Original Research Article

Water, sanitation, and hygiene factors associated with nutrition status among children under five years in Ewaso Narok Wetland, Laikipia County, Kenya

Colleta M. Kiilu*, John P. Oyore, Isaac J. M. Mwanzo

Department of Community Health and Epidemiology, Kenyatta University, Nairobi, Kenya

*Correspondence:
Dr. Colleta M. Kiilu,
E-mail: colleta.kiilu@gmail.com

ABSTRACT

Background: Wetlands are known to harbor disease-causing bacteria, posing health risks that can be mitigated through improved water, sanitation, and hygiene (WASH) practices. This study aimed to understand the factors affecting nutritional status and its connection to WASH-related diseases among children under five in Ewaso Narok Wetland, Laikipia County.

Methods: Using a mixed-method approach, qualitative and quantitative data were collected. Simple random method was used to identify the respondents.

Results: Findings revealed that 36% of households surveyed had children with nutritional edema, with mean age, weight, and height at 21 months, 11 kilograms, and 73 centimeters respectively. Using WHO standards, a significant proportion of children were found to be undernourished at 45.3% and stunted at 41.3%. Socio-demographic factors like caregiver education level and marital status were identified as influential on the nutrition status. While 51% of households had unimproved water sources, 86% had access to toilet facilities, predominantly traditional pit latrines. 67% of the respondents were located near a wetland with a proximity ranging from 1km to 5km. Disease prevalence among children included diarrhea (46%), typhoid-related fevers (22%), and malaria (12%), with edema significantly associated with WASH diseases.

Conclusions: Factors such as feces disposal, wetland proximity, protective gear use, handwashing, and toilet facilities were linked to child nutrition. Recommendations include implementing WASH programs, improving water and sanitation access, promoting hygiene practices, ensuring safe feces disposal, using protective gear in wetlands, and advocating for improved toilet facilities. Further research is warranted to assess intervention effectiveness and explore additional influencing factors.

Keywords: Nutrition status, Wetlands, Sanitation, Hygiene, Stunting, Underweight

INTRODUCTION

Nutrition remains closely linked to several important factors. Malnutrition is defined as nutrient deficiencies or excesses, essential nutrient imbalances, or nutrient utilization impairment.[1] Undernutrition, which includes stunting (low height-for-age), underweight (low weight-for-age), and wasting (low weight-for-height); micronutrient-related malnutrition, which includes micronutrient deficiencies or micronutrient excess; and overweight, obesity, and diet-related non-communicable diseases (NCDs) are the three broad categories of conditions.[2]

One in every nine people worldwide is still hungry or undernourished, with 149 million stunted children under

the age of five, 45 million wasted children, and 38.9 million overweight children.[3] Underweight is a persistent problem in the poorest countries, with rates up to ten times greater than in wealthy countries. Obesity and overweight are five times more prevalent in wealthy countries than in poorer ones.[4] Poor nutrition, inconsistency in water supply, illnesses, poor sanitation and hygiene, and stunted development and growth are all difficulties that children in low-income nations confront.[5]

Poor care practices, insufficient food intake, and disease caused directly or indirectly by insufficient access to proper hygiene, sanitation, and safe water are the main underlying causes of undernutrition.[6] Undernutrition accounts for roughly half of all deaths in under five, putting them at a higher danger of dying from common diseases, increasing the incidence and severity of infections, and prolonging recovery. 297,000 WASH-related diarrhea deaths occur each year globally, accounting for 5.3 percent of total deaths among children under the age of five.[5] It is estimated that one out of every five children born does not live beyond the age of five and this is largely attributed to WASH-related disease. 88 percent of diarrheal disease is caused by contaminated water, poor sanitation, and poor hygiene.[7] According to research, better WASH conditions and practices could avert 45 percent of worldwide malnutrition-related child fatalities.[8]

Every year, nearly 4 billion instances of diarrhea among children are reported in Africa due to poor sanitation.[9] In addition, 2 billion individuals globally are plagued with intestinal parasites, with children in resource-poor nations or countries bearing the brunt of the affliction. The world health organization (WHO) claims that 50 percent of malnutrition is caused by recurring diarrhea or intestinal worm infections resulting from contaminated water, poor sanitation, or poor hygiene.

