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Dissertation

Factors Associated with stunting among Children aged 6-23 months in Nyanza District, Rwanda, 2019, A Cross sectional study.

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Executive summary

Background: Stunting is a most important public health problem in developing countries. Stunting is among the priorities of Rwanda for the Sustainable Development Goals. Nyanza District is one of Districts where different nutritional interventions have been implemented to decrease malnutrition. Despite that stunting remains an important public health problem among children under 5 years in Nyanza District. We conducted this study to identify factors associated with stunting among children aged between 6 to 23 months residing in Nyanza District.

Methods: This was a cross sectional study conducted to 374 mothers and their children aged 6 to 23 months in Nyanza District from July to September 2019. Length was measured using height board; Emergency Nutrition Assessment (ENA) software was used to calculate height for age Z score. The children with height for age index below -2 Z-scores were considered stunted, and not stunted >-2 Z score according to the criteria by the WHO. A questionnaire was used to collect variables on socio demographic, maternal and children's conditions. Data was analyzed using SPSS 20. Association between the variables was assessed by using multivariate logistic regression. The level of significant was set at $p<0.05$ and CI 95%.

Results: A total of 374 children were screened for stunting in this study. Among them 28.1% were stunted. Factors significantly associated with stunting were: education level of the mothers [OR=3.14, CI 1.31 - 7.51, the poor socio economic status: Ubudehe category 1 [OR=2.96, CI 1.39 - 6.29] and ubudehe category 2 [OR = 2.83, CI 1.59 - 5.03], hand washing with soap, [OR=2.30, CI 0.13- 0.72] those factors were more likely associated with stunting.

Conclusion: Stunting remains a public health problem in Nyanza District. Factors that contributing to stunting identified are education level of the mothers; ubudehe category and hand washing with soap. We recommended increasing awareness of mothers in nutrition and hygiene and improve socio economic status of the population, to those who are in ubudehe category 1 and ubudehe category 2, by increasing income generating activities in the community in order to address poverty.

Key words: Stunting, Associated factors, Children 6-23 months, Nyanza District.

Résumé

Contexte: La malnutrition chronique reste un problème de Santé Publique dans les pays en voie de développement. La malnutrition chronique est parmi les prioritees du Rwanda pour les objectifs du développement durable. Le District de Nyanza est parmi ceux ou on a implementé differentes interventions nutritionnelles afin de réduire la malnutrition chronique. Malgré cela, la malnutrition chronique reste un problème de Santé Publique dans le District de Nyanza. L'objectif de cette étude est d'identifier les facteurs associés à la malnutrition chronique parmi les enfants de 6 à 23 mois dans le District de Nyanza, Juillet - Septembre 2019.

Méthodes: Nous avons conduit une étude transversale faite auprès de mères (374) et leurs enfants agés de 6 à 23 mois du District de Nyanza Juillet à Septembre 2019. La taille des enfants etait mesurée en position couchée en utilisant la toise. Z score était calculé en utilisant le logiciel ENA de l'OMS. Les données sur les caractéristiques sociodémographiques de la mère et des ménages ont été collectées à l'aide du questionnaire. Les mesures d'association et la signification statistique ont été évaluées à un niveau de confiance de 95% et à $p < 0,05$.

 Résultats: Un total de 374 enfants ont été pris en compte pour notre analyse de données. Le résultat a montré que la prévalence de la malnutrition chronique est 28.1%. Les facteurs qui étaient significativement associés à la malnutrition chronique étaient: le niveau d'étude de la mère [OR=3.14, CI 1.31 - 7.51, Ubudehe category 1 [OR=2.96, CI 1.39 - 6.29] et Ubudehe categorie 2 [OR = 2.83, CI 1.59 - 5.03] ainsi que se laver les mains le repas et après avoir visité la toilette [OR=2.30, CI 0.13- 0.72] Ces facteurs étaient plus susceptibles d'avoir la malnutrition chronique.

Conclusion: Nous avons identifiés le niveau d'étude de la mère, le statut socio économique ainsi que le lavage des mains avant le repas et après avoir visité la toilette comme facteurs significativement associés a la malnutrition chronique. Nous avons recommandé d'améliorer les connaissances des mères en matières de nutrition et de l'hygiene, d'ameliorer le statut socio économique de la population pauvre en créant des activités génératrices de revenue en leur faveur.

