



INFLUENCE OF WATER, SANITATION AND HYGIENE PRACTICES ON STUNTING AMONG UNDER FIVE CHILDREN IN RUKWA REGION, TANZANIA

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ABSTRACT

Stunting is among the barriers constraining growth and development of many underfive years children particularly in developing countries like Tanzania. Rukwa is among the regions with highest prevalence rate of stunting of the underfive children. Water, sanitation and hygiene (WASH) practices may contribute on stunting of underfive children in the region. The main objective of the study was to explore WASH practices influencing stunting among underfive children in Rukwa Region. A cross-sectional survey design was used to collect data from households whereby 401 mothers with children aged 6-59 months were selected by using simple random sampling. This study used raw data collected through questionnaire by Tanzania Demographic and Health Survey (TDHS) 2015/16. Data analysis was done descriptively and using logit regression model. STATA version 14 was employed to run the analysis. Results showed that spending short time in fetching water for a mother (AOR=0.468, p=0.021) as water practice, and household members use of improved toilet (AOR=0.442, p=0.041) as hygiene practice had significant influence on stunting of underfive children as the two WASH practices minimize the likelihood of stunting. The study recommends that policy makers should endorse new policies or review existing ones as well as implement most appropriate interventions which can improve household access to water and promote sanitation and hygiene especially by providing adequate clean and safe water while sensitising an improvement and use of toilets among community members so as to reverse the rate of stunting partly contributed by poor WASH practices in Rukwa Region.

1. INTRODUCTION

Stunting is a serious problem constraining growth and development of children below the age of five years in developing countries including Tanzania. Stunting has been defined by the World Health Organization (WHO) as height for age z-score of less

than negative two (HAZ<-2) or simply short for age (WHO,2006). It affects approximately 165 million of under-five children globally equivalent to 23% of all children (approximately one in every four children) (Marie et al., 2018). Stunting is an indication of chronic undernutrition which leads to impaired cognitive



development, resulting in low school performance and lower earning as adults, which in turn affects national economic growth at large.

Poor environmental conditions related to water, sanitation and hygiene (WASH) such as lack of availability and accessibility of clean and safe water, poor handwashing at a critical times, improper faecal disposal at the household level, unimproved toilet facility and sharing of toilets among members are the principle causes of diarrhoea among under-five years of age children and may contribute to stunting (Bhutta et al., 2013). The most direct pathway that links poor WASH practices to stunting is via repeated bouts of diarrhoea from a recurrent faecal-oral contamination with a resultant chronic intestinal inflammation and villous blunting (Brown et al., 2013). Apart from contaminated water, poor sanitation and hygiene, infections is also implicated in the pathogenesis of Environmental Enteric Dysfunction (EED) which is still among the possible cause of stunting among under-five children (Brown et al., 2013; Cumming et al., 2016).

In efforts to eradicate stunting and diarrhoea among under-five years of age children, access and all-time availability of safely managed water sources within the premises for purposes of drinking and other house chores is paramount (Modern et al., 2020). Moreover, safely managed sanitation services with unshared latrine facilities within the premises are also vital (Cairncross et al., 2010). People, including children, should have the convenience place for washing their hands with soap and water at all times within their premises. These improved conditions can prevent disease transmissions which lead to diarrhoea, EED and subsequently to stunting among children (Clasen et al., 2014).

In Tanzania, the average stunting prevalence has decreased from 50% in 1991/92 to 34% in 2015/16 affecting one in every three children below the age of five years. Although national prevalence rate of stunting has been observed to drop according to the Tanzania Demographic Health Survey (TDHS), still there is high stunting prevalence rate of 56% in Rukwa region affecting approximately one in every two children (TDHS 2015/2016). Also in the National Nutrition Survey (TNNS) which was conducted in 2018 in the same country, showed high rates of stunting in Rukwa Region, which was 48%. In both Tanzanian national surveys; TDHS 2015/2016 and TNNS 2018, Rukwa remained among of the regions with highest stunting prevalence rate of 56% and 48% respectively which is above World Health Organisation (WHO) threshold ($\geq 40\%$).