In Kenya, 26% of under-fives are stunted, 11% are underweight with 4% are wasted.[10] In Laikipia County, stunting among under-fives accounts for 27% while underweight and wasting are at 14% and 4.4% respectively.[10] This shows that malnutrition is still a huge challenge, especially in children aged under 5 years. The goal of this study was to identify the WASH-related parameters that are linked to the status of nutrition among under-fives in Ewaso Narok Wetland, Laikipia County, which has fewer quality water and sanitation amenities than the national average. Scanty data has also been documented on the WASH-related factors in relation to the nutrition status in wetlands hence informing the need for this research

METHODS

Study design

The study adopted a cross-sectional design to investigate factors associated with the nutritional status of children under the age of 5 in the Ewaso Narok semi-arid wetlands. Both quantitative and qualitative data was collected.

Study setting

The study was done in the Ewaso Narok wetland semi-arid wetlands in the Laikipia west sub-county of Laikipia County. Laikipia East, Laikipia West, and Laikipia Central are the three main regions of the county, with two significant urban centers; Nyahururu to the southwest and Nanyuki to the southeast. Rumuruti is the country's capital. The County is located between the latitudes of 0° 51" North and 0° 18" South and the longitudes of 37° 24' East and 36° 11" West. According to the Kenya Population and housing Laikipia 2019, Laikipia has a population of 518,560+29.9%.

The Wetland is roughly 250 kilometers north of Nairobi, Kenya, near Rumuruti town and administrative centre which has a population of approximately 33,000 people and adjacent to Gatundia town which has a population of around 500 people. The Aberdare Mountains are the principal watershed for the papyrus wetland, which gets floodwater from Mutara and Eng'are Narok Rivers seasonally. The Ewaso Narok Wetland is vital to its people's lives, as many of them rely only on the natural resources and perennial surface water of the wetland.

Ewaso Narok Wetland, like wetlands across other parts of East Africa, ensures agricultural productivity, food security, domestic water, animal grazing, and other diversified uses. As a result, it is attracting a greater number of people. The effects of widespread use and growing population are visible in ecological degradation, poor waste management, and a decrease in the quantity and quality of water. The Ewaso Narok Wetland is situated in a rural area with limited access to safe water and sanitation. Because it is the region's most vital source of water, the under-studied wetland is critical to a big portion of the population.

Study population

The study population included all women of reproductive age (between 15-49 years) who live within the target location and have children under the age of five which translates to 127,047.

Sample size and sampling techniques

The study employed the simple random method to identify respondents using the children under 5 years' clinic visit card which contains the patient's unique identification number. The childcare provider corresponding to the unique identification numbers was then chosen one at a time from a database of random numbers until the appropriate sample size was reached. The sample size was determined by the number of children under five who are malnourished and were

exposed to WASH-related diseases. The sample size was computed using the formula developed by Fishers et al. (1998) for populations larger than 10,000 which gave us a sample size of 285. The inclusion criteria included those who gave informed consent to participate in the study, those who had children who fall in the age bracket of under 5, and those who had lived within the wetland area for more than 6 months at the time of the study. The study excluded those who did not give consent and mothers or caregivers of children who were critically ill at the time of data collection.

Data collection and variable measurement

Conducted between 28th November 2022 and 9th December 2022, the study used both quantitative and qualitative methods to collect data. Interviewer-administered semi-structured interview schedules, focus group talks, and key informant interview schedules were used as research instruments which were developed per the study's unique objectives to acquire the desired data.

Data analysis

Data analysis began on 20th January 2023 using the statistical package for social sciences (SPSS version 28) computer software program. Bloom cut-off points were utilized to assess sanitation and hygiene knowledge and practice. Pearson's independence chi-square test was used to determine relationship between nutritional status linked to the presence of stunting, BMI for age, and wasting against presence of a WASH-related disease contracted by a child in previous 2 weeks. The study variables being compared had a frequency of more than 5 responses.

