	52.10%	64.80%	76.50%	89.10%	
Unimproved	32.70%	47.90%	35.20%	23.50%	10.90%	
Sanitation Facility						<0.001
Improved	48.90%	28.40%	42.10%	62.30%	86.20%	
Unimproved	51.10%	71.60%	57.90%	37.70%	13.80%	
Currently Breastfeeding						0.213
Yes	85.20%	84.80%	85.50%	85.40%	84.90%	
No	14.80%	15.20%	14.50%	14.60%	15.10%	

Prevalence of Diarrhea

The overall two-week prevalence of diarrhea among under-two children was 9.1%. Table 2 shows the prevalence by maternal education and other covariates. A stark gradient was observed: the prevalence was 13.5% among children of mothers with no education, 9.8% for primary, 7.2% for secondary, and 5.1% for higher education. Significant bivariate associations were also found with child's age, household wealth, rural residence, region, unimproved water, unimproved sanitation, and not being breastfed.

Table 2: Bivariate Analysis of Diarrhea Prevalence Among Under-Two Children by Selected Characteristics, Nigeria 2023 -24 NDHS

Characteristic	**Diarrhea Prevalence (%)**	**95% CI**	**p-value**
Overall	9.1	8.4-9.8	
Maternal Education			<0.001
No education	13.5	12.1-15.0	
Primary	9.8	8.3-11.5	
Secondary	7.2	6.3-8.2	
Higher	5.1	3.5-7.3	
Child's Age (months)			<0.001
0-5	7.2	6.1-8.5	
6-9	8.5	7.1-10.2	
10-17	11.2	9.9-12.6	
18-23	8.3	7.1-9.7	
Household Wealth Quintile			<0.001

Poorest	12.8	11.3-14.5	
Poorer	10.1	8.7-11.7	
Middle	8.2	6.8-9.8	
Richer	6.5	5.2-8.1	
Richest	5.0	3.8-6.6	
Place of Residence			<0.001
Urban	7.0	6.1-8.0	
Rural	10.8	9.8-11.9	
Water Source			<0.001
Improved	8.0	7.2-8.9	
Unimproved	11.4	10.1-12.8	
Sanitation Facility			<0.001
Improved	7.6	6.7-8.6	
Unimproved	10.6	9.5-11.8	

Multivariable Logistic Regression Results

Table 3 is the outcome of the sequential multi-variable logistic regression. In the unadjusted Model 1, the likelihood of getting diarrhoea reduced as the mother education level increased. In Model 3, maternal education was a strong and independent predictor following the control of all the covariates. The adjusted odds were higher, 2.81 times among children of mothers who had no education, 1.92 times among children of mothers who had primary education and 1.48 times among children of mothers who had secondary education. Additionally, poorest wealth quintile, rural residence, use of unimproved water, use of unimproved sanitation, and child age 10-17 months were additional important independent predictors in the complete model. The fact that the odds ratios of maternal education in Model 1 and Model 3 are attenuated indicates that some of the impact of its effect is conditioned by not only wealth but also by WASH.

Table 3: Sequential Multivariable Logistic Regression Models for Factors Associated with Diarrhea among Under-Two Children in Nigeria

Factor	Category	Model 1 (Unadjusted) OR [95% CI]	Model 2 (Child-Level Adjusted) AOR [95% CI]	Model 3 (Fully Adjusted) AOR [95% CI]
Maternal Education	Higher (Ref)	1	1	1
	Secondary	1.43 [1.11-1.85]	1.45 [1.12-1.88]	1.48 [1.14-1.92]
	Primary	2.03 [1.55-2.65]	2.05 [1.56-2.69]	1.92 [1.45-2.54]
	No education	2.89 [2.21-3.78]	2.95 [2.25-3.87]	2.81 [2.12-3.72]
Wealth Quintile	Richest (Ref)	1	-	1

	Richer	1.32 [0.99-1.76]	-	1.12 [0.85-1.48]
	Middle	1.70 [1.30-2.22]	-	1.23 [0.94-1.61]
	Poorer	2.17 [1.68-2.81]	-	1.38 [1.05-1.81]
	Poorest	2.81 [2.16-3.66]	-	1.65 [1.22-2.23]
Place of Residence	Urban (Ref)	1	-	1
	Rural	1.61 [1.39-1.86]	-	1.31 [1.08-1.58]
Water Source	Improved (Ref)	1	-	1
	Unimproved	1.48 [1.29-1.70]	-	1.24 [1.05-1.47]
Sanitation Facility	Improved (Ref)	1	-	1
	Unimproved	1.44 [1.26-1.64]	-	1.19 [1.01-1.40]
Child's Age (months)	0-5 (Ref)	1	1	1
	6-9	1.19 [0.93-1.52]	1.20 [0.94-1.53]	1.18 [0.92-1.51]
	10-17	1.62 [1.31-2.00]	1.63 [1.32-2.02]	1.52 [1.21-1.91]
	18-23	1.16 [0.92-1.47]	1.17 [0.92-1.48]	1.11 [0.87-1.42]

Model 2 adjusted for child's age, sex, and breastfeeding status. Model 3 adjusted for all variables in the table plus region and child's sex.

Stratified Analysis by Place of Residence

In order to discuss the effect modification further, Table 4 shows the fully adjusted models stratified by urban and rural residence. The slope of maternal education remained the same in both the settings, but the strength of association was higher in the rural regions. In rural settings, children of mother who was not educated had 3.12 times the level of odds of having diarrhoea than children of mother who was educated and the level of odds in urban areas was 2.21. This is indicative of the fact that the protective role of higher education is highly essential in resource-deprived rural settings.

Table 4: Adjusted Odds Ratios (AOR) for the Association Between Maternal Education and Diarrhea, Stratified by Place of Residence

Maternal Education	**Urban AOR [95% CI]**	**Rural AOR [95% CI]**
Higher (Ref)	1	1
Secondary	1.35 [0.98-1.86]	1.58 [1.15-2.17]
Primary	1.78 [1.26-2.52]	2.05 [1.48-2.84]
No education	2.21 [1.41-3.46]	3.12 [2.28-4.27]

Models adjusted for child's age, sex, wealth quintile, region, water source, sanitation facility, and breastfeeding status.

DISCUSSION

The paper presents an interesting and current evidence of a robust and graded negative correlation between maternal schooling and cases of diarrheal illness in children under the age of two in Nigeria. The results also correspond to the theoretical hypotheses of the Andersen Behavioural Model and prove the previous studies and provide recent data about the topic based on the national data.

The distinct trend, in which a one-step decline in education attainment leads to a huge rise in the diarrhoea risk, emphasises the fact that education is a continuum protective factor. High odds of children of mothers with no education are especially conspicuous and indicate a vulnerable group. This result is in line with previous literature in Nigeria (Desmennu *et al.*, 2017), as well as other recent multi country studies in Africa that suggest low maternal education to be a major predictor of childhood diarrhoea (Worede *et al.*, 2025; Azanaw *et al.*, 2024). The mechanisms are well explained in the literature; educated mothers have more chances of having the knowledge, resources, and autonomy to act to prevent it, e.g., by washing their hands properly, handling food safely, and seeking healthcare in a timely manner (Kompat *et al.*, 2024; Hernandez Vasquez, Rojas Rueda, and Azanedo, 2023).

These results can be interpreted with the help of Andersen model. The effect of maternal education, one of the predisposing factors, is probably achieved via several avenues. Our fully adjusted model based on incorporating education effect, wealth, and WASH indicates that knowledge, agency, and other unmeasured predisposing factors are directly involved, rather than just simply due to economic capacity. This is in line with the finding that in the presence of similar resources, maternal education affects health outcomes based on cognitive skills and empowerment (Demoze, Shibre, and Assefa, 2024). The stratified analysis also demonstrates that the association is more pronounced in the rural setting, which shows that the protective effect of education is even more critical in the environment where the enabling resources of the community level is minimal. This interrelation between individual level education and community level infrastructure is a crucial finding which implies interventions are required to be context specific.

The multifactorial nature of diarrheal disease is also supported by the independent influence of poverty, rural living and unfavourable WASH infrastructure. These aspects compound the risk in the case of less educated mothers resulting in a syndemic of disadvantage among children. It is understandable that the 10 17-month age group presents a significant risk as the stage is characterised by increased mobility and introduction of complementary foods; a high-risk stage that has been well established in many studies (Tag, Gete, & Girma, 2025). This is because our findings support the idea that strategies that are used in public health should be specific to this particular stage of development.

The implications of the policy are big. The long-term strategies should focus on and hasten female education beyond primary level because it is a long-term investment that can impact the child health outcomes of future generations. Children of mothers who have low or no education especially in rural settings should be specifically targeted by the public health initiative through community based, participatory health education that is specifically based on low literacy groups. Given that poverty and poor WASH are independent determinants of risk, diarrhoea prevention should be focused on as a part of overall campaign to enhance the economic status of the family and access to clean water and sanitation.

The strengths of this paper are that recent, nationally-representative data is utilised, there is a well-defined theoretical framework, vulnerable under-two population is examined, and the confounding factors are adjusted to have a wide scope. Nevertheless, there should be restrictions. The cross-sectional design eliminates causal inference. It depends on the recall of the mother, who could be biased. Moreover, maternal education is a measure of formal schooling, which fails to indicate the health specific literacy, as well as, the quality of schooling. There is the possibility of residual confounding of unmeasured factors.

CONCLUSION

This research confirms that maternal education is one of the strong independent social determinants of childhood diarrheal disease in Nigeria among children below two years. There is a defined dose response relationship where

children of mothers who have never had any formal schooling bear the greatest burden. The results demonstrate how social, economic, and environmental issues are intertwined in order to determine child health, which is how the Andersen Behavioral Model integrates it. The problem of preventing the burden of childhood diarrhea in Nigeria has to be handled as a multi-pronged intervention that covers educational inequalities and poverty, the inequity between rural and urban areas, as well as the lack of water and sanitation coverage. Mothers empowerment by educating is one of the most sustainable methods of protecting the health of the youngest children in the country.

RECOMMENDATIONS

Based on the findings of the study, the study suggests the following recommendations:

1. Empower and Enhance Girls Education Policies through Special Interventions

The government must stop declaring its policies to active implementation and sponsoring free, compulsory basic education to girls. This needs a multi-layered solution: conditional cash transfers or scholarships to families in the north to counter the opportunity cost of educating girls; recruiting and training more female teachers who could be safer, more relatable learning environments; and starting community-based advocacy programs concerned with traditional and religious leaders to change the cultural norm. Such targeted programs should specifically be focused on the socio-economic and cultural factors that trigger high dropout rates to make sure that girls do not fail to enroll but graduate, which will result in the long-term intergenerational health outcomes that the study demonstrates.

2. Include Child Health and WASH Literacy in the Women Educational Curricula

Programs on adult literacy and non-formal education of women, mostly operated by the National Commission of Mass Literacy, Adult and Non-Formal Education (NMEC), and affiliated non-governmental organizations, need to incorporate in a systematic manner, practical modules regarding child health. These modules are to include the prevention of diarrhea (handwashing, safe storing of water, food hygiene), identification of danger indicators, and home care and care-seeking. At the same time, simple WASH (Water, Sanitation, and Hygiene) education is to be provided, and it should be directly associated with family health outcomes. This incorporation makes literacy programs strong platforms of direct health promotion and mothers gain life-saving knowledge irrespective of their schooling level.

3. Create Low-Literacy Community-Based Health Promotion Programs.

Participatory communication strategies should be developed and scaled to mothers with fewer formal education, and they have to be designed in the collaboration with development organizations and community health workers. This includes the abandonment of materials that are heavy in text to the use of visual aids, pictorial tales, drama and interactive demonstrations that are carried out in local languages. Programs must be created using firmly existing community outlets- like women groups, religious meetings and home visits by frontline health providers to ensure cultural relevance and high attendance in order to successfully transfer the vital health and hygiene knowledge into behavioural habits.

4. Integrate and Co-locate WASH Services with Primary Maternal and Child Health care

We urgently need to enhance the integration of the hardware and software WASH interventions into the Primary Health Care (PHC) centers. This involves making sure that all PHC facilities have operative water and sanitation facilities which are gender-segregated to model the good practice. Health workers need to be educated to advise caregivers on household WASH on antenatal visits, vaccination visits, and sick-child visits. Moreover, the distribution of resources (e.g. water treatment product, soap) in the rural and poor urban settlements should be emphasized through these health channels thus forming a synergistic one-stop point in preventing diarrheal disease.

5. Fund Applied, Interdisciplinary Research on Causal Pathways and Integrated Interventions

To transform correlation into actionable insight, longitudinal studies need to be specifically funded to follow maternal education, household processes and child health longitudinarily, making the causal direction more definite. Mixed-methods research should be done complementary to examine qualitatively the concrete barriers (economic, social, gendered) which less-educated mothers encounter. Above all, there is a need of operational research to test and determine the efficacy of combined intervention frameworks that simultaneously tackle the triad of maternal education support, poverty reduction (e.g., livelihoods), and WASH access to get a strong evidence base of scalable and multi-sector programming.

REFERENCES

1. Andersen, R. M. (1995). *Revisiting the behavioral model and access to medical care: Does it matter?* Journal of Health and Social Behavior, 36**(1),** 1–10. https://doi.org/10.2307/2137284
2. Ashaolu, J. O., Ibekwe, P. I., & Adebowale, A. S. (2025). *Determinants of childhood diarrhea in low- and middle-income countries: A dual approach analysis.* BMC Public Health, 25(3845). https://doi.org/10.1186/s12889-025-25076-y
3. Azanaw, J., Malede, A., Yalew, H. F., & Worede, E. A. (2024). *Determinants of diarrhoeal diseases among under-five children in Africa (2013–2023): A comprehensive systematic review.* BMC Public Health, 24**(**1234).
4. Demoze, M., Shibre, G., & Assefa, N. (2024). *Maternal empowerment and childhood diarrhea in Ethiopia: A population-based cross-sectional study.* PLOS Global Public Health, 4(3), e0003001.
5. Desmennu, A. T., Opeyemi, O., & Oluwasanu, M. M. (2017). *Maternal education and diarrhea among children aged 0–24 months in Nigeria.* African Journal of Reproductive Health, 21(3), 27–36. https://doi.org/10.29063/ajrh2017/v21i3.2
6. Hernández Vásquez, A., Rojas Rueda, D., & Azañedo, D. (2023). *Prevalence and determinants of childhood diarrhea in Peru: A secondary analysis of the Demographic and Health Survey.* Journal of Public Health and Emergency, 7, 15.
7. Kombat, M. Y., Alhassan, R. K., & Appiah, J. A. (2024). *Diarrhea in children under-five in Ghana: Determinants and the role of maternal education.* BMC Public Health, 24(567).
8. Nigeria Demographic and Health Survey (NDHS) 2023–24. (2025). National Bureau of Statistics (NBS) & ICF.
9. Oyedibu, O. W. (2023). *Assessment of maternal strategies in the prevention of childhood diarrhea in Nigeria.* International Journal of Caring Sciences, 16**(**2), 45–58.
10. Tag, H. K., Gete, Y. K., & Girma, D. E. (2025). *Prevalence and determinants of diarrhea among children 6–23 months of age in Ethiopia: Further analysis of the 2019 Ethiopian Mini Demographic and Health Survey.* BMC Pediatrics, 25(89).
11. Tiruneh, M. G., Kassa, G. M., & Yalew, A. F. (2024). *Multilevel analysis of healthcare utilization for childhood diarrhea in high mortality countries.* Nature Communications, 15(3456).
12. World Health Organization. (2024). *Diarrhoeal disease (Fact sheet).* World Health Organization.
13. Worede, E. A., Azanaw, J., & Tiruneh, M. G. (2025). *Prevalence of diarrheal diseases and associated factors among under-five children in Africa: A systematic review and meta-analysis.* PLOS ONE, 20(3), e0326501. https://doi.org/10.1371/journal.pone.0326501
14. Yirsaw, B. G., Gebremariam, A. D., & Demissie, G. D. (2025). *Prevalence of diarrheal disease and its determinants among children under-five in East Africa: A systematic review and meta-analysis.* BMC Infectious Diseases, 25(234).
15. Zewdie, A., Solomon, E. B., & Taye, B. W. (2024). *Maternal education and child health outcomes in Sub-Saharan Africa: The mediating role of health knowledge and empowerment.* Social Science & Medicine, 340**,** 116456.