The linkages between stunting and nutrition are well known (e.g. Musheiguza et al., 2021; Sunguya et al., 2019; Mgongo et al., 2017), but a few has been explored on the linkages between Water, Hygiene and Sanitation (WASH) and stunting especially in Rukwa Region. Whilst the linkages between nutrition and stunting are well recognized, there is a need to explore environmental factors such as water, hygiene and sanitation, which may influence stunting outcomes (Kwami et al., 2019). Therefore, this study assessed the influence of WASH practices on stunting among under-five children in Rukwa region. The findings from this study will help the government, policy maker, WASH program officers and nutrition partners to plan appropriate nutrition interventions which incorporate WASH factors so as to reduce the rates of stunting for under-five children not only in Rukwa Region but also Tanzania as a whole.

2. STUDY OBJECTIVES

2.1 Main objective

The main objective of the study was to explore the influence of water, hygiene and sanitation (WASH) practices on stunting among under-five children in Rukwa Region.

2.2 Specific objectives

- i. To identify water practices influencing stunting among under-five children.
- ii. To assess sanitation practices influencing stunting among under-five children.
- iii. To determine hygiene practices influencing stunting among under-five children.

3. METHODOLOGY

A cross-sectional design was adopted in conducting this study. The study employed quantitative raw data from Tanzania Demographic and Health Survey (TDHS) 2015/16 which was gathered using structured questionnaire administered to mothers with children of 6 to 59 lifetime months. The questionnaire comprised of questions asking WASH practices and measurement instrument of stunting. The study used logit regression model to examine WASH practices influencing stunting among under-five children. Binary indicators was created to measure status of stunting which thereafter coded as 1 if "stunted" (HAZ less than -2 SD) and 0 if "not stunted" (HAZ greater or equal to -2 SD). Independent variables was WASH practices which were measured by selected WASH indicators using dummies except for the time spent by mothers in getting water which was measured in interval scale (walking minutes) (Table 1). Statistical analysis was performed using STATA version 14. The outputs of



logit regression model including Adjusted Odds Ratio (AOR), confidence intervals (C.I) and significance value (p value) were used in interpretation of results regarding WASH factors influencing stunting of underfive children. The following is a logit regression model used in examining WASH predictors.

$$\text{logit}(p) = \ln\left(\frac{\text{Odds}}{1 - \text{Odds}}\right) = \beta_0 + \beta_n X_n + \epsilon_i$$

Whereby; Odds=likelihood of a child to be stunted; X_n =independent variables comprising of WASH practices; β_n =coefficient of X_n ; β_0 =constant term; and error term denoted as ϵ_i .

Table 1: Independent variables and measurements used in the study

Variable	Description of indicators	Measurement
Time spent to find water within 16-35 walking minutes (W1)	Spending about 16-35 minutes in finding water.	Walking minutes
Time spent to find water in more than 35 walking minutes (W2)	Spending more than 35 minutes in finding water.	Walking minutes
Drinking water cleanliness and safety (S1)	Use of clean and safe water for drinking	1=if drinks clean and safe water 0=otherwise
Water treatment (S2)	Household treatment of water to make it safe	1=if household treat water 0=otherwise
Sharing of toilets (H1)	Whether households share toilets	1=if households share toilets 0=otherwise
Use of improved toilet (H2)	Whether households use improved toilet facility	1=if household has improved toilet 0=otherwise
Safety handwash (H3)	Use of soap/detergent for hand washing	1=if household members use soap/detergent for handwash 0=otherwise
Handwash place (H4)	Availability of clean and safe water at handwash place.	1=if handwash place has clean and safe water 0=otherwise

4. SAMPLING DESIGN

The survey sample was obtained through simple random sampling of mothers with children of 6-59 lifetime months. Sampling procedures were conducted by Tanzania Demographic and Health Survey (TDHS) in 2015/16. Based on sampling procedures undertaken, 401 mothers were selected by using simple random sampling and thereafter participated as respondents.