The level of significance was set at $p < 0.05$ with any p-value less than the 0.05 level being considered significant. Anthropometric data was analyzed using the WHO cut-off to explain the nutrition status. The indices of interest were W/H (wasting), H/A (stunting), and W/A (underweight). A Z score of between -2 SD and -3SD was categorized as malnourished while <-3 SD reflected severe malnutrition. MUAC cut of above 135mm reflected well-nourished children, 125-135 mm reflected mild malnutrition, <125-115mm reflected moderate malnutrition and less than 115 mm reflected severe malnutrition. Qualitative data from FGDs was typed and the common views were captured, coded, and organized into themes. Results were presented in the form of graphs and tables.

WHO AnthroPlus software was used to calculate the z-scores for weight for age (WAZ), height for age (HAZ), and BMI for age (BAZ). These Z-scores were used to describe the children with wasting, or stunting. Children were considered stunted when they had a HAZ of -2 compared with the WHO Child Growth standards median of same age and sex. Wasting was defined as children with BAZ below -2 to suggest acute undernutrition or rapid weight loss.

RESULTS

Sociodemographic characteristics

A total of 289 respondents aged 15-49 years were interviewed. From the findings, more than half (59%) of respondents were married, 29% were single/never married, 12% were divorced/separated and 5% were widowed. Education status of all respondents indicates that more than two-thirds (68%) had received post-primary level education whereby 39% had completed secondary education, 15% had tertiary/university level education and 14% had not completed secondary level education. Overall, of the 32% who had not received post-secondary school education, 13% had no formal education, 12% had completed primary school and 7% had no completed primary school. Source of income shows that nearly half of all respondents either were casual labourers (31%) or had not reliable source of income (17%). For the rest, they were mainly in formal employment (17%) or had running their own businesses (15%). The religion status of all respondents reveals that the majority (73%) were Christians mainly practising as protestants (37%) or in Roman Catholic (36%). Muslims made 9% of total respondents while the remaining proportion was shared by Adventists (8%), traditionalists (5%) while 5% were not practising any form of religion as highlighted in Table 1. Average age of the respondents at the time of interview was 31.5 years, the average of age during first delivery was 21.6 years while the parity was 2 children. 53% of total respondents mentioned that the gender of their youngest child was female while the other 47% stated the gender to be male. Average age of their last-born child was 21.8 months.

Nutrition status

The minimum dietary diversity score (MDDS) indicated that 87% of the respondents had consumed all the food groups that follow the WHO guideline in the last 24 hours thus scoring a DDS score of 7. The 11% had a DDS of 6 while 2% had a DDs of 5. 36% of the households visited had a child with nutritional oedema.

Presence of nutritional oedema

Nutritional oedema is a sign of severe acute malnutrition. In nutritional oedema, water accumulates most likely as a result of reduced metabolism, with or without hypokalaemia. Nutritional oedema always starts from the feet and extends upwards to other parts of the body. 36% of households visited had a child with nutritional oedema.

Distribution of z-score indices

Means for age, weight and height were 21 months, 11 kilograms and 73 centimeters respectively. Most children had no oedema 185/288 (64.2%), although 103 had edematous malnutrition. The mean and ±SD WAZ-score for children <24 months old was -0.45±2.4, and children

24-60 months was 0.31±1.9. The mean and ±SD HAZ-score for children <24 months old was -0.86±2.36, and children 24-60 months was -2.84±1.97. The mean and ±SD BAZ-score for children <24 months old was--0.02±2.0, and children 24-60 months was 1.4±1.8 (Table 2). For WAZ and BAZ-scores, boys had lower Z scores than girls but girls 24-60 months old were more stunted than boys.