Mots clés: Malnutrition chronique, Facteurs associés, Enfants 6 -23 mois, District de Nyanza.

Dedication

I dedicate this dissertation to my family, especially my wife who worked hard to make my education possible and successful, and to my colleagues and friends who have been closely to me. Your contribution is valuable and unforgettable.

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Abbreviation and Acronyms

BFHI: Baby Friendly Hospital Initiative

CBNP: Community Based Nutrition Program

CHW: Community Health Worker

CI: Confidence Interval

CMHS: College of Medicine and Health Sciences

COR: Crude Odd Ration

DPEM: District Plan to Eliminate Malnutrition

ENA: Emergency Nutrition Assessment

FBF: Fortified Blinded Food

HAZ: Height-for- Age -Z -score

MDD: Minimum Dietary Diversity

MDGs: Millennium Development Goals

MMF: Minimum Meal Frequency

MNP: Micronutrient Powders

OR: Odds Ratio

RDHS: Rwanda Demography and Health Survey

SD: Standard deviation

SDGs: Sustainable Development Goals

SPSS: Statistical Package for Social Sciences

UNICEF: United Nations Children's Fund

WHO: World health organization

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I. Introduction

1.1. Definition of key concepts

Stunting:

UNICEF defines stunting as the percentage of children aged 0 to 59 months whose height for age is below minus two standard deviations (moderate and severe stunting) and minus three standard deviations (severe stunting) from the median of the WHO Child Growth Standards(1).

WHO defines stunting as an impaired growth and development that children experience from poor nutrition, repeated infections, and inadequate psychosocial stimulation. Children are defined as stunted if their height-for-age is less than minus two standard deviations below the WHO Child Growth Standards median (2).

Stunting is a syndrome where linear growth failure serves as a marker of multiple pathological disorders associated with increased morbidity and mortality, loss of physical growth potential, reduced neurodevelopmental and cognitive function and an elevated risk of chronic disease in adulthood(3).

1.2. Background

Malnutrition is a major public health problem faced by children under 5 years as it contributes to child morbidity and mortality, in 2016 an estimated 5.6 million children died before reaching their fifth birthday in almost half of the cases, malnutrition plays a role (4)**.**

It is estimated that globally in 2016, 22.9% or 154.8 million children under 5 years of age are malnourished in terms of stunting, defined by a low height-for-age (4)**.**The prevalence of stunting is very high in sub-Saharan Africa and South Asia 80 per cent of the world's stunted children live in 14 countries with the largest numbers of children under 5 years old who are moderately or severely stunted (India, Nigeria, Pakistan, China, Indonesia, Bangladesh, Ethiopia, Democratic Republic of the Congo, Philippines, United Republic of Tanzania, Egypt, Kenya, Uganda, Sudan) (5,6)**.**

A study conducted by Akambi BJ et al. in Sub Saharan Africa which analyzed data of 10 years from Demographic and Health Survey of the period from 2006 to 2016, revealed that countries with high rate of chronic malnutrition were: Burundi with 57.7% of stunting, Malawi 47.1%, Niger 43.9% and the Democratic Republic of Congo 42.7%(7).

Many studies comfirm that chronic malnutrition appears from conception through the first two years of life that represent the first thousand days (3, 4).

Studies show that majority of children stunted 70% are less than two years this predicts poorer cognitive and educational outcomes in later childhood and adolescence, the effect of childhood stunting leads to physical and psychological sequelae, continue through adulthood, cause intergenerational impact, loss of human potential leading to loss of social productivity (8).

Reduction of 40% in the number of stunted children under 5 by 2025 is one of targets adopted by the member states of the World Health Organization. To achieve that target many interventions have been recommended to improve child nutrition (exclusively breastfeeding from 0 to 5 months, complementary feeding from 6 to 23 months, using multiple micronutrients, vitamin A, hygiene promotion) were to be implemented during the first 1,000 days of life from conception until 2 years (9) .

Stunting is one of the MDGs not achieved by Rwanda and it is among the priorities of Rwanda for the SDGs, children under 2 years are the most vulnerable groups to stunting(10) .