5. GEOGRAPHICAL AREA

Rukwa region is situated in the South West highlands of the Tanzania between Latitude of 50 and 90 degrees South of Equator, and between Longitudes of 300 and 33 degrees East. Rukwa Region has an area of 75,240 sq. km, (68,635 sq. km. of land and 6,605sq. km. of inland water) which is equivalent to 8% of the total area of Tanzania Mainland. This region has the

highest stunting prevalence rates of 56% that is approximately one in every two children (TDHS 2015/16), which is above WHO threshold (≥ 40). Therefore, this study is ideal in providing useful information to policy makers and other health sector stakeholders so that they can use the study to initiate and implement interventions which can effectively address stunting among underfive children in Rukwa region.

6. RESULTS AND DISCUSSION

6.1 Stunting among the underfive children across demographic characteristics

Demographic characteristic of a child and mother was cross-tabulated against stunting among the underfive children and results are shown in table 2.



Table 2: Cross-tabulations and chi-square tests of the association between demographic characteristics and stunting(HAZ<-2SD) among underfive children

Variable		Stunted	Normal	p-value
		%	%	
Child's age in months	0-5	32.50	67.50	0.002**
	6-23	52.52	47.48	
	24-59	62.71	37.29	
Child's sex	Male	58.24	41.76	0.260
	Female	52.30	47.70	
Residence	Rural	56.73	43.27	0.331
	Urban	50.62	49.38	
Mother's Education	Non formal education	48	52	0.015**
	Primary education	60.89	39.11	
	Secondary or higher education	38.71	61.29	

Note:**significantat p< 0.01

This study identified that stunting rate is higher among male children than female in Rukwa Region (58.24% and 52.30% respectively) although the association between sex of a child and stunting is not significant at 5% significant level. This study also found that stunting rate increases with age, from 0 to 59 months. The association between age of the child and stunting is significant (p=0.002) at 5% level of significance (Table 2). Mothers of who had underfive children participated in the study were distributed in different levels of education. Most of mothers had primary education (60.89%) while majority of mothers with stunted children were belonging to respondents who completed secondary and post secondary

education and those who never attend formal education. However, there was significant association between mother's level of education and stunting of their underfive children (p=0.015) at 5% significance level.

6.2 Influence of WASH practices on stunting among underfive children

In order to ascertain whether there is influence of WASH practices on stunting of underfive children, multiple logit model was used to examine strong WASH predictors. The findings revealed by logit regression model are summarized in table 3 below.

Table 3: WASH factors influencing stunting among underfive children

Characteristics	AOR	95% Confidence interval (C.I)		p-value
		Lower C.I	Upper C.I	
Fetching water by walking within 16-35 minutes (W1)	0.468	0.246	0.89	0.021***
Fetching water by walking in more than 35 minutes (W2)	0.711	0.392	1.289	0.262
Drinking clean and safe water (S1)	1.231	0.709	2.139	0.460
Water treatment (S2)	0.843	0.459	1.545	0.581
Sharing of toilets between households (H1)	0.842	0.518	1.370	0.489
Use of improved toilet (H2)	0.442	0.202	0.965	0.041***
Handwash by clean and safe water (H3)	0.755	0.292	1.95	0.563
Handwash place has clean and safe water (H4)	0.765	0.397	1.475	0.425
Safety handwash (H5)	0.754	0.416	1.368	0.353