Weight for age Z-scores

Given the WHO reference population, and children who had valid WAZ measurements, 45.3% of children <24 months old and 55.4% of children 24-60 months old were below median (<-2 SD/edema) as shown in Figure 1.
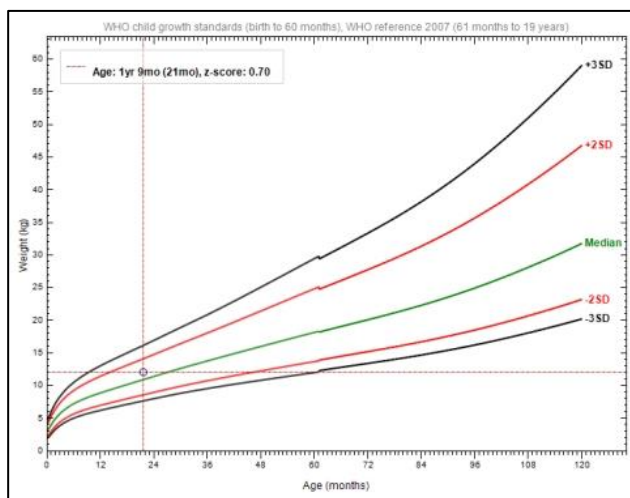

Figure 1: Weight for age Z-scores.

Length/height for age Z-scores

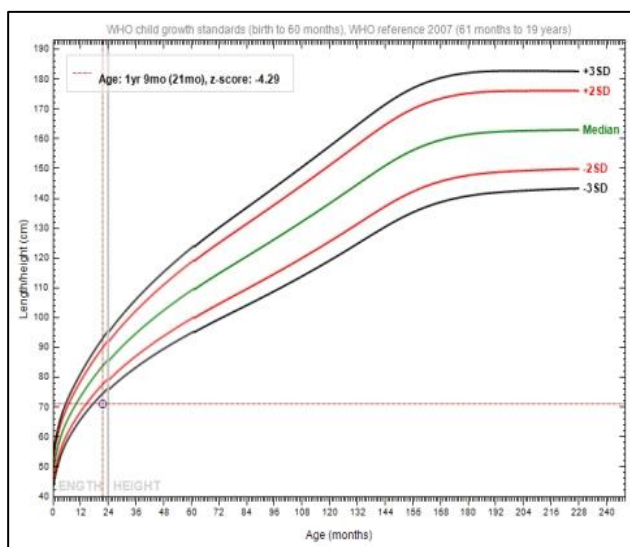Based on valid HAZ, 62/150 (41.3%) of the children were considered stunted (HAZ <-2 SD) as shown in Figure 2.

Figure 2: Length/height for age Z-scores.

BMI for age Z-scores

Based on valid BAZ, 54.0% of children <24 months old and 68.7% of the children 24-60 months old were below the median (<-2 SD or edema) as shown in Figure 3.
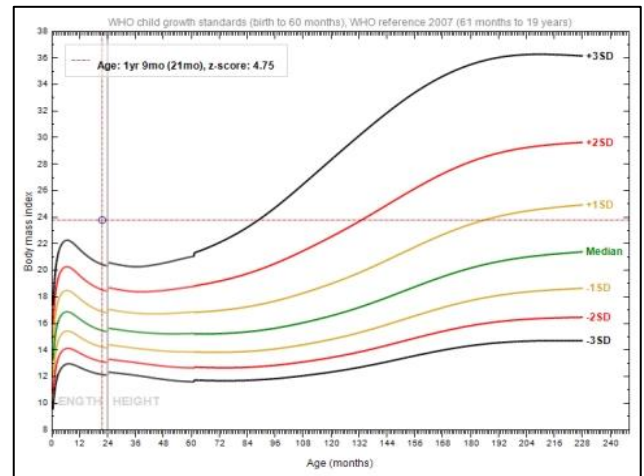

Figure 3: BMI for age Z-scores.

WASH related factors

Figure 5 shows the sources of drinking water and the proportion of improved and unimproved sources of drinking water. According to survey findings, the two most common sources of drinking water were piped water into yard/plot/building and surface water as mentioned by 33% of total respondents respectively. Overall and based on WHO categorization of improved sanitation facilities and drinking-water sources, 51% of drinking-water sources were unimproved while 49% were improved as highlighted in Figure 4.

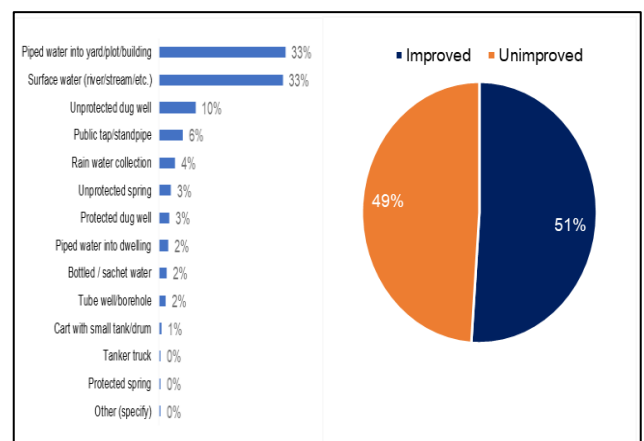**Figure 4: Sources of drinking water.**

According to WHO improved water sources include piped water into dwelling, piped water into yard/plot/building, protected dug well, protected spring, public tap/standpipe, rain water collection, tube well/borehole. Unimproved: Bottled/sachet water, cart with small tank/drum, surface water (river/stream/etc.), tanker truck, unprotected dug well, unprotected spring.

Wetland and caregiver location

The study sought to determine the association between wetlands, nutrition status, and diseases. Figure 6 seeks to establish the location of the respondent's homestead to a wetland. Based on the first chart, 67% of all respondents were located near a wetland. The approximate distance to a wetland was mainly between 1-5 km as mentioned by 44% of all respondents as highlighted in Figure 5.
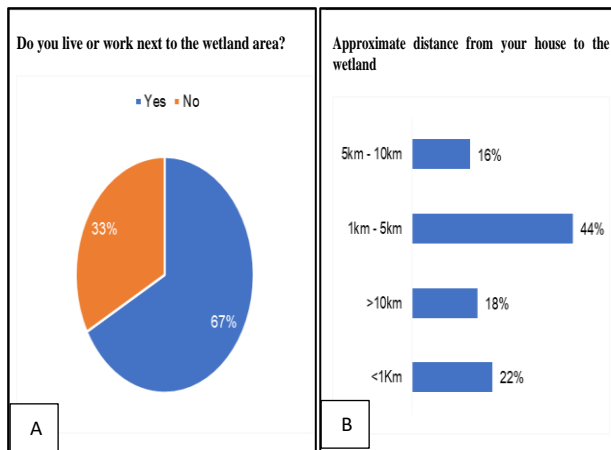

Figure 5 (A and B): Proximity to the wetlands.

WASH factors influencing nutritional status

Table 3 shows wash factors that influence the nutritional status of child that is assessed in terms of presence/absence of edema. Based on findings captured by the table the factors with significant differences are distance to the wetland; use of protective gear in wetland; washing of hands especially when eating, feeding a child, after eating and after cleaning, and type of toilet facility.

Relationship between WASH-related diseases and nutrition status

Table 4 summarises the relationship between nutritional status that has been linked to presence of stunting, BMI for age, and wasting against the presence of a WASH-related disease contracted by child in previous two weeks. A chi-square test has been used to test this relationship and a binary logistic regression utilized to provide information on odd ratio (OR).

Based on information presented in table, there is significant relationship between the nutritional status of child and WASH-related diseases (p<0.001). Notably, children who had presence of edema=3.35 times more likely to suffer from WASH diseases than those who were observed as not having presence of nutritional edema.

Table 5 shows relationship between different categories of nutrition status and occurrence of specific diseases. Most common WASH-related disease presented was diarrhea (46%) whereby of 54 children with diarrheal diseases, 18 underweight (WAZ), 17 had both underweight and stunting (HAZ), 5 children were stunted and 4 had low BMI for age. Ten of children with diarrhea did not have any form of malnutrition, 26 children with typhoid-related fevers (22%), 11 had both stunting and wasting, 7 underweight while 6 of them stunted. This was followed by malaria at 12% (n=14) where 7 children were underweighted, 6 were both underweight and stunted and only 1 child was stunted. Other common WASH-related diseases reported were Eye infections, skin infections, and worm infections. Subsequently, out of 171 children who did not have WASH-related disease, 108 (63%) had 1 for, of nutrition condition (either stunting, BMI for age/wasting). Further, out of 108 who had nutritional conditions, 93 (86%) either stunted/ wasted or both.

Table 1: Respondents profile.

Variables		N	Percentages (%)
Marital status	Married	169	59
	Single/never married	71	25
	Divorced/separated	34	12
	Widowed	14	5
Education level	Secondary completed	113	39
	Tertiary college/ university	42	15
	Secondary not completed	41	14
	No formal education	36	13
	Primary completed	35	12
	Primary not completed	21	7
Source of income	Casual labor/wage earner	90	31
	No reliable source of HH income	50	17
	Salaried employment	50	17
	Business	42	15
	Crop farming	27	9
	Animal husbandry	17	6
	Assistance (hand-outs)	9	3
	Others specify	3	1

Continued.

Variables		N	Percentages (%)
Religion	Protestant	107	37
	Roman Catholic	103	36
	Muslim	25	9
	Adventist	22	8
	None	15	5
	Traditional religion	15	5
	Pagan	1	0

Table 2: Summary of WAZ, HAZ and BAZ scores.

Age groups (in months)	N*	Z scores			
		% < -3SD	% < -2SD	Mean	SD
Weight-for-age (%)**, mean ± SD					
Set 1: Sexes combined					
0-23	110	34.9	45.3	-0.45	2.43
24-60	39	53.3	55.4	0.31	1.9
Set 2: Males					
0-23	55	44.7	52.6	-1.31	2.36
24-60	22	58.8	60.8	0.15	1.71
Set 3: Females					
0-23	55	27.1	39.6	0.24	2.28
24-60	17	46.3	48.8	0.46	2.08
Length/height-for-age (%) **, mean ± SD					
Set 1: Sexes combined					
0-23	110	21.8	30.9	-0.86	2.36
24-60	39	48.7	69.2	-2.84	1.97
Set 2: Males					
0-23	55	25.5	34.5	-1.2	2.24
24-60	22	40.9	59.1	-2.39	2.11
Set 3: Females					
0-23	55	18.2	27.3	-0.53	2.44
24-60	17	58.8	82.4	-3.41	1.65
BMI-for-age (%) **, mean ± SD					
Set 1: Sexes combined					
0-23	110	50.0	54.0	-0.02	2.0
24-60	39	67.2	68.7	1.4	1.8
Set 2: Males					
0-23	55	54.2	61	-0.38	2.1
24-60	22	68.3	70.7	0.99	1.9
Set 3: Females					
0-23	55	46.2	47.7	0.31	1.9
24-60	17	65.4	65.4	1.99	1.5

*For each indicator all children with plausible z-scores for all 3 indices are included in table (n=149).
**Percentages below median based on weight-dependent indicators are defined as <-3 SD/oedema, and <-2 SD/oedema. Oedema cases are excluded when deriving mean and SD of z-scores.

Table 3: WASH factors influencing nutritional status.

Variables	B	Std. Error	Sig.	Odd ratio
Children's faeces disposal				
Not disposed (reference group)				
Disposed of immediately	-1.38	0.6879	0.045	0.252
Distance to wetlands				
<1 km (reference group)				
5-10	-2.972	0.7504	0.00	0.051
1-5	-0.771	0.5775	0.182	0.462
>10	-0.915	0.4875	0.061	0.401

Continued.

Variables	B	Std. Error	Sig.	Odd ratio
Use of protective gear in wetland				
Yes	-0.998	0.4118	0.015	0.369
Do you do anything to make your water safe for drinking?				
Yes	-0.394	0.3902	0.312	0.674
Do you know the times when it is important to wash hands?				
Before preparing food	0.414	0.4393	0.346	1.513
Before eating	-1.479	0.396	0.00	0.228
Before feeding child	0.929	0.4258	0.029	2.532
After cleaning child's bottoms	-0.327	0.5212	0.531	0.721
After using the toilet	0.535	0.3994	0.181	1.707
After eating	-1.737	0.502	0.001	0.176
After cleaning	1.776	0.6922	0.01	5.908
After touching something sticky	-1.018	0.563	0.071	0.361
Type of toilet facility				
No facility (reference group)				
Flush toilet	0.332	1.1032	0.764	1.393
Traditional pit latrines	1.937	0.7788	0.013	6.936
Ventilated improved pit latrine	1.212	0.8661	0.162	3.36
Constant	1.258	0.5241	0.016	3.517

Table 4: Nutrition oedema and diarrheal diseases.

Variables		Has the last-born child suffered WASH-related disease in the last 2 weeks?	
		Yes	**No**
Presence of oedema	Yes	59%	41%
	No	30%	70%
P value		<0.001 at 95% level of significance	
Odd ratio		3.35	

Table 5: Cross-tabulation of WASH-related diseases and nutrition status.

Nutrition condition	No disease	Diarrhea diseases	Eye infections	Malaria	Others specify	Skin infections	Typhoid related fevers	Worm infections	Total
None	63	10	5	0	0	3	2	0	83
BAZ	15	4	0	0	0	0	0	0	19
HAZ	37	5	0	1	0	0	6	1	50
HAZ, WAZ	43	17	2	6	0	2	11	7	88
WAZ	13	18	2	7	1	0	7	0	48
Total	171	54	9	14	1	5	26	8	288

DISCUSSION

The study assessed the association between WASH-related factors and nutrition status among children under five in the Ewaso Narok wetland, Laikipia County, Kenya. The findings of the survey presented a mixed picture of the nutrition status of children under 5 years in the surveyed area. While the majority of households reported consuming all seven food groups recommended by WHO for minimum dietary diversity, a significant proportion (36%) had a child with nutritional edema, which is a sign of severe acute malnutrition.

The distribution of z-score indices for weight-for-age, height-for-age, and BMI-for-age show that a considerable proportion of children were stunted, wasted, or underweight. For instance, the mean HAZ-score for children aged 24-60 months was -2.84±1.97, indicating severe stunting. Furthermore, boys had lower WAZ scores than girls, suggesting that boys are more likely to be underweight.

These findings have significant implications for the nutrition and health of children under 5 years in the surveyed area. Children who are stunted, wasted, or underweight are at higher risk of morbidity and mortality from infectious diseases, such as pneumonia, diarrhea, and malaria. Malnutrition can also have long-term consequences on cognitive development, educational attainment, and economic productivity.[11] Malnourished children may experience stunted growth, impaired cognitive development, and delayed mental milestones, affecting their ability to learn, concentrate, and retain information. This can lead to reduced educational

attainment, limiting opportunities for employment and economic mobility. Malnutrition can also reduce economic productivity by making individuals more susceptible to illness and disease, leading to absenteeism from work or reduced work capacity.[11] Additionally, malnourished individuals may have lower cognitive function, reducing their ability to learn new skills and contribute to their workplaces. Addressing malnutrition by providing access to nutritious food and necessary nutrients is crucial to preventing these long-term consequences.

It is particularly alarming that 36% of households visited had a child with nutritional edema indicating severe acute malnutrition is prevalent in the area. This requires urgent attention, as untreated severe acute malnutrition can lead to death within a few weeks. Interventions such as therapeutic feeding programs and treatment with ready-to-use therapeutic foods (RUTF) can be lifesaving for children with severe acute malnutrition. Therapeutic feeding programs typically involve providing a combination of nutrient-dense foods and medical care to treat the underlying cause of malnutrition.[12] RUTF, on the other hand, is a specially formulated nutrient-dense paste that can be used to treat severe acute malnutrition in children. These interventions can help improve a child's nutritional status, promote healthy growth and development, and ultimately save lives. It is crucial to ensure that these interventions are widely available and accessible to those who need them most, particularly in low-income and resource-limited settings where malnutrition is most prevalent.

Similarly, the high prevalence of stunting, wasting, and underweight indicates that the quality of the food consumed may be inadequate. Improving the quality of the food consumed can be achieved through interventions such as promoting the consumption of nutrient-rich foods, such as fruits and vegetables, and fortifying staple foods with essential vitamins and minerals.

Malnutrition remains a significant public health concern in the surveyed area, with a high prevalence of stunting, wasting, and underweight, as well as a significant proportion of children with severe acute malnutrition. Urgent interventions are needed to address these nutrition challenges and improve the health and well-being of children under 5 years in the area.

This study equally demonstrates a significant relationship between the nutritional status of a child and the incidence of WASH-related diseases. The most common WASH-related disease presented was diarrhea (46%) whereby of the 54 children with diarrheal diseases, 18 were underweight (WAZ), 17 had both underweight and stunting (HAZ), 5 children were stunted and 4 had a low BMI for age. 10 of the children with diarrhea did not have any form of malnutrition. Of the 26 children with typhoid-related fevers (22%), 11 had both stunting and wasting, 7 were underweight while 6 of them were stunted. This was followed by Malaria at 12% (n=14) where 7 children were underweight, 6 were both underweight and stunted and only 1 child was stunted. Other common WASH-related diseases reported were Eye infections, skin infections, and worm infections. Subsequently, out of the 171 children who did not have a WASH-related disease, 108 (63%) had at least one of the nutrition conditions (either stunting, low BMI for age, or wasting). Further, out of the 108 who had nutritional conditions, 93 (86%) were either stunted/ wasted or both.

Children who had nutritional oedema were 3.35 times more likely to suffer from WASH diseases than those who did not have nutritional oedema. These results indicate that malnutrition is a major contributing factor to the occurrence of WASH-related diseases among children under the age of five in Ewaso Narok wetland.

The presence of nutritional edema in a child is an indication of severe acute malnutrition, which is a serious and potentially life-threatening condition. Malnutrition weakens the immune system, making children more vulnerable to infectious diseases. Inadequate intake of nutrients such as vitamins and minerals impairs the body's ability to fight infections, resulting in a higher incidence of WASH-related diseases.[13] Additionally, malnutrition can cause stunted growth and cognitive development, which can have long-term consequences on the child's health and future opportunities.

The findings also indicate that the distance to wetlands significantly influences the nutritional status of the child. Children living within a distance of 5-10 km from the wetlands have a significantly lower chance of developing edema than those living within a distance of less than 1 km. This finding suggests that the wetlands may be contaminated, and children who live near them are at a higher risk of exposure to harmful pathogens. It is argued that reducing proximity to wetlands could be an effective strategy for improving the nutritional status of children.

Overall, the findings of this study suggest that several WASH factors significantly influence the nutritional status of the child. The study highlights the importance of promoting proper handwashing practices, reducing the proximity to wetlands, promoting the use of protective gear in wetlands, and promoting the use of improved toilet facilities to improve the nutritional status of children. These findings have significant implications for policy and practice in the areas of health, hygiene, and sanitation. They suggest that interventions aimed at improving WASH practices could be effective in improving the nutritional status of children, particularly those living in resource-limited settings.

The study limitations included the lack of validated or standardized procedures for evaluating WASH-related parameters that influenced the status of nutrition among children under five years old. Consequently, there was minimal evidence of the relationship between nutrition status and WASH. The study design was cross-sectional

with a random selection of participants and only focused on caregivers with children under five living or working in the wetlands area.

CONCLUSION

In conclusion, the assessment of nutritional status among children under five years old in the Ewaso Narok wetland area revealed alarming rates of malnutrition, with significant implications for child health and well-being. The prevalence of stunting, underweight, and wasting highlights the severity of both chronic and acute malnutrition in the community, further exacerbated by the presence of nutritional edema in a substantial proportion of children. Socio-demographic factors such as caregiver education, marital status, and religion emerged as influential determinants of child nutrition outcomes, highlighting the complex interplay of social and cultural factors in shaping nutritional practices. Additionally, access to safe water and environmental hygiene practices were identified as critical factors influencing child nutrition, with disparities in water accessibility and protective measures impacting nutritional outcomes. Furthermore, the study revealed a strong correlation between malnutrition and the prevalence of WASH-related diseases, emphasizing the interconnectedness of nutrition and health outcomes. These findings underscore the urgent need for targeted interventions addressing both nutritional and WASH-related factors to improve the overall well-being of children in vulnerable communities like Ewaso Narok.

ACKNOWLEDGMENTS

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