Many nutrition interventions were implemented in Nyanza District to overcome the problem of malnutrition, among those interventions there are, Community Based Nutrition Program(CBNP), improving the first 1000 days of child, initiation of Baby Friendly Hospital Initiative(BFHI) to promote exclusive breast feeding, District Plan to Eliminate Malnutrition(DPEM), Community Growth monitoring and promotion, distribution of micronutrient powders (MNP) to all children of 6-24 months, supplementation food to poor family, pregnant women and children from the family of Ubudehe category 1 by giving fortified blended food(FBF), mass distribution of vitamin A and deworming to children (6-59 months) every semester (6) .

Regardless these interventions the results of Rwanda Demographic Health Survey show that chronic malnutrition is very high in Nyanza District compared to the norms of WHO(7, 8).

Thus the research question of this study is as follows:

- What is the prevalence rate of chronic malnutrition in Nyanza District?

- What are the factors associated with chronic malnutrition among children aged 6 -23 months in Nyanza District?

1.3. Study objectives

General objective:
To identify associated factors with malnutrition among children aged 6 -23 months in Nyanza District, in Southern Province of Rwanda.

Specific objectives:

1. To calculate the prevalence rate of stunting among children aged between 6 -23 months in Nyanza District.

2. To identify associated factors with stunting among children aged between 6-23 months in Nyanza District.

1.4. Literature review

The literature review aims to provide background information for the current study. It includes definition of malnutrition, the burden of the problem, Cycle of stunting, Factors associated with stunting and conceptual framework of under nutrition (stunting).

Malnutrition is defined as deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. Under nutrition includes stunting (< -2 SD height for age), wasting (< -2 SD weight for height), underweight (< -2 SD weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals), while excesses intake of energy and or nutrients include overweight, obesity (12).

Global burden

Undernutrition causes 45% of all child deaths among children of under 5 years (8) .

The current available data indicate that stunting is the most prevalent form of under nutrition globally, it is estimated that there are about 22.9 per cent or 154.8 million stunted children under 5 years, 56% of them live in Asia and 38% live in Africa, around 7.7 percent or nearly 52 million wasted children under 5 years, this makes stunting a problem of greater magnitude than underweight and wasting in developing countries (4)**.**

The current available data indicate that stunting is the most prevalent form of under nutrition globally, it is estimated that there are about 22.9 per cent or 154.8 million stunted children under 5 years, 56% of them live in Asia and 38% live in Africa, around 7.7 percent or nearly 52 million wasted children under 5 years, this makes stunting a problem of greater magnitude than underweight and wasting in developing countries (13). It is estimated that two out of five stunted children in the world live in Southern Asia (14) .

A study conducted by Akambi BJ et al. in Sub Saharan Africa which analyzed data of 10 years from Demographic and Health Survey of the period from 2006 to 2016, revealed that countries with high rate of chronic malnutrition that representing the 4 parties of Africa were: Burundi with 57.7% of stunting in East, Malawi with 47.1% in Southern, Niger 43.9% in West and the Democratic Republic of Congo 42.7% in Central of Africa(7).

Cycle of stunting

The cycle of stunting may begin with the undernourished mother who cannot provide her child with sufficient nutrients at the fetal stage, as she herself has not benefited from a rich diet. However, it is during the first 1000 days following its conception that the baby is most vulnerable and that damage incurred tends to be irreversible.

The first 1,000 days of life are defined as the period from conception to 2 years of age and nutrition along this period is crucial for child growth and development. The period of pregnancy and childhood are important periods for the development of the child, where the

brain function is established. This is an optimal window for interventions to improve maternal and infant nutrition, reduce risk to child of developing chronic diseases at the adult age (15) .

Some authors have shown that stunting could continue until 5 years of age, but more than two-thirds of being stunted appeared when child has less than 2 years of life (5) .

Factors associated with child stunting

Many studies reveal that there are different factors associated with stunting, among those factors are maternal nutritional status, breastfeeding practice especial the delayed initiation, non-exclusive breastfeeding, early cessation of breastfeeding feeding practices, complementary feeding, education level of mother, social economic status of the household, hygiene and sanitation conditions, infectious disease and accessibility to health facilities are factors associated with stunting to children aged less than two years old (16–18) .

1.5. Conceptual framework of under nutrition(stunting)

This conceptual framework presents factors of stunting at three different levels: the first level of basic factors is related to political, social, cultural and economic. The second level which is underlying factors includes the availability of food in the family, care and feeding practice, while at the third level describe the poor nutrition status and poor health status of child as it is presented in Figure 1.