Note: W=Water safety practices; S=Sanitation practices; H=Hygiene practices

In water safety practice, the study revealed that mothers of children who spend 16 to 35 minutes to

and from the water source to fetch water had Adjusted Odd Ratio (AOR) of 0.468, which indicated that



likelihood of their underfive children to be stunted was times 0.468 lower than that of their counterparts who spend more than 35 minutes ($p=0.021$) (Table 3). At 95% confidence level, the lower and upper confidence interval for a child belongs to a woman spending a range of 16 to 35 minutes to fetch water for domestic use to be stunted is 0.246 and 0.89 times lower than their counterparts belonging to women who spend more than 35 minutes to fetch water. Inaccessible water sources can cause additional financial burden on households. The water purchase and travel time to access water may drain funds required for adequate diet and time caring for children. Lack of access to safe water also affects the physical well-being of a mother and children who have no choice but to carry heavy vessels long distances to fetch water which impacts the health of families. Short time duration to access to safe water helps the families to prepare and protect themselves from illness and disease. Improved access to water could help them to practice good hygiene like handwash and will make the family members not to leave their homes to collect water for long time and save time to care for their children and hence, escape them from stunting.

As far as the use of hygiene ins concerned, it appeared that the Adjusted Odd Ratio of children who belong to mothers living in households with improved toilet facilities to be stunted was 0.442, which is significant at $p=0.041$ (Table 3). This implies that the likelihood of being stunted among children belonging to households with improved toilet facilities was times 0.442 lower than that of their counterparts who live in households which do not have improved toilets. The lower and upper confidence interval where the odds of being stunted among children belonging to households with improved toilet facilities was 0.202 to 0.965 times lower than that of their counterparts who live in households which do not have improved toilets. Therefore, there is lower possibility for children from households using improved toilet for defecation and disposal of child faeces to be stunted than children from households whose members use unimproved toilets. Stunting of children can be caused by faecal contaminations which led to frequent attacks of diseases such as diarrhoea. Poor health status of children due to frequent attacks of diseases from water contaminations with faeces discharged from unimproved toilets is often adversely affect growth and development of children and consequently may contribute to child stunting.

Evidence from descriptive statistics revealed in this study show that in Rukwa 57.97% of households dispose the stool from children in an open environment (not in the toilet) and 61.39% percent of households do

not have access to improved sanitation such as improved toilets which do not discharge faeces or allow disease transmission agents such as flies to enter in. This implies that the more open defaecation and use of unimproved toilets are practiced in the community, the more children will suffer from infectious diseases and hence result to child stunting. Moreover, the study revealed that other WASH assessment indicators including drinking clean and safe water among household members; water treatment at household level; sharing of toilets between households; use of clean and safe water for handwash; availability of water at handwash places; and use of soaps and detergents as safety handwash had no significant influence on stunting of underfive children.

7. SUGGESTIONS

This study is suggesting that policy makers should endorse new policies or review existing ones as well as implement effective interventions which can appropriately address stunting among underfive children while dealing with improvement of water, sanitation and hygiene. Policies supporting WASH interventions especially those improving household access to clean and safe water together with sensitising improvement and use of improved toilets among community members can contribute in reversing the rate of child stunting accelerated by existence of poor water, sanitation and hygiene practices in the study area.

8. CONCLUSION

Adequate childhood development is crucial especially for children who are under the age of five years due to the fact that during this lifetime children face several barriers in their growth and development including stunting. Adequate and safe drinking water, proper sanitation and adequate hygiene are key drivers of health and nutrition for human beings especially the underfive children. Rukwa Region in Tanzania is experiencing the highest rate of stunting among underfive children. Water, sanitation and hygiene practices have an influence on stunting of these children in the region. Spending few hours for mothers in fetching water for domestic uses reduces the possibilities of stunting of their children since mothers can have more time to take care of their children by making sure that children are always clean, child have access to safe water and complying with general hygienic conditions. Also, children from households with improved toilets have low possibilities of being stunted due to the fact that they are usually prevented from faecal contaminations which contribute to waterborne diseases such as diarrhea. Exposure to



waste contaminations results cause diseases to underfive children which deteriorate their health and growth. Thus, improving water, sanitation and hygiene practices especially by making water available nearby households and improving household toilets can contribute to reduce the rate of stunting among underfive children.

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