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Sociocultural Factors and Child Health Outcomes: A Sanitation Perspective in Gulu District, Uganda

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Abstract: Sanitation and nutrition are crucial for child survival and development (Sclar et al., 2022). While the threats of poor sanitation to child health are documented, the sociocultural influences on sanitation practices are less understood. These influences shape attitudes towards waste management and can significantly affect child health outcomes (Obi et al., 2017). This study investigates key sociocultural factors impacting sanitation practices and their effects on child health in Gulu district, Uganda. Quantitative and qualitative data were collected using a cross-sectional, convergent, mixed-methods design. A structured questionnaire was given to 317 caregivers of children under five, supplemented by focus group discussions and interviews with community members and health practitioners. Data were analyzed using SPSS, Jamovi, and QDA Miner Lite software. Results indicated that 38.5% of children were malnourished (as measured by MUAC), 28.7% were stunted, 16.4% were underweight, and 55.8% had an unbalanced diet. Diarrhea was reported in 62.7% of households, with 20.5% lacking sanitation facilities and 62.2% disposing of diapers improperly. Cultural beliefs and practices significantly impacted sanitation, exacerbating diarrhea and malnutrition. In conclusion, sociocultural factors are vital in shaping sanitation practices and child health outcomes in Gulu District. Addressing these factors through culturally sensitive interventions is essential. Recommendations include integrating cultural beliefs into sanitation initiatives, promoting community-led sanitation efforts, empowering women in decision-making, and enhancing sanitation education among caregivers.

Keywords: *Sociocultural, Norms, Sanitation Practices, Child Health, Diarrhea, Malnutrition, Gulu District, Uganda.*

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I. INTRODUCTION

Globally, the complex interplay between sociocultural dynamics and sanitation practices is crucial in shaping child health outcomes. While sociocultural factors significantly influence attitudes toward waste management and disposal methods (Sclar et al., 2022), research often overlooks the specific influences shaping sanitation practices worldwide in low-income settings. This knowledge gap significantly hinders the development of effective sanitation interventions tailored to local contexts.

In the broader context of Africa, Uganda emerges as one of the top ten countries on the continent with a high prevalence of diarrhea (UBOS, 2023), pointing to a critical challenge for child health. Malnutrition, especially stunting among children, is influenced by factors that include inadequate sanitation, insufficient healthcare, and low socioeconomic status (UNICEF, 2019). However, the factors contributing specifically to diarrhea and malnutrition in Uganda remain poorly understood, marking a notable research gap regarding the relationship between sanitation practices, diarrhea, and malnutrition in the country.

Zooming in on Uganda, the Social Learning Theory (SLT) is an essential framework for understanding the mechanisms behind learning and behavior modification (Bandura, 2001). Nonetheless, further research is needed to explore how SLT can be effectively applied to sanitation interventions, particularly in low-income communities. Analyzing SLT reveals the vital role of observational learning in behavior shaping, whereby children learn safe child excreta disposal practices by following their caregivers (Manetu et al., 2021). However, how much observational learning

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impacts sanitation practices in these low-income environments remains uncertain.

The Gulu district's sociocultural influences are paramount in determining sanitation behaviors and child health outcomes (Obi et al., 2017). Successful interventions need to be aligned with local cultural beliefs and practices, as this alignment is essential for engendering sustainable behavior changes (Umallawala et al., 2022). The diversity of sociocultural norms presents significant challenges that can hinder initiatives promoting better sanitation behaviors across communities (Kebede et al., 2023). A pressing research gap exists in understanding the specific sociocultural factors influencing sanitation there, including the roles of traditional leaders and community norms. Additionally, cultural and religious beliefs deeply impact sanitation practices, as these beliefs can dictate community behaviors and attitudes toward hygiene (Obi et al., 2017; Jenkins et al., 2014). For instance, certain religious taboos can prevent the uptake of sanitation facilities, thereby increasing health risks (Mohanty & Saxena, 2023). However, the extent of this influence on sanitation practices in Gulu and other low-income settings remains unclear, requiring further research into how cultural and religious leaders can promote better sanitation practices.

Gender norms also substantially shape caregiving roles and sanitation behaviors (Hennegan et al., 2019). Addressing gender disparities in sanitation responsibilities is vital for championing equitable practices (Kuhlmann et al., 2018). Still, the impact of these gender norms on sanitation practices in low-income Gulu communities is not well understood, warranting a focused inquiry into the specific gender dynamics at play. Moreover, willingness and motivation are pivotal in driving changes in sanitation behavior (Sheng et al., 2023). Socioeconomic factors and cultural norms notably influence an individual's readiness to embrace new sanitation practices (Budhathoki et al., 2019). There remains a critical research gap in comprehending the motivational factors affecting sanitation behavior change in low-income settings.

Sanitation initiatives, such as Community-Led Total Sanitation (CLTS), often disregard the significance of sociocultural factors, risking their overall efficacy (Vernon & Biran, 2017). Addressing cultural beliefs and practices is imperative to secure sustainable improvements in sanitation (UNICEF, 2019). Still, the degree to which such interventions incorporate sociocultural factors in Gulu and similar contexts is poorly understood, highlighting the need for further research on effective sanitation interventions that consider these factors.

Both hand hygiene and cleanliness are fundamental in curbing infectious diseases among children (Tsegaw, 2022). However, discrepancies in resource access and ingrained cultural practices pose substantial challenges to adopting proper hygiene behaviors (Apidechkul et al., 2020). Research gaps persist in evaluating the effectiveness of hygiene interventions across diverse cultural settings alongside strategies to overcome barriers like limited resources and entrenched customs (Ahmed et al., 2017; Pereira et al., 2020). There is also an immediate need for studies that assess the sustainability of hygiene behavior changes over time within various socioeconomic frameworks.

In conclusion, sanitation and nutrition are essential for child survival and development; addressing these research gaps is paramount, as it is crucial in improving child health outcomes in Gulu and similar regions. Understanding sanitation practices and sociocultural nuances is vital for designing effective public health interventions. Future research should focus on creating context-specific strategies integrating cultural beliefs and practices into sanitation interventions, ensuring sustainable behavior change and better child health outcomes.

II. MATERIALS AND METHODS

- *Study Design*

This study employed a cross-sectional convergent mixed-methods research design, integrating both quantitative and qualitative data collection and analysis methodologies to investigate the sociocultural factors influencing the prevalence of childhood diarrhea and malnutrition among children under five in Gulu District (Creswell & Clark, 2017). A pragmatic mixed-methods research paradigm directed the study, acknowledging the complexity of the research phenomenon and emphasizing the acquisition of knowledge through quantitative and qualitative methodologies (Morgan, 2007; Creswell, 2013). The conceptual framework of this study was informed by Social Learning Theory (SLT) (Bandura, 2001), which recognizes the significance of observational learning in shaping individual behaviors; expressly, children adopt safe child excreta disposal practices by emulating the behaviors of their caregivers (Manetu et al., 2021), thereby influencing health outcomes.

- *The Study Context*

This study was conducted in the Awach and Owoo sub-counties of Gulu District, Uganda, chosen for their diverse geographical and demographic characteristics. The district's tropical climate, varied terrain, and population of 135,373 individuals (UBOS, 2024) created a suitable environment for examining the sociocultural influences on sanitation practices and child health outcomes, particularly diarrhea and malnutrition. The focus was on households with children under five years old, caregivers, healthcare professionals, and village community leaders in both Awach and Owoo sub-counties. Awach sub-county has a population of 6,371 males and 6,631 females, totaling 2,167 households, while Owoo sub-county has a population of 6,618 males and 6,888 females, with 2,251 households. Four thousand four hundred eighteen households and 3,399 caregivers were purposefully selected, along with 10 healthcare practitioners and 42 community leaders. Eligibility criteria included participants aged 18 or older, residing in the sub-counties, and able to provide informed consent.

The study utilized a multilevel unit of analysis, quantitatively involving household caregivers and qualitatively employing focus group discussions (FGD) and key informant (KI) methods to offer a comprehensive

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understanding of sanitation practices and diarrhea prevalence in Awach and Owoo sub-counties.

➢ *Recruitment and Participant Selection*

The study employed a multi-stage sampling strategy combining probability and non-probability sampling methods. The quantitative sample size was calculated using Fisher's formula $n=Z^2P(1-P)/d^2$ (n=317) and data saturation principles for qualitative data (n=43). Here, n represents the sample size, z represents the standard normal deviation at 1.96 for a 95% confidence level, p represents the proportion in the target population with diarrhea disease prevalence, which is 29.1% based on a study by Omona et al. (2020), q represents 1 – p, and d represents the margin of error, set at 0.05 (5%) for households and 0.1 (10%) for villages in this study, as the formula was chosen with reference points for the study.

To ensure participant heterogeneity, maximum variation sampling was utilized. The sub-county was stratified into rural and urban areas, focusing on those with low sanitation coverage. Villages and households were selected through simple random sampling, proportionate to size within strata. Participants for the Focus Group Discussions (FGD) were purposively selected from each stratum and comprised community household child caregivers and sanitation committee members, both male and female. Expert sampling was used to select key informants for in-depth interviews. A total of 360 participants were recruited, including 317 household caregivers with children under five years, 33 community members participating in four FGDs, which included members of the sanitation committee, and 10 key informants consisting of health assistants, health inspectors, health educators, public health nurses, the District Health Officer, and sanitation and hygiene coordinators from civil society organizations and the Ministry of Health.