Figure 1: Conceptual framework of stunting
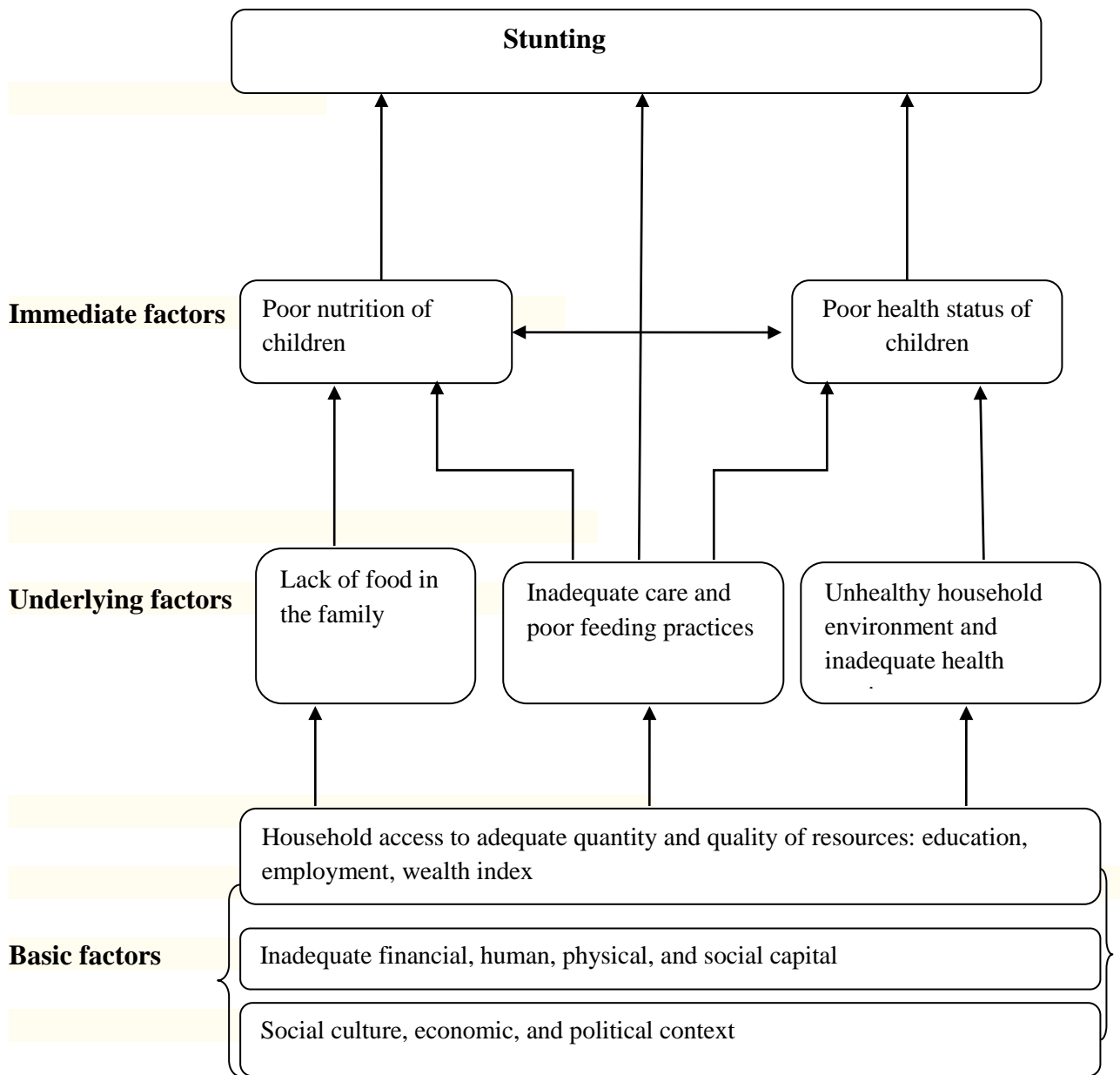
Source: UNICEF. "*Improving Child Nutrition: The achievable imperative for global progress*. United Nations Children's Fund"2013. p. 4.

2. Methods and materials.

2.1. Study area description

The study was conducted in six Sectors of Nyanza District. Nyanza District has 10 Sectors, 51 Cells, 420 Villages, a population of 372,833 among whom 54,434 are children under 5 years old. It has one District Hospital, 16 Health Centers, 38 Health Posts and 1263 Community Health Workers. It is bordered by Ruhango and Bugesera Districts on the North, Burundi on the East, Gisagara and Huye District on the South and Nyamagabe District on the West.

Refer to Rwanda national Census of 2012, Nyanza District had a population of 323,719, and 16,218 children between 6 - 23 months (19). The largest part of this population lives in rural areas and depends on agriculture and livestock keeping. Nyanza District population is predominantly rural: 92.1% of the resident population lives in rural areas and 7.9% in urban areas.

2.2. Study design

This study is a cross sectional study using multi stage cluster design.

2.3. Specific objectives achievement

- For calculating the prevalence of stunting among the children between 6-23 months, we calculated the percentage of children with stunting among those taken in sample which represent the study population of children aged between 6 - 23 months of Nyanza District.
- For identifying the associated factors with stunting among the children between 6-23 months, Chi square test was used, only variables that had a statistically significant association with stunting at bivariate analysis were entered into the multiple regression model to identify independent predictors for stunting. The Enter method was used to get the final model of independent risk factors for stunting using a p value of 0.05 as the cut off level for significance.

Study variables

Dependent variable: Status of malnutrition in terms of stunting.

Independent variables:

- Socio-economic and demographic factors: Age and sex of child, place of residence, birth order, level of education of the mother, religion of the mother, age of mother, ubudehe category (wealth index),occupation of the mother of child, health insurance, number of children under 5 years, number of household members.

- Behavioral factors: water and sugar to new born, food avoid giving child, eating with other children, avoiding to breastfeed child when mother become pregnancy, food restricted when is ill.

- Child health and caring practices: Breast feeding started within 1 hour of birth, exclusive breastfeeding up to 6 months, age of starting complementary feeding, minimum meal frequency, minimum dietary diversity, using ongera micronutrients, using fortified food, supplementation vitamin A, deworming and immunization status of the child, health status and place to take care for child.

- Environmental factors: Hand washing with soap before eating and after defecation, diarrhea episodes, housing conditions, sanitation during feeding and food preparation, source of drinking water, distance to fetch water.

Minimum dietary diversity: Proportion of children 6–23 months of age who receive foods from 4 or more food groups. The 7 foods groups used for tabulation of this indicator are: — grains, roots and tubers — legumes and nuts — dairy products (milk, yogurt, cheese) — flesh foods (meat, fish, poultry and liver/organ meats) — eggs — vitamin-A rich fruits and vegetables — other fruits and vegetables(20).

Minimum meal frequency: Proportion of breastfed and non-breastfed children 6–23 months of age, who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more. Minimum is defined as: 2 times for breastfed infants 6–8 months, 3 times for breastfed children 9–23 months, and 4 times for non-breastfed children 6–23 month(20).

Analysis plan

Data collected were entered in a software of Epi info (Emergency Nutrition Assessment) for calculating Z score for length for age, analysis was done by using SPSS 20 and findings were interpreted using the text, and tables.

Univariate analysis was performed by running frequency distributions, and proportion of socio-demographic characteristics.

Stunting was categorized using WHO definition of stunting define as Z score $<- 2\cdot0$.

Moderate stunting define as Z score $\geq- 3$ and $<- 2$. Severe stunting define as $<- 3$ Z score.

Bivariate analysis: Chi square test was used to find proportions between independent variables and outcome variable.
Odds Ratio for binary outcome variables (normal/stunting) was estimated by logistic regression.
Multivariate analysis was performed using logistic regression for more than two independent variables with dependent variable. Measures of association and statistical significance were assessed at 95% confidence interval and $p <0.05$.

2.4. Study population

The present study was carried out on 6-23 months children of Nyanza District. All children between 6 -23 months of age in the district were the target population.

Sample size calculation

 The sample size was calculated based on the proportion of stunting in Rwanda to be 33% based on findings of the 2014-2015 RDHS, in this regard, a 5% level of significance (95% confidence interval).

Formula: $n = (Z_{1-\alpha/2})^2 p (1-p)/d2$ Where Z = level of confidence $= Z_{1-\alpha/2} =1.96$

P = Prevalence of stunting in Nyanza District (33%) taken from RDHS 2014-2015

d = margin of error (5%) and n = sample size.

After adjustment for non-response (10% contingency) n= (340+34) =374.

Sampling techniques

For better representation, 6 Sectors were randomly selected (Sector Busasamana, Busoro, Rwabicuma, Mukingo, Kibilizi and Muyira) from 10 Sectors of Nyanza District.

The sample was drowned proportionally to the size of the sector: total number of sample size divided by the number of target population (children 6-23 months old) in each selected sector. Therefore, the sector with more population has a larger number of sample population as determined in Table 1.

In this study 8 children aged between 6- 23 months was planned to be part of our study per village, a village was considered as a cluster. As we had a sample size of 374 children, the number of clusters was calculated by dividing the number of sample size to the number of children to find in a cluster (village): 374/8 = 47 as determined in Table 1.

Table 1: Study population distribution proportionally by Sector

Sector	Population by Sector 2019	Target Population 6 -23 months (4.35%)	Proportion Sample size	Sample by size	Number of cluster
Busasamana	48,741	2,120	0.201	75	9
Busoro	38,698	1,683	0.159	60	7
Kibilizi	36,658	1,595	0.151	56	7
Mukingo	57,706	2,510	0.238	89	11
Muyira	40,411	1,758	0.167	62	8
Rwabicuma	20,488	891	0.084	32	4
Total	242,702	10,558	1.000	374	47

Cluster selection

The 47 clusters were selected randomly from 201 villages of the 6 Sectors as described in the Table 1 those clusters were selected using the sampling interval of 225.

The sampling interval in cluster was calculated by considering the target population 6- 23 months divided by the number of clusters, (10,554/47=225).

List of Sectors, Cells and Villages with their population was obtained from the administrative leader of Nyanza District, after receiving that list, Cells and Villages of each Sector selected were entered alphabetically into Microsoft Excel and select randomly Cells and Villages for the study.

Subject selection

At the village level, one point was selected near the middle of the village. Starting from that point, all houses in one direction were interviewed until required numbers of eligible children were enrolled.

At the household level child aged between 6-23 months was selected for the study after getting consent from the parents and the information was obtained from mother or primary care giver of child.

Inclusion criteria: Children of age between 6 – 23 months

Exclusion criteria: - Child with any physical disability

- Child suffering from any illness presently

Data collection procedures

Before collecting data, a training session was given to 10 data collectors and 2 supervisors involved in the research. The training was focused on the process of data collection, including how to accurately measure the heights of the children using a portable calibrated board, according to recommendations for anthropometric measurement. The questionnaire includes the demographic characteristics of the children and their caregivers/mothers such as the sex of the child, the age of the child and their mother, the level of education, occupation, and care practices. To minimize measurement bias we offered instructions to the data collectors and supervisors to take carefully the length of children. The data collection instruments were tested previously and validated.

A semi-structured questionnaire was used to ask questions to the mothers of the children selected to participate in the study. Data were collected on social demographic characteristics of the family, on household characteristics, infant feeding practices, and immunization history and on illnesses of the children. The questionnaire prepared in English was translated in local language; Kinyarwanda which was tested before using. The interview took the average of 35 minutes to each mother including time of screening her child.

Measurements:

Length measurement

For measuring length, child was put in supine position with head touching the base of length board that was placed on a flat surface. Parents were requested to assist in taking measurement. Child was looking straight up perpendicular to the board.

Now hold the knees with the thumb and index finger. Press it gently so that back of knee touches the board. Right handed person held the knees with left hand and measuring board with right and vice versa. After ascertaining above checklist, foot piece was gently but firmly pressed against the heel of the child. The length was taken to the nearest 0.1cm using a portable calibrated board, the child's growth chart designed by the United Nations Children's Fund (UNICEF).

2.5. Materials

Research instruments

This study used quantitative research instrument composed of questionnaire which focused on socio-demographic characteristics of respondents, proportion of stunting, and factors associated with stunting to children 6-23 months in Nyanza District area.

The questionnaire was elaborated in English language according to the variable needed and translated in Kinyarwanda language.

2.6. Utilization and potential implications

This study will establish the reasons of increasing of malnutrition in Nyanza District. It will also reveal some important gaps that will be helpful to the relevant bodies, both governmental and NGOs in their effort to implement and to scale up nutrition interventions.

Consequently the Nyanza district area community which will benefit the effective implementation nutrition program that will help to reduce the rate of malnutrition among children under 2 years.

Findings will also help to the Ministry of Health and its partners in developing nutrition interventions awareness programs and policies and results of the study will provide baseline information that will assist health planners to design effective strategies directed towards dealing with factors that are increasing malnutrition in Nyanza District.

2.7. Ethical considerations

Ethical approval was provided by the CMHS/ Institutional Review Board. All participants involved in the study were informed about the nature of the study, the research objectives, and the confidentiality of the data. The participation to the subjects was completely voluntary in nature, and verbal consent was obtained from each mother before recruiting their children into the study. All subjects were free from any physical deformities and not suffering from any disease at the time of data collection. Interview was administered after obtaining informed consent.

All collected information were coded and kept into password protected computers; and the hard copies checklist used were kept in a locked cupboard, then privacy of data was maintained during the study process. Nobody did not have access on these without permission.

3. Results

3.1.1. Socio-demographic characteristics of the study population

Table 2 presents descriptive statistics for the sample of 374 children aged between 6-23 months and their families. Most of the children screened for stunting (38.8%) of them were found in age range from 12 to 17 months. Most of the children involved in this study (54 %) were boys. Most of the respondents (23.8%) lived in Mukingo Sector. More than two-thirds of children screened for stunting (70.3%) were found in birth order category 1-3. About two-thirds of mothers (67.9 %) completed primary school. Most of the mothers (79.7%) respondent lived in rural area. Most of the mothers (41.7%) belonged to Adventist church. Almost half of the mothers (46.5 %) were in age range of 25–34 years. Almost half of households interviewed (47.3%) were in Ubudehe category 2. Almost of responding of mothers (94.7%) were farmers. And 82.6% of household respondents had health insurance. Most of the respondents (58.3%) had one child under 5 years in the household. Most of the respondent mothers (58.6%) were living in a household with a range group of 4 to 6 members.

Table 2: Socio-demographic characteristics of the study population

Variables	Frequency	Percentage
Age (in months)		
6 - 11	138	36.9
12- 17	145	38.8
18-23	91	24.3
Sex		
Male	202	54
Female	172	46
Sectors		
Busasamana	75	20
Busoro	60	16
Kibilizi	56	15
Mukingo	89	23.8
Muyira	62	16.6
Rwabicuma	32	8.6
Birth order category		
1 - 3	263	70.3
4 - 6	101	27
6 - 9	8	2.2
10 - 12	2	0.5
Level of education of mother		

No education	59	15.8
Primary school	254	67.9
Secondary or University	61	16.3
Residence		
Urban	76	20.3
Rural	298	79.7
Religion of the mother		
Catholic	86	23
Protestant	108	28.9
Adventist	156	41.7
Muslim	5	1.3
Others	19	5.1
Age category of mother		
15-24	129	34.5
25-34	174	46.5
35-44	70	18.7
45-54	1	0.3
Ubudehe category		
Category 1(poorest)	57	15.2
Category 2(poorer)	177	47.3
Category 3(middle)	140	37.4
Occupation of the mother of child		
Farmer	354	94.7
Trader	8	2.1
Employed/ salaried	8	2.1
Others	4	1.1
Health insurance		
Yes	309	82.6
No	65	17.4
Number of children under 5 years in the household		
One child	218	58.3
Two children	152	40.6
Three children	4	1.1
Number of household members		
1 - 3	89	23.8
4 - 6	219	58.6
6 - 9	61	16.3
10 - 12	5	1.3

3.1.2: Child health and caring practices of the study population

Table 3: Child health and caring practices

In the table 3 results show that most of children (90.9%) started breast feeding within 1 hour of birth. Most of children (90.1%) were exclusively breastfed up to 6 months. About two-thirds of children (62.6%) started the complementary feeding at 6 months of age. Most of children aged between 6 months to 8 months (92.9%) received recommended minimum meal frequency, while about two-thirds (67%) of children aged between 9 months to 23 months received recommended minimum meal frequency. Less than one-third (27.8%) of children aged 6 to 23 months received minimum dietary