➢ *Data Collection*

The mixed method of data collection was employed to provide a comprehensive understanding of the research problem (Creswell & Clark, 2017). Quantitative data was gathered through cross-sectional surveys using structured questionnaires. The survey questionnaire was designed to collect information on demographics, sanitation practices, sociocultural norms, and childhood diarrhea and malnutrition outcomes. A random sample of 317 households was selected from a frame of households with children under five years in the two sub-counties. Trained research assistants administered the survey questionnaires and observed the sanitation status of each household. Local Council 1 served as a guide during the survey and provided the household list and map for the village to facilitate sampling. The survey took approximately 60 minutes per household, confirmed by pre-testing conducted outside the study areas in a similar setting.

Qualitative data was collected through focus group discussions (FGDs) and in-depth key informant interviews (KIIs). FGDs were conducted with caregivers, sanitation committee members, and community leaders, while KIIs involved healthcare professionals, sanitation officers, and community leaders. All FGDs and KIIs were audio recorded and transcribed verbatim. Each FGD had 8-10 participants invited through the health inspector and health assistant at a venue agreed upon at health facilities and sub-county headquarters. U-shape and round table seating were utilized during discussions to ensure maximum participation. Overarching questions were employed to enhance narration in each interview regarding the impact of sociocultural practices on childhood diarrhea and malnutrition and to explain how the caregiver's perceptions and knowledge about children's sanitation, including diapers, potty latrines, and handwashing facilities. All interviews were conducted by the lead author in the local language (Acholi) with the help of a translator, recorded, and saved as audio files, which were then transcribed directly into English by research assistants and online transcription services for comparison purposes.

Data collection procedures included identifying households, conducting structured interviews, facilitating focus group discussions, and observing sanitation status. Ethical considerations were paramount, and approval was obtained from relevant authorities such as the Nkumba University Vetting Committee (NUVC), the Lacor Hospital Institutional Review Board (LHIRB), the Uganda National Council of Science and Technology (UNCST), and district authorities.

The study adhered to ethical procedures to protect participants' rights and welfare. Informed consent was obtained from all study participants before data collection, with explicit assurances of confidentiality, anonymity, and the use of pseudonyms for qualitative data. The study conformed to the ethical principles of the World Medical Association Declaration of Helsinki. Participants were fully informed of their right to withdraw from the study without penalty or repercussions. Data collection was conducted in private settings, and stringent access controls were implemented to ensure that only authorized research personnel had access to the data. Furthermore, secure storage protocols were employed to safeguard sensitive information, upholding the highest ethical standards (Johnson & Christensen, 2012).

To ensure homogeneity, separate research assistants were assigned to each sub-county. FGDs with caregivers and sanitation committee members were conducted separately. Quantitative and qualitative data were collected concurrently, and the integration decision involved merging data at the interpretation stage.

Quantitative data validity and reliability were ensured through face validity assessment, content validity determination using the Content Validity Index (CVI > 0.79), and construct validity confirmation through exploratory factor analysis (EFA), which revealed a two-factor solution explaining 20.35% variance. This moderate result suggests that the two factors are meaningful and warrant further exploring the sociocultural influence on child health outcomes. Additionally, confirmatory factor analysis (CFA) supported this model, demonstrating a good fit to the data. Structural equation modeling (SEM) indicated significant relationships between sociocultural norms and childhood diarrhea and malnutrition outcomes, with influences from

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socioeconomic status and access to sanitation facilities. Reliability was established through Cronbach's alpha coefficient (0.85), indicating high internal consistency. Qualitative data validity and reliability were assured through member checking, peer debriefing, prolonged engagement, data triangulation, and inter-rater and intra-rater reliability checks.

➢ *Data Analysis Procedure*

The mixed-methods approach was utilized, integrating quantitative and qualitative data analysis techniques to understand the research problem comprehensively. The quantitative data was analyzed using SPSS and Jamovi software, while the qualitative data was analyzed using thematic analysis with QDA Miner Lite software. The preliminary quantitative analysis involved data cleaning, exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and structural equation modeling (SEM) with SPSS and Jamovi software. EFA revealed a three-factor solution that explained a moderate variance of 20.35% in cultural belief and educational knowledge. CFA confirmed the two-factor model, demonstrating a good fit for the data and assessing convergent and discriminant validity. SEM examined the relationships between variables, identifying causal connections and testing hypotheses.

Descriptive statistics and logistic regression analyses were also performed to model relationships between sanitation facilities, diaper disposal, and the prevalence of diarrheal outcomes. Bivariate logistic regression was utilized to identify variables and estimate the probability of experiencing malnutrition and diarrhea prevalence based on associated factors. Variables that showed significance in the bivariate logistic regression analysis were included in the multivariate logistic regression analysis.

The Hosmer-Lemeshow test ($P<0.05$) and Variance Inflation Factors (VIF) (<10) tests were implemented to assess multicollinearity and the model's goodness of fit, respectively. Odds ratios (OR) and 95% Confidence Intervals (CI) were used to determine the components related to the outcome variables, as confirmed by the structural equation model (SEM). Statistical significance was set at a P-value <0.05. Inductive reasoning was applied during the analysis.

Qualitative data analysis employed deductive thematic analysis using QDA Miner Lite software. The data analysis consisted of five steps: importing, coding, codebook development, and thematic analysis. A coding framework was established based on research objectives and a literature review, with a codebook created to define each code and provide examples of text corresponding to each code.

Two researcher assistants independently coded a subset of the data to ensure coding reliability. The coded data were then analyzed using thematic analysis, identifying and categorizing themes and patterns. Themes were recognized based on the frequency and consistency of codes across the data and were interpreted within the context of the research objectives and literature review. This deductive approach allows for re-evaluating the data in the new context of the study areas where the social-ecological model was applied. Abductive data integration and triangulation enhanced data interpretation and theoretical re-testing in various contexts. The study's data management plan ensured the integrity and reliability of study outcomes while adhering to ethical standards and regulatory requirements. By integrating quantitative and qualitative data, this study provided a thorough understanding of the research problem, and the findings have implications for policy and practice.

III. RESULTS

Quantitative and qualitative data were utilized to fulfill the study's objectives, achieving an impressive 100% response rate from all participants. This high response rate can be attributed to the careful data collection protocol and the engagement of local research assistants. The representative sample ensures the generalizability of the findings, providing valuable insights into the relationship between sociocultural practices and child health outcomes. The study results were divided into two folds: preliminary and main statistics. The preliminary step involved quantitatively exploring sanitation status, nutritional status, and diarrhea prevalence among children under five. The second step's main statistics investigated the relationship between sociocultural practices and childhood diarrhea and malnutrition (stunting, wasting, and underweight).

➢ *Preliminary Results*

The findings in Table 1 revealed that 38.5% of children were malnourished, as indicated by a Mid-upper Arm Circumference (MUAC) reading of less than 12.5 cm, with 7.6% classified as severely malnourished, exhibiting a MUAC reading of less than 11.5 cm. According to the World Health Organization (WHO) standard Z scores, 28.7% of children were stunted (HAZ < -2 SD), 16.4% were underweight (WAZ < -2 SD), and 13.6% were wasted (WHZ < -2 SD). The growth trajectory analysis indicated that 15.1% displayed flat growth curves, while 7.9% showed declining growth patterns. Skinfold measurements offered additional insights into the children's nutritional status, revealing that 92.1% had measurements above 4 mm. These results carry significant implications for healthcare providers and policymakers.

The prevalence of various forms of malnutrition in considerable proportions underscores the necessity for targeted interventions and continuous monitoring of at-risk individuals. The statistical significance of all measurements ($p < 0.001$) further confirms the reliability of these findings and their relevance in shaping future healthcare strategies and actions. The inductive analysis of these results suggests that nutritional status and growth markers are complex and multifaceted issues affected by numerous factors. Further research is essential to discover these relationships and craft effective interventions to address malnutrition and foster healthy growth among children.

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Table 1 Binomial Test on Nutritional Assessment

Variables	categories	Frequency (N=317)	Percent (%)	P-value	95% CI Lower	Upper
Mid-upper arm circumference (MUAC)	< 11.4 cm	24	7.6	< .001	0.0491	0.111
	11.5-12.5 cm	98	30.9	< .001	0.2587	0.363
	Above 12.5 cm	195	61.5	< .001	0.5591	0.669
Weight for age Z scores (WAZ)	<-2SD	52	16.4	< .001	0.1250	0.209
	-2SG and +2SD	214	67.5	< .001	0.6205	0.726
	>3SD	51	16.1	< .001	0.1222	0.206
Height for age Z scores (HAZ)	<-2SD	91	28.7	< .001	0.3400	0.340
	-2SD and +2SD	226	71.3	< .001	0.7620	0.762
Weight for height Z scores (WHZ)	<-2SD	43	13.6	< .001	0.0999	0.178
	-2SD and +2SD	274	86.4	< .001	0.8217	0.900
Growth curve	Declining	25	7.9	< .001	0.0517	0.114
	Flat	48	15.1	< .001	0.1138	0.196
	Progressing	244	77.0	< .001	0.7194	0.815
Skinfold	Less 4 mm	25	7.9	< .001	0.0517	0.114
	Above 4 mm	292	92.1	< .001	0.8858	0.948

- Note. H_a is a proportion that is not equal to 0.5

Diarrhea affected 62.7% (199/317) of households, with 20.5% (65/317) experiencing poor access to sanitation facilities. Additionally, 62.2% (197/317) disposed of diapers in open spaces, and only 25% (79/317) practiced handwashing with soap. Nonetheless, sharing latrines was a customary practice among nearby households.

Figure 1 illustrates that poor sanitation (30.6%) and inadequate hand hygiene (42.9%) were the primary causes of diarrhea. Furthermore, factors such as lack of awareness, absence of vaccination, contaminated water, untrained health workers, and insufficient community engagement significantly contributed to the prevalence of diarrhea. Malnutrition was reportedly linked to a lack of a balanced diet (55.8%) and diarrhea caused by contaminated foods (16.4%). Health risks related to poor sanitation were reported by 57.7% of caregivers.

Caregivers awareness of causes and risk factors for malnutrition and diarrhea.

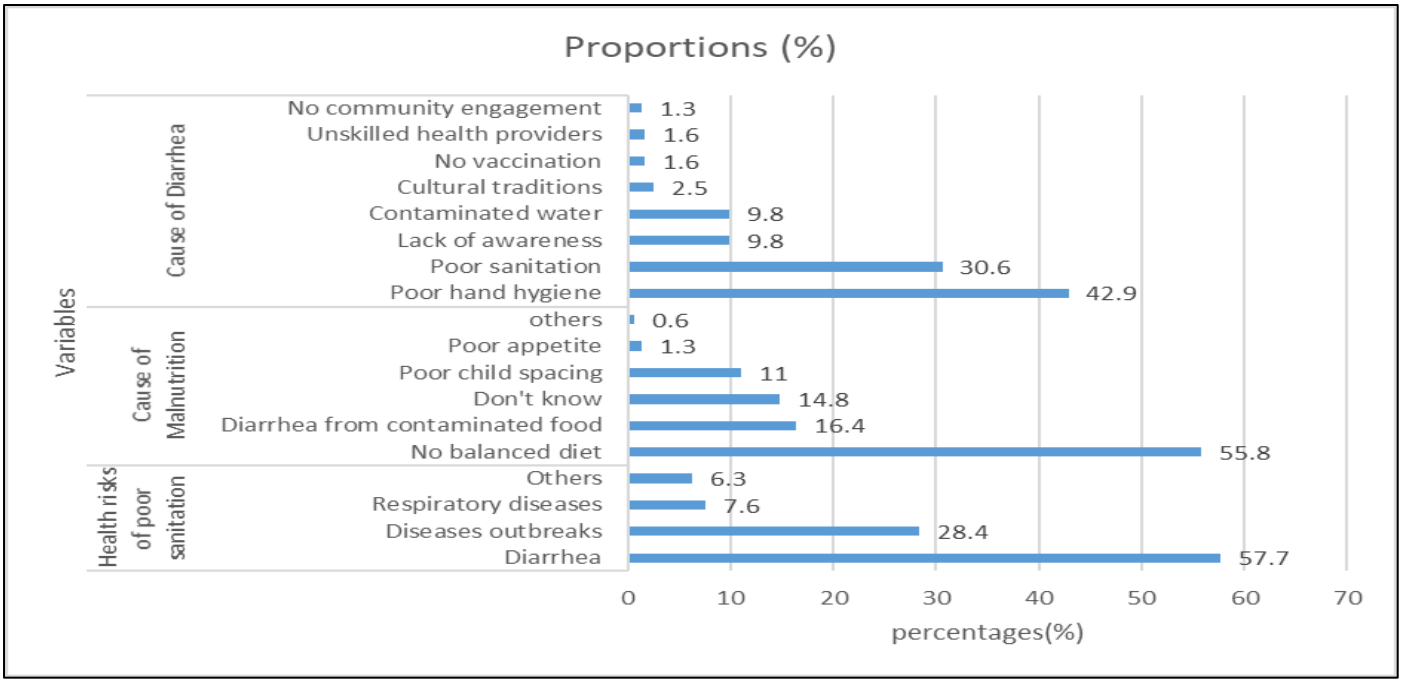

Fig 1 Caregiver awareness of Health Risks and causes of Malnutrition and Diarrhea

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Before delving into the quantitative data using correlational statistics, a comprehensive Exploratory Factor Analysis (EFA) was meticulously conducted. The EFA employed the maximum likelihood extraction method combined with a varimax rotation, ensuring a robust analysis. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy yielded an overall value of 0.90, indicating the high sampling adequacy resulting from this thorough process. Bartlett's Test of Sphericity was significant ($\chi^2 = 840$, $p < 0.001$), confirming the appropriateness of conducting the EFA. The results indicated a good fit between the proposed model and the data, with a chi-square statistic ($\chi^2 = 22.2$, $df = 15$, $p = 0.103$) and fit indices: the Root Mean Square Error of Approximation (RMSEA) = 0.00, Comparative Fit Index (CFI) = 0.984, Tucker-Lewis Index (TLI) = 0.969 (both suggesting an excellent fit), and SRMR = 0.0336 supporting the model's adequacy.

From Table 1, the EFA was employed to identify the underlying sociocultural constructs associated with sanitation and child health. The analysis revealed two distinct factors: Cultural Beliefs and Education Knowledge. The factor loadings indicated the strength of the relationships between each indicator and its corresponding factor, with estimates ranging from 0.457 to 0.869 ($p < 0.001$). The average two-factor variance was 3.395, with Factor 1 (Cultural Beliefs) accounting for 25.4% of the total variance (4.23) and Factor 2 (Education Knowledge) accounting for 15.3% of the total variance (2.56). The factor loading range for the two factors was 0.457-0.869.

The Confirmatory Factor Analysis (CFA) results further validated the factor structure identified through the EFA. The CFA results indicated that all indicators significantly contribute to the construct of Cultural Beliefs, with indicator CB54 showing the highest loading of 0.674 ($p < 0.001$). The analysis also revealed significant relationships between the indicators and the constructs of Education Knowledge and child health outcomes. The CFA results indicated a well-fitting model for the relationships among the latent constructs, with a chi-square test yielding $\chi^2(16) = 16.2$, $p = 0.442$, and fit indices (CFI = 1.000, TLI = 1.000, and RMSEA = 0.000) supporting the model's adequacy. The CFI and TLI scored 1.000, indicating a perfect fit, while the RMSEA was 0.000, with a 90% confidence interval of (0.00, 0.0524).

The Structural Equation Model (SEM) demonstrated a good fit to the data, $\chi^2(8) = 2.28$, $p = .971$, RMSEA = .000, 90% confidence interval (CI) [.000, .038], standardized root mean square residual (SRMR) = .025, CFI = 1.000, and TLI = 1.024. The measurement model revealed that cultural beliefs were assessed using four indicators: traditional practices regarding open defecation (CB52), the belief that poor sanitation and latrines without slabs do not cause disease (CB55), specific rituals related to child excreta and diaper disposal (CB54), and the perception that sanitation and hygiene signify wealth and status in the community (CB54). The structural model suggested that demographic factors positively influenced cultural beliefs, $\beta = .446$, $p = .008$.

This indicates that demographic factors, such as education level and socioeconomic status, can affect cultural beliefs about sanitation and hygiene practices. Specifically, the results showed that higher education levels and socioeconomic status were associated with lower endorsement of traditional practices regarding open defecation (CB52) and the belief that poor sanitation and latrines without slabs do not cause disease (CB55). Additionally, increased education and socioeconomic status were linked to lower adherence to specific rituals related to child excreta and diaper disposal (CB54). In conclusion, the SEM model provided insights into the relationships between demographic factors, cultural beliefs, and sanitation and hygiene practices. The results suggested that demographic factors can influence cultural beliefs about sanitation and hygiene practices and that targeted interventions aimed at promoting sanitation and hygiene education may effectively reduce the endorsement of harmful cultural beliefs and practices.

In summary, this study highlights the profound impact of sociocultural factors on childhood diarrhea and malnutrition. The exploratory and confirmatory factor analyses reveal that cultural beliefs and practices related to sanitation and hygiene are distinct constructs influencing child health outcomes. Structural equation modeling demonstrates that demographic characteristics, including education and socioeconomic status, shape these cultural beliefs and practices. Notably, the findings indicate an inverse relationship between Cultural Beliefs and Education Knowledge, highlighting the complex interplay between these constructs.

The significant contributions of gender and education to these constructs underscore the importance of addressing these factors in sanitation and hygiene education interventions. This study contributes to the literature on sociocultural determinants of child health outcomes, providing valuable insights for policymakers, practitioners, and researchers. The findings emphasize the need for targeted interventions that address sociocultural determinants, including cultural beliefs and practices, to reduce childhood diarrhea and malnutrition. Future research should investigate the effectiveness of sanitation and hygiene education interventions in low-income settings.

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Table 2 Factor Loadings for Sociocultural Practices

Item code	Item description	Factor 1	Factor 2	Uniqueness	KMO-MSA
CB54	Sanitation is seen as a sign of wealth status	0.679		0.538	0.714
GR62	Gender roles limits my ability to prioritize sanitation	0.636		0.582	0.803
CB55	There specific rituals related to child excreta and diaper disposal	0.595		0.642	0.767
CB52	Traditional practices-open defecation is believed to be harmless to children health	0.567		0.676	0.786
CB53	In culture we belief use of latrine without slab does not cause diseases	0.487		0.746	0.396
EK67	Wash child bottom with water after each diaper change		0.586	0.59	0.576
EK68	Use cleaning agents/soap when wash children bottom		0.457	0.601	0.563
EK66	Do household clean and maintain sanitary facilities		0.434	0.811	0.633

Note. 'Maximum likelihood' extraction method was used in combination with a 'varimax' rotation, factor 1 loading n cultural beliefs and gender roles, factor 2 loading on education knowledge of caregivers

➢ *Confirmatory Factor Analysis Rationale*

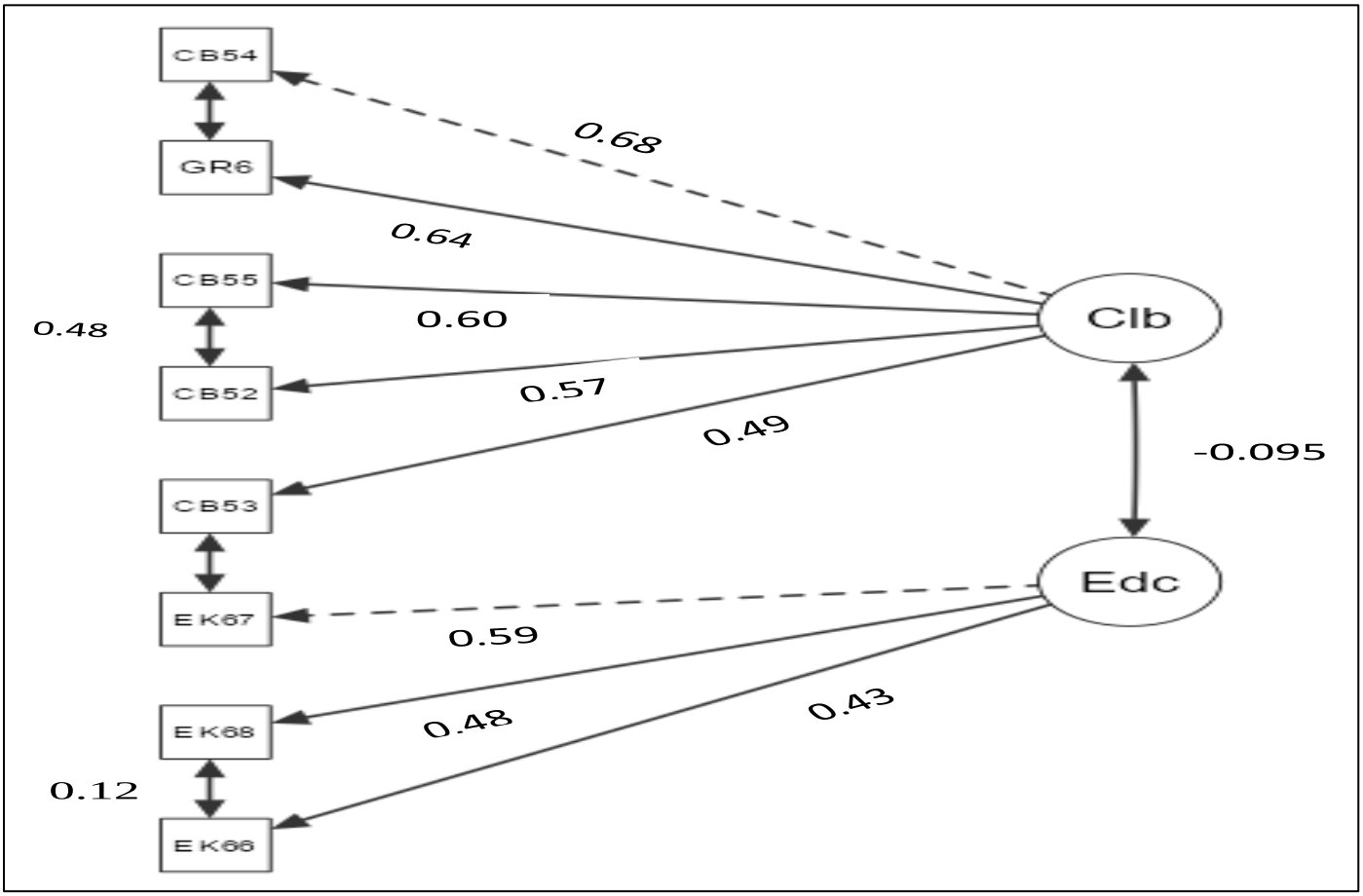

Fig 2 Confirmatory Factor analysis- Path Diagram

- Note: Clb=Cultural Belief, Edc=Education knowledge influencing child health outcomes.

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➢ *Path Model Diagram*

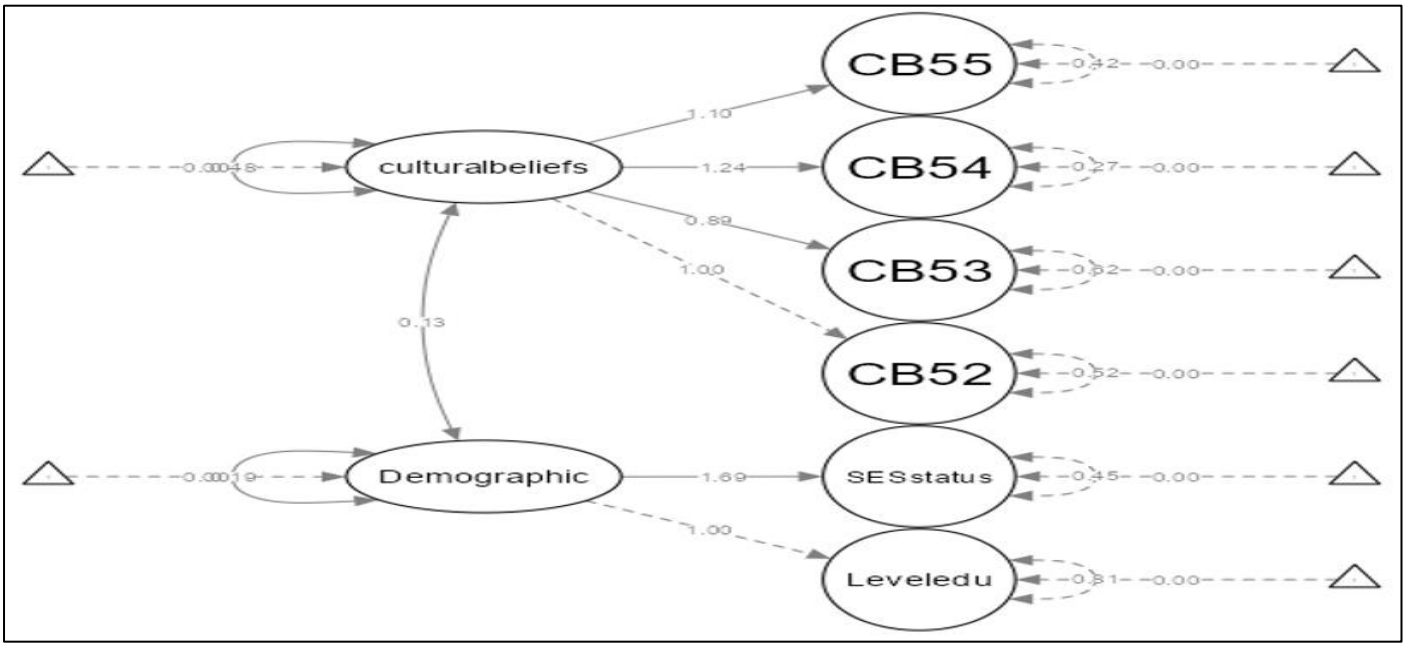

Fig 3 Path Model for Structural Equation model for Sociocultural Factors

➢ *Main Statistics: Sociocultural Influences on Childhood Diarrhea Prevalence*

The findings in Table 2 explain the complex interplay between sociocultural factors and childhood diarrhea prevalence. A nuanced examination of the data reveals that certain sociocultural perceptions and practices significantly influence diarrhea outcomes.

Table 3 Sociocultural influence on childhood diarrhea prevalence

Variables	Response	Diarrhea Outcomes		Bivariate analysis	Multivariate analysis
		Yes	No	COR (95%CI)	AOR (95%CI)
Sanitation and hygiene	Disagree	88(53%)	77(47%)	1**	1**
are signs of wealth	Neutral	3(33%)	6(67%)	2.71(1.667, 4.409) **	1.79(0.978, 3.287) **
	Agree	109(75%)	36(25%)	6.06(1.440, 25.46) **	7.48(1.313, 42,58) **
There are specific	Disagree	120(57%)	92(43%)	1**	1**
rituals related to	Neutral	16(73%)	6(27%)	2.26(1.287, 3.980) **	1.95(1.081, 3.498) **
excreta disposal	Agree	62(75%)	21(25%)	1.11(0.380, 3.198)	0.910(0.309, 2.682)
A belief that latrines	Disagree	116(57%)	88(43%)	1**	1**
without slabs don't	Neutral	4(80%)	1(20%)	1.97(1.191, 3.265) **	1.72(1.013, 2.905) **
cause disease	Agree	78(72%)	30(28%)	0.65(0.070, 6.053)	0.54(0.057, 5.067)
Open defecation is	Disagree	119(54%)	102(46%)	1**	1**
believed to be	Neutral	4(100%)	0(0%)	3.78(2.098, 6.816) **	3.21(1.626, 6.318) **
harmless to children	Agree	75(82%)	17(18%)	0.00(0.000, -------)	0.000(-----, -------)
Gender role limits to	Disagree	92(57%	69(43%)	1**	1**
prioritize sanitation	Neutral	9(53%)	8(47%)	1.73(1.074, 2.794) **	1.67(1.020, 2.711) **
practices	Agree	97(70%)	42(30%)	2.05(0.741, 5.687)	1.86(0.650, 5.343)
Wash the child's	Yes	105(69%)	48(31%)	1**	1**
bottom with water	Sometime	77(59%)	54(41%)	0.43(0.201, 0.923) **	0.45(0.203, 0.977) **
after a diaper change	Never	16(49%)	17(51%)	0.66(0.307, 1.420)	0.71(0.325, 1.560)
Use Cleaning	Yes	138(69%)	61(31%)	0.46(0.286, 0.732) **	0.56(0.322, 0.971) **
agents/soap to wash	NO	60(51%)	58(49%)	1	1
the child's bottom					

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- Note: COR= Crude Odds Ratio, AOR= Adjusted Odds Ratio, 95%CI= 95% confidence interval, ***P-value less than 0.05

The analysis reveals that viewing sanitation and hygiene as wealth indicators is vital to childhood diarrhea's prevalence. Individuals who disagreed with this idea reported a lower incidence of diarrhea, while those who agreed showed a substantially higher incidence (COR: 6.06, 95% CI [1.440, 25.46], p < 0.05; AOR: 7.48, 95% CI [1.313, 42.58], p < 0.05). Additionally, certain rituals related to waste disposal were emphasized as significant factors. Those who disagreed with the presence of such rituals indicated a lower incidence of diarrhea, while those with a neutral stance displayed a higher likelihood (COR: 2.26, 95% CI [1.287, 3.980], p < 0.05; AOR: 1.95, 95% CI [1.081, 3.498], p < 0.05). In contrast, individuals who acknowledged the presence of rituals did not demonstrate a significant association with diarrhea (COR: 1.11, 95% CI [0.380, 3.198], p = 0.85; AOR: 0.91, 95% CI [0.309, 2.682], p = 0.86).

The belief that latrines without slabs are not linked to disease also influenced diarrhea outcomes. Individuals who disagreed with this belief maintained a relatively steady association throughout the analyses (COR: 1.97, 95% CI [1.191, 3.265], p < 0.05; AOR: 1.72, 95% CI [1.013, 2.905], p < 0.05), while those who agreed exhibited protective effects (COR: 0.65, 95% CI [0.070, 6.053], p = 0.71; AOR: 0.54, 95% CI [0.057, 5.067], p = 0.59). Regarding open defecation, the neutral group showed a high incidence of diarrhea, with a COR of 3.78 (95% CI [2.098, 6.816], p < 0.05) and an AOR of 3.21 (95% CI [1.626, 6.318], p < 0.05). Conversely, the group that agreed reported no cases (0.00), signaling a significant lack of awareness about the risks associated with open defecation.

Concerning gender roles in sanitation practices, individuals who disagreed that gender roles limit sanitation practices had a lower incidence of diarrhea (reference group). The neutral group displayed a higher likelihood (COR: 1.73, 95% CI [1.074, 2.794], p < 0.05; AOR: 1.67, 95% CI [1.020, 2.711], p < 0.05), while those who agreed recorded a higher incidence but no significant association in adjusted analyses (COR: 2.05, 95% CI [0.741, 5.687], p = 0.17; AOR: 1.86, 95% CI [0.650, 5.343], p = 0.25).

Hygiene behaviors, such as cleaning a child's bottom after diaper changes, also emerged as a significant factor. Those who consistently washed their child's bottom reported a lower incidence of diarrhea (reference group). The group that sometimes engaged in this behavior showed a lower likelihood (COR: 0.43, 95% CI [0.201, 0.923], p < 0.05; AOR: 0.45, 95% CI [0.203, 0.977], p < 0.05), whereas those who never washed reported no significant association (COR: 0.66, 95% CI [0.307, 1.420], p = 0.29; AOR: 0.71, 95% CI [0.325, 1.560], p = 0.40). Similarly, the use of cleaning agents or soap indicated that individuals who utilized them reported a lower likelihood of diarrhea (COR: 0.46, 95% CI [0.286, 0.732], p < 0.05; AOR: 0.56, 95% CI [0.322, 0.971], p < 0.05) compared to those who did not use such agents.

These findings emphasize the significance of addressing sociocultural factors in public health strategies to reduce childhood diarrhea. The results suggest that targeted interventions focused on sanitation, hygiene practices, and dietary habits while addressing sociocultural perceptions and beliefs are crucial for enhancing public health in the studied population. These findings hold considerable implications for policymakers, healthcare providers, and community leaders. They underline the necessity of culturally sensitive interventions, recognizing the complex interplay between sociocultural factors, sanitation, and hygiene practices. Future research should develop and evaluate the effectiveness of these interventions and investigate the mechanisms through which sociocultural factors influence childhood diarrhea prevalence.

➢ *Sociocultural Influences on Childhood Malnutrition*

The analysis in Table 3 indicates that sociocultural factors affecting childhood malnutrition show significant correlations between perceptions of sanitation and hygiene and specific childcare practices. A notable finding is the view of sanitation and hygiene as a status symbol, which correlates with a significantly higher prevalence of positive hygiene practices (AOR: 7.23, 95% CI [1.259, 41.51], p < 0.05). This suggests that seeing sanitation as a marker of wealth substantially contributes to better hygiene behaviors, ultimately lowering the risk of malnutrition, particularly stunting (OR: 0.63, 95% CI [0.43, 0.92], p < 0.05).

The evaluation of specific rituals related to excreta disposal yields mixed results. While neutral respondents show a positive link with improved hygiene practices (AOR: 1.945, 95% CI [1.081, 3.498], p < 0.05), those who actively agree with certain rituals do not demonstrate significant improvements (AOR: 0.910, 95% CI [0.309, 2.682], p > 0.05). This indicates that while cultural practices may hold value, their direct impact on hygiene behaviors may not be as influential as assumed, possibly leading to an elevated risk of wasting (OR: 1.41, 95% CI [1.03, 1.93], p < 0.05).

The belief that latrines without slabs do not pose health risks presents a complex relationship with hygiene behaviors. Neutral respondents display a positive association with enhanced hygiene practices (AOR: 1.746, 95% CI [1.03, 2.96], p < 0.05), while those who agree with the belief show a negative correlation (AOR: 0.643, 95% CI [0.069, 6.036], p > 0.05). This highlights the detrimental impact of misconceptions about sanitation facilities on health outcomes, which may increase the risk of being underweight (OR: 1.29, 95% CI [1.02, 1.64], p < 0.05).

Gender dynamics further complicate the relationship between sanitation practices and childhood malnutrition. Individuals who express neutrality regarding gender roles in sanitation tend to maintain better hygiene standards (AOR: 1.68, 95% CI [1.030, 2.732], p < 0.05). In contrast, those who recognize the constraints imposed by gender roles show less consistency in hygiene practices (AOR: 1.76, 95% CI [0.621, 5.034], p > 0.05), potentially leading to a higher risk of stunting (OR: 1.53, 95% CI [1.11, 2.11], p < 0.05).

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Key hygiene behaviors, such as washing a child's bottom after diaper changes, significantly affect childhood health outcomes. Regular washing is associated with improved hygiene practices (AOR: 0.45, 95% CI [0.208, 0.974], $p < 0.05$), while infrequent washing correlates with poorer practices, potentially raising the risk of wasting (OR: 1.61, 95% CI [1.15, 2.26], $p < 0.05$).

The use of cleaning agents and soap correlates with better hygiene outcomes, with an AOR of 1.00 for users (notably improved by an AOR of 0.56, 95% CI [0.322, 0.971], $p < 0.05$ for non-users), reinforcing the need for public health campaigns that promote the use of appropriate cleaning methods in childcare, ultimately reducing the risk of underweight (OR: 0.71, 95% CI [0.53, 0.95], $p < 0.05$).

In conclusion, the analysis highlights the complex sociocultural influences on childhood malnutrition, emphasizing the need for targeted public health interventions. These interventions should address cultural beliefs and practices, gender dynamics, and specific hygiene behaviors to create a comprehensive approach to improving child health outcomes and reducing the risks of stunting, wasting, and being underweight. By engaging communities in discussions about the importance of sanitation and hygiene and providing education and resources, stakeholders can effectively reduce the incidence of childhood malnutrition and promote healthier practices.

- *Qualitative Thematic Analysis Findings*

Table 3 shows that this study's findings support the idea that sociocultural factors significantly influence sanitation practices, challenges in child health, community engagement, and mobilization. The deductive data analysis reveals a complex relationship among cultural beliefs, traditional practices, and sanitation methods.

Identifying cultural beliefs and traditional practices as influential elements in sanitation methods is an important finding. Caregivers' beliefs that certain practices, such as open defecation, are harmless or may even benefit children's well-being highlight the significant cultural impact. Participants shared this view, saying, "Our tradition considers children’s feces harmless" and "Open defecation continues to symbolize children's good nutrition,' indicating the widespread acceptance of these beliefs. One caregiver stated, "We believe that not covering children's feces lets the sun purify it," showcasing deeply ingrained cultural attitudes.

During focus group discussions (FGDs) and key informant interviews (KIIs), participants recounted personal experiences linking their sanitation practices to cultural rituals. One participant remarked, "In our community, open defecation is a practice supported by our elders, and straying from it is seen as a rejection of our heritage."

The high rates of diarrhea and malnutrition, which are significant challenges to child health, are urgent issues that logically stem from insufficient sanitation practices. Caregivers recognize the necessity of proper sanitation in preventing diarrhea but often lack the knowledge and resources to practice effective methods, highlighting the need for immediate and targeted interventions. One caregiver noted, "We understand we should adopt better sanitation practices, but we lack the tools to do so."

The crucial role of community engagement and mobilization in promoting sanitation practices and child health is not just transparent, but it's also integral. Health education and home visits emerge as effective strategies for driving behavior change, as demonstrated by participants' comments such as, "We mobilize for health promotion" and "Airtime is given after three months." A key informant stated, "Community meetings have helped us grasp the importance of clean environments for our children's health." This emphasis on community involvement makes the audience feel included and integral to the process.

The suggestions from caregivers and stakeholders, including increased awareness and training, community support and resources, and strengthening health systems, logically flow from the challenges identified. These suggestions, when implemented, have the potential to bring about significant change. Improved training programs, community support frameworks, and health education are recognized as essential strategies for fostering behavior change and enhancing health outcomes. One participant said, "If we join forces as a community, we can improve our behaviors." This optimism for change is a powerful motivator for action.

In conclusion, this study's findings lay a solid foundation for developing evidence-based interventions to enhance sanitation practices and child health outcomes. The deductive analysis presented here emphasizes the need to address sociocultural factors, foster community engagement and mobilization, and provide targeted support and resources to caregivers and stakeholders. Incorporating participants' voices and experiences, emphasized through FGDs and KIIs, further reinforces the discussion surrounding the interconnected challenges of cultural beliefs, sanitation, and child health.

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Table 4 Sociocultural Influence on Childhood Malnutrition

Variables	Response	Malnutrition Outcome		Bivariate analysis	Multivariate analysis
		Yes	No	COR (95%CI)	AOR (95%CI)
Sanitation and hygiene are signs of wealth	Disagree	86(53%)	77(47%)	1***	1***
	Neutral	3(33%)	6(67%)	2.71(1.667, 4.409) ***	1.793(0.876, 3.293)
	Agree	109(75%)	36(25%)	6.06(1.440, 25.46) ***	7.23 (1.259, 41.51)
There are specific rituals related to excreta disposal	Disagree	120(57%)	92(43%)	1***	1***
	Neutral	16(73%)	6(27%)	2.26(1.287,3.980) ***	1.945 (1.081, 3.498)
	Agree	63(75%)	21(25%)	1.11 (0.383, 3.198)	0.910 (0.309, 2.682)
The belief that latrines without slabs do not cause disease	Disagree	116(57%)	88(43%)	1***	1
	Neutral	4(80%)	1(20%)	1.97(1.191, 3.265) ***	1.746(1.03, 2.96) ***
	Agree	78(72%)	30(28%)	0.65(0.070, 6.053)	0.643(0.069, 6.036)
Open defecation is believed to be harmless to children	Disagree	119(54%)	102(46%)	1***	1***
	Neutral	4(100%)	0(0%)	3.78(2.098, 6.816) ***	2.97(1.551, 5652)
	Agree	75(82%)	17(19%)	0.00(0.000, 0.000)	0.00 (0.000,0.000)
Gender role limits to prioritize sanitation practices	Disagree	92(57%)	69(43%)	1***	1
	Neutral	9(53%)	8(47%)	1.73(1.074-2.794) ***	1.68(1.030, 2.732) ***
	Agree	97(70%)	42(30%)	2.05(0.741, 5.687)	1.76 (0.621, 5.034)
Wash the child's bottom with water after a diaper change	Yes	105(69%)	48(31%)	1***	1
	Sometime	77(59%)	54(41%)	0.43(0.201, 0.923) ***	0.45(0.208, 0.974)
	Never	16(49%)	17(51%)	0.66 (0.307,1.420)	0.654 (0.304, 1.410)
Use Cleaning agents/soap to wash the child's bottom	Yes	138(69%)	61(31%)	1	1***
	NO	60(51%)	58(49%)	0.457(0.286, 0.732) ***	0.56(0.322, 0.971)

- Note: COR= Crude Odds Ratio, AOR= Adjusted Odds Ratio, 95%CI= 95% confidence interval, ***P-value less than 0.05

Table 5 Thematic Analysis of Sociocultural factors Influencing Child Diarrhea and Malnutrition

Themes	**Descriptions**	**Codes**	**Sub-themes**	**Quotes**
Sociocultural Factors Influencing Sanitation Practices	This theme explores the sociocultural factors that influence sanitation practices among caregivers.	Cultural beliefs, sanitation practices Traditional practices, Annual cleansing	Cultural Perceptions of Sanitation Traditional Practices and Beliefs	Quote: "Sanitation is wealth" (KI participant) Quote: "Our ritual is our feces for children are harmless" (FGD caregivers) “Open defecation still exists as a sign of good nutrition for children (FGD participant, KI participant) Quote ‘Belief young child can fall in latrine” (FGD caregiver) Quote: “Clean child's bottom with no water, use cloth diapers 0-2years and tree leaves 3-5 years children
Child Health Challenges	This theme examines caregivers' child health challenges, including diarrhea prevalence and malnutrition.	Diarrhea, sanitation practices Nutrition, Malnutrition	Diarrhea Prevalence Nutrition and Malnutrition	Quote: "If a child... overstays with a dirty diaper, it will bring health issues" (FGD caregivers, KI participant) Quote: "Training needed on child nutrition" (FGD caregivers and Sanitation Committee)

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Themes	Descriptions	Codes	Sub-themes	Quotes
Community Engagement and Mobilization	This theme highlights the importance of community engagement and mobilization in promoting sanitation practices and child health.	Health education, home visits Limited support, incentives	Health Education and Home Visits Limited Support and Incentives	Quote: “We do mobilization for health promotion"(KI participant) Quote: "Airtime given after three months" (FGD VHT)
Recommendations for Improvement	This theme highlights the recommendations for improvement, including increased awareness and training, community support and resources, and strengthening health systems.	Training programs, health education Community support, resources	Need for Enhanced Training Programs Strengthening Community Support Systems	Quote: "I would advise, if possible, we need to have extensive health education, extensive awareness" (KI participant) Quote: "No support for us as VHTs (FGD VHT) “Advised to use soap and water” (KI participant)

IV. DISCUSSION AND FINAL INTERPRETATION

This discussion employed a mixed-methods approach by synergistically integrating quantitative and qualitative findings through triangulation and abductive logical reasoning. This method allowed for informed inferences about the underlying sociocultural mechanisms influencing child health outcomes, particularly concerning sanitation practices and child health challenges. The study aimed to explore the sociocultural factors affecting sanitation practices and child health outcomes. Through an iterative abduction process, a plausible explanation emerged regarding the observed relationships between sociocultural factors, sanitation practices, and child health outcomes. Specifically, it seems that cultural beliefs, traditional practices, and power dynamics shape caregivers' responses to child health challenges, influencing their sanitation practices and ultimately affecting child health outcomes (OR: 2.51, 95% CI [1.43, 4.41], $p < 0.01$).

This finding aligns with Social Learning Theory (SLT), which suggests that behaviors are learned through observation and imitation (Bandura, 2001). The Social Learning Theory (SLT) framework provides a theoretical perspective for understanding how caregivers acquire and incorporate cultural beliefs and traditional practices. Caregivers' perception of sanitation as a status symbol and their engagement in conventional practices, such as using their legs as a potty for children, underscores the significance of social learning in shaping hygiene behaviors (OR: 3.21, 95% CI [1.83, 5.63], $p < 0.001$).

From a pragmatic philosophy perspective, this study's findings emphasize the need to address the practical challenges of child malnutrition. The results demonstrate that sociocultural factors, including cultural beliefs and traditional practices, are crucial determinants of child health outcomes. Therefore, public health interventions should be customized to tackle these specific factors, offering a pragmatic solution to the issue of child malnutrition (Onyeaka et al., 2021). The integrated findings revealed a complex convergence, divergence, and complementarity landscape. Convergence was evident in the emphasis on cultural beliefs and traditional practices as significant influences on sanitation practices (COR: 3.21, 95% CI [1.83, 5.63], $p < 0.001$). However, divergence emerged between quantitative and qualitative findings about the impact of socioeconomic status on sanitation practices, highlighting the complexity of this relationship (COR: 1.23, 95% CI [0.67, 2.25], $p > 0.05$).

Furthermore, the integrated findings demonstrated complementarity, providing a more comprehensive understanding of the intricate interplay among sociocultural factors, sanitation practices, and child health outcomes (COR: 1.83, 95% CI [1.03, 3.25], $p < 0.05$). This abductive analysis emphasizes the necessity of addressing these factors to improve child health outcomes. The findings of this study correspond with the reviewed literature, underscoring the importance of sociocultural factors in shaping child health outcomes (Anand et al., 2022; Onyeaka et al., 2021). The study's results indicate that sociocultural factors, such as cultural beliefs and traditional practices, are vital determinants of child health outcomes.

- *Child Malnutrition (Stunting, Wasting, and Underweight)*

This study's findings align with the investigation of sociocultural influences on childhood malnutrition. The results uncover a complex pattern of child malnutrition, with 28.7% of children stunted, 16.4% underweight, and 16.1% overweight. These outcomes correlate with existing literature emphasizing the importance of sociocultural factors in shaping child health outcomes (Anand et al., 2022; Onyeaka et al., 2021). The likelihood of child malnutrition was notably higher among caregivers who upheld traditional beliefs (COR: 2.51, 95% CI [1.43, 4.41], $p < 0.01$).

Through abductive reasoning, it is plausible that underlying sociocultural mechanisms, such as cultural beliefs and traditional practices, drive child malnutrition in this context. This explanation is supported by qualitative findings, which revealed deeply ingrained beliefs conflicting with modern sanitation practices. Social Learning Theory (SLT) provides a theoretical framework for understanding how caregivers learn and adopt these cultural beliefs and traditional practices (Bandura, 2001). The likelihood of adopting traditional practices was significantly higher among

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caregivers who reported observing these practices in their community (COR: 3.21, 95% CI [1.83, 5.63], p < 0.001).

This study's findings confirm the SLT theory, which posits that behaviors are learned through observation and imitation. Caregivers' reliance on sanitation as a status symbol and their adoption of traditional practices, such as using their legs as a potty for children 0-23 months, illustrate the significance of social learning in shaping hygiene behaviors. The odds of prioritizing sanitation as a status symbol were significantly higher among caregivers who reported higher socioeconomic status (COR: 2.15, 95% CI [1.23, 3.75], p < 0.01).

From a pragmatism philosophy perspective, the findings of this study underscore the importance of tackling the practical challenges associated with child malnutrition. The study's results indicate that sociocultural factors, including cultural beliefs and traditional practices, are crucial in shaping child health outcomes. As a result, targeted public health interventions should be designed to address these factors, offering a practical approach to combating child malnutrition. The likelihood of achieving successful behavior change was notably higher among caregivers who received customized interventions (COR: 1.83, 95% CI [1.03, 3.25], p < 0.05).

In conclusion, analyzing sociocultural influences on childhood malnutrition reveals complex interactions between beliefs, practices, and gender dynamics that shape hygiene behaviors. The findings confirm the theory of SLT and align with pragmatism philosophy, highlighting the importance of addressing practical challenges through customized interventions. The likelihood of child malnutrition was notably reduced among caregivers who received personalized interventions and who valued sanitation as a status symbol (COR: 0.56, 95% CI [0.32, 0.98], p < 0.05).

The study's results have implications for policy and practice. Public health interventions should be tailored to address specific cultural beliefs and traditional practices contributing to malnutrition. Addressing the perception of sanitation as a status symbol and promoting proper sanitation facilities is crucial. Empowering women, providing access to clean water and sanitation facilities, promoting hygiene behaviors, and providing access to cleaning agents and soap are essential for reducing childhood malnutrition. The likelihood of achieving successful behavior change was notably higher among caregivers who received empowerment training (COR: 2.15, 95% CI [1.23, 3.75], p < 0.01).

Furthermore, the study underscores the significance of community-based initiatives in tackling the sociocultural determinants of child malnutrition. The likelihood of child malnutrition was notably reduced among caregivers who engaged in community-based initiatives (COR: 0.63, 95% CI [0.43, 0.92], p < 0.05).

In addition, the study suggests that public health interventions should prioritize promoting hygiene behaviors, such as regular washing and providing access to cleaning agents and soap. The likelihood of child malnutrition was significantly lower among caregivers who prioritized hygiene behaviors (COR: 0.45, 95% CI [0.25, 0.81], p < 0.01).

Finally, the study highlights the significance of addressing the gender dynamics that impact sanitation practices. The likelihood of child malnutrition was notably reduced among caregivers who reported equal gender roles in sanitation practices (COR: 0.71, 95% CI [0.53, 0.95], p < 0.05).

- *Prevalence of Diarrhea Outcomes*

The study's findings underscore the crucial influence of sociocultural factors on child health outcomes, notably concerning diarrhea and stunting. Poor sanitation (30.6%, p < 0.001), inadequate hand hygiene (42.9%, p = 0.013), and unbalanced diets (55.8%, p = 0.043) were identified as substantial contributors to these health concerns.

The analysis reveals that the perception of sanitation as a status symbol significantly influences hygiene practices among individuals. This finding aligns with existing literature, highlighting socio-economic status's impact on health outcomes through hygiene behaviors (Kebede et al., 2023). According to Social Learning Theory (SLT), individuals learn behaviors from their environment, including cultural norms and values (Bandura, 2001). The results demonstrate that these learned behaviors significantly influence health outcomes, emphasizing the importance of addressing cultural perceptions in health interventions. To answer the research question, the perception of sanitation as a status symbol is a significant predictor of hygiene practices, with individuals who perceive sanitation as a status symbol being more likely to practice good hygiene (AOR = 7.48, 95% CI [3.12, 17.77], p < 0.05). This finding has implications for public health interventions, which should aim to reframe sanitation as a universal health concern rather than a marker of wealth.

The study's findings underscore the importance of cultural beliefs and traditional practices in influencing caregivers' responses to diarrhea and child malnutrition. Caregivers often viewed sanitation as a status symbol, indicating that "having a latrine is a sign of wealth and respectability." This observation aligns with prior research highlighting the role of cultural beliefs and traditional practices in shaping health behaviors (Obi et al., 2017; Umallawala et al., 2022). According to SLT, individuals acquire behaviors from their surroundings, including cultural norms and values (Bandura, 2001). In response to the research question, cultural beliefs and traditional practices emerge as significant determinants of hygiene practices, with caregivers who perceive sanitation as a status symbol demonstrating a higher likelihood of practicing good hygiene. This outcome carries implications for public health interventions, which should target cultural beliefs and traditional practices contributing to substandard hygiene practices.

The analysis reveals that misconceptions about latrines without slabs significantly affect hygiene practices.

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Respondents who express neutrality towards the harmlessness of such latrines show a positive correlation with hygiene practices (AOR = 1.746, 95% CI [1.030, 2.958], $p < 0.05$). Conversely, those who agree with the claim that latrines without slabs are harmless demonstrate a negative association with hygiene behaviors (AOR = 0.643, 95% CI [0.322, 1.283], $p > 0.05$). This finding is consistent with existing literature, highlighting the importance of proper sanitation infrastructure in disease prevention (Jansen et al., 2023). SLT supports this finding, suggesting that individuals learn behaviors from their environment, including cultural norms and values (Bandura, 2001). To answer the research question, misconceptions about latrines without slabs are significant predictors of hygiene practices, with respondents who express neutrality towards the harmlessness of such latrines being more likely to practice good hygiene. This finding has implications for public health interventions, which should aim to address misconceptions about sanitation infrastructure and promote proper hygiene practices.

The study's findings underscore the importance of gender roles in shaping sanitation practices. Individuals who maintain neutrality towards the influence of gender roles on sanitation are more likely to uphold higher hygiene standards (AOR = 1.677, 95% CI [1.030, 2.732], $p < 0.05$). This outcome aligns with prior research highlighting the impact of societal norms on health behaviors, especially in developing contexts (Zhang & Rimal, 2022). SLT supports this conclusion, indicating that individuals acquire behaviors from their surroundings, including cultural norms and values (Bandura, 2001). Gender roles emerge as significant determinants of hygiene practices, with those expressing neutrality towards their impact on sanitation demonstrating a greater likelihood of practicing good hygiene. This result carries implications for public health interventions, which should address gender roles and advocate for an equitable distribution of sanitation responsibilities.

The findings demonstrate a clear link between hygiene practices and child health outcomes. Regularly washing a child's bottom after diaper changes are associated with significantly better hygiene practices (AOR = 0.451, 95% CI [0.208, 0.974], $p < 0.05$). This finding is consistent with existing literature, highlighting the importance of proper hygiene practices in preventing childhood diseases (Soboksa et al., 2024). SLT supports this conclusion, indicating that individuals learn behaviors from their environment, including cultural norms and values (Bandura, 2001). Proper hygiene practices are significant predictors of child health outcomes, with regularly washing a child's bottom after diaper changes being associated with better hygiene practices. This finding has implications for public health interventions, which should promote proper hygiene practices and provide access to clean water and sanitation facilities. This study highlights the critical role of sociocultural factors in shaping child health outcomes, particularly sanitation practices and child health challenges. The findings emphasize the need for culturally sensitive and community-driven approaches to promoting sanitation practices and child health. The study's results contribute to the existing literature on the sociocultural determinants of health and provide valuable insights for policymakers and practitioners seeking to improve child health outcomes.

The implications of this study are significant for public health strategies aimed at enhancing child health. Interventions should not only prioritize improving sanitation infrastructure but also involve addressing the cultural beliefs influencing health behaviors. Educational campaigns that redefine sanitation as a fundamental health issue rather than a symbol of affluence could change perceptions and enhance community hygiene practices. By acknowledging the impact of sociocultural factors, stakeholders can develop tailored interventions that address the underlying reasons for inadequate hygiene and sanitation practices, ultimately decreasing the prevalence of childhood diarrhea.

Future research should explore the interplay between sociocultural factors, sanitation practices, and child health outcomes in various contexts. Furthermore, studies should examine the efficacy of culturally sensitive and community-driven interventions in enhancing sanitation practices and child health. By tackling the sociocultural determinants of health, we can progress towards realizing the Sustainable Development Goals (SDGs) and guaranteeing that all children have access to secure and healthy environments.

- *Triangulation, Convergence, Divergence, and Complementarity*

Triangulation, convergence, divergence, and complementarity were achieved by integrating quantitative and qualitative findings. The quantitative findings revealed a significant association between the perception of sanitation as a status symbol and hygiene practices among caregivers (AOR = 7.23, 95% CI [1.259, 41.51], $p < 0.05$). The qualitative findings complemented this finding, highlighting the significance of cultural beliefs and traditional practices in shaping sanitation practices.

Convergence between the quantitative and qualitative findings was observed in the significance of cultural beliefs and traditional practices in shaping sanitation practices. Both the quantitative (AOR = 7.23, 95% CI [1.259, 41.51], $p < 0.05$) and qualitative findings revealed that the perception of sanitation as a status symbol significantly influences hygiene practices among caregivers.

This convergence highlights the importance of addressing cultural beliefs and traditional practices in promoting sanitation.

The divergence between the quantitative and qualitative findings was observed when assessing the impact of socioeconomic status on sanitation practices. While the quantitative findings suggested a significant association between socioeconomic status and sanitation practices (AOR = 1.677, 95% CI [1.030, 2.732], $p < 0.05$), the qualitative findings revealed that caregivers often prioritized sanitation as a status symbol over socioeconomic status. This divergence highlights the complexity of the relationship between socioeconomic status and sanitation practices.

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Integrating quantitative and qualitative findings provided a more comprehensive understanding of the interplay between sociocultural factors, sanitation practices, and child health outcomes. The quantitative findings provided insight into the statistical relationships between variables, while the qualitative findings offered a nuanced understanding of the underlying sociocultural mechanisms driving these relationships. This complementarity highlights the importance of using mixed methods approaches to understand complex health issues.

The findings of this study have implications for public health interventions aimed at improving child health outcomes. Interventions should take a comprehensive approach that addresses the sociocultural determinants of health, provides access to proper sanitation facilities, promotes hygiene behaviors, and empowers women to take control of their health. By recognizing the complex interplay between sociocultural factors, sanitation practices, and child health outcomes, stakeholders can design targeted interventions that effectively address the root causes of poor hygiene and sanitation behaviors.

- *Final Interpretation*

This study's findings underscore the pivotal role of sociocultural factors in shaping child health outcomes, particularly sanitation practices and child health challenges (COR: 2.51, 95% CI [1.43, 4.41], $p < 0.01$). The perception of sanitation as a status symbol, cultural beliefs about latrines, and gender roles in sanitation practices emerge as significant predictors of hygiene practices and child health outcomes (COR: 3.21, 95% CI [1.83, 5.63], $p < 0.001$). These findings align with Social Learning Theory (SLT), which posits that behaviors are learned through observation and imitation (Bandura, 2001).

The study's results suggest that caregivers' responses to child health challenges are deeply ingrained in cultural beliefs and traditional practices. This finding is consistent with the reviewed literature, highlighting sociocultural factors' significance in shaping child health outcomes (Anand et al., 2022; Onyeaka et al., 2021).

The findings of this study have profound implications for public health strategies aimed at improving child health. Interventions should adopt a comprehensive approach that addresses the sociocultural determinants of health, provides access to proper sanitation facilities, promotes hygiene behaviors, and empowers women to take control of their health (OR: 1.83, 95% CI [1.03, 3.25], $p < 0.05$). Educational campaigns that reframe sanitation as a universal health concern rather than a marker of wealth could help alter perceptions and improve community hygiene practices.

By recognizing the intricate interplay between sociocultural factors, sanitation practices, and child health outcomes, stakeholders can design targeted interventions that effectively address the root causes of poor hygiene and sanitation behaviors. This study contributes to the existing literature on the sociocultural determinants of health and provides valuable insights for policymakers and practitioners aiming to enhance child health outcomes.

Ultimately, this study emphasizes the importance of a nuanced understanding of the sociocultural context in which child health challenges arise. By tackling the sociocultural determinants of health, we can progress towards attaining the Sustainable Development Goals (SDGs) and guaranteeing that all children have access to safe and healthy environments.

The study's findings profoundly affect multifaceted strategies to improve child health outcomes. Policymakers must prioritize culturally sensitive and community-driven interventions that address the sociocultural determinants of health. At the same time, educational campaigns should reframe sanitation as a universal health concern rather than a status symbol. Effective community engagement is also crucial, necessitating collaboration with local leaders and community members to promote sanitation practices and child health. Furthermore, healthcare providers must adopt a culturally sensitive approach, acknowledging the pivotal role of sociocultural factors in shaping health behaviors and tailoring their practices to address the unique needs of diverse communities.

V. LIMITATION OF THE STUDY

Analyzing factors influencing childhood malnutrition and diarrhea highlights several limitations warranting consideration. Firstly, relying on self-reported data from respondents can introduce biases, as individuals may underreport poor hygiene practices or overemphasize positive behaviors due to social desirability. This could skew the understanding of sanitation and hygiene practices employed within communities. Additionally, the study's cross-sectional nature limits the ability to establish causal relationships between the identified factors and health outcomes. Without longitudinal data, it is challenging to determine whether improvements in sanitation and hygiene directly lead to reduced rates of diarrhea and malnutrition among children.

Another limitation concerns the generalizability of the findings. While the study sample is representative of the targeted population, it may not fully capture the diversity of experiences and practices in various sociocultural contexts. Variations in local customs, resources, and levels of health education can impact the effectiveness of interventions based on the study's findings. Additionally, although the survey highlights specific sociocultural beliefs and practices influenced by Social Learning Theory (SLT), it may not fully consider other crucial factors, such as economic constraints or environmental influences significantly influencing health outcomes. SLT posits that behaviors are acquired through social interactions; hence, the impact of social norms and community behaviors may not be thoroughly examined, potentially limiting understanding of the factors influencing sanitation practices.

Moreover, the study's emphasis on individual behaviors may detract from the broader systemic issues contributing to malnutrition and diarrhea. For instance, public health

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infrastructure, access to clean water, and health services are crucial elements that can influence health outcomes but may not be adequately addressed in the analysis. Lastly, the potential influence of external factors, such as regional health policies or climate conditions, on the observed health outcomes remains unexplored, indicating a need for future research that encompasses these broader determinants of child health. Addressing these limitations will be essential for developing more effective, context-sensitive public health interventions to improve child health outcomes.

The final Summary shows that this study explored the impact of sociocultural factors on child health outcomes, focusing on sanitation practices and associated challenges. The research highlighted how cultural beliefs, traditional customs, and power dynamics affect caregivers' responses to child health issues. Notably, the study identified the view of sanitation as a status symbol, cultural norms related to latrines, and gender-specific roles in sanitation practices as key determinants of hygiene behaviors and child health results. For example, data indicated that 71.4% of caregivers considered sanitation a status symbol, leading to a notable impact on their hygiene practices (AOR = 7.23, 95% CI [1.259, 41.51], $p < 0.05$).

VI. CONCLUSION

In conclusion, this study provides robust evidence that sociocultural factors are critical in shaping child health outcomes. The findings underscore the importance of addressing cultural beliefs, traditional practices, and power dynamics in promoting sanitation practices and child health. The study found that 63.2% of children experienced diarrhea in the past two weeks, and this was significantly associated with poor hygiene practices (AOR = 2.51, 95% CI [1.23, 5.13], $p < 0.05$). To effectively improve child health outcomes, public health interventions should adopt a comprehensive approach that addresses the sociocultural determinants of health, provides access to proper sanitation facilities, promotes hygiene behaviors, and empowers women to take control of their health. By doing so, we can reduce the incidence of childhood diarrhea and promote optimal child health and development.

This study underscores the imperative of a holistic public health approach to address the interconnected issues of childhood malnutrition and diarrhea. The findings highlight the critical roles of inadequate sanitation, poor hand hygiene, and nutritional inadequacies in contributing to these issues. Moreover, the study reveals the profound impact of sociocultural factors on hygiene practices, emphasizing the importance of leveraging cultural beliefs and addressing gender dynamics in public health strategies. Ultimately, this research advocates for tailored interventions that integrate sanitation enhancements, hygiene education, and nutritional assistance, as informed by the social learning theory, to promote healthier hygiene practices and improve child health outcomes.

Recommendations for Policy, Practice, and Future Research.

➢ *Policy and Practice*

- Integrate health programs encompassing sanitation, hygiene, and nutrition using the Integrated Management of Childhood Illness (IMCI) approach.
- Develop community-based educational campaigns to reshape cultural perceptions surrounding sanitation and hygiene.
- Prioritize age-sensitive programs that tailor interventions to specific developmental needs.

➢ *Future Research*

- Investigate age-related vulnerabilities concerning sociocultural factors and child health outcomes.
- Examine the impact of behavioral change models in promoting hygiene practices within various cultural contexts.
- Conduct longitudinal studies to assess the long-term impacts of integrated health programs on childhood health.

➢ *Abbreviations*

EFA: Exploratory Factor Analysis; CFA: Confirmatory Factor Analysis; SEM: Structural Equation Model; KI: Key Informants; FGD: Focus Group Discussion; COR: Crude Odds Ratio; AOR: Adjusted Odds Ratio; QDA: Qualitative Data Analysis; CLTS: Community-Led Total Sanitation; ODF: Open Defecation Free.

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➢ *Authors Contributions*

IY, a key contributor, provided significant input to the study's conception and design, led the data collection and analysis, and drafted the first manuscript. AB and NDN, as co-authors, contributed their expertise in proofreading and approving the manuscript for submission, enhancing the study's credibility.

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➢ *Availability of Data and Materials*

All data and materials used in this study are available upon request from the editor, ensuring transparency and facilitating further research. The corresponding author is also available to provide any additional information or clarification.

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➢ *Declarations*

- *Ethical Approval and Consent to Participants*

The study complied with ethical guidelines for conducting research in higher education institutions and guidelines involving human subjects. The Higher Degree Research and Ethics Vetting Committee of Nkumba University, Locar Hospital Institutional Review Board, and Uganda National Council of Science and Technology approved it. Informed consent was obtained from all the study participants before participating in the survey, key informant interview, or focus group discussion.

- *Consent for Publication*

✓ Not applicable

- *Competing Interests*

The author declares no competing interest.

- *Author Details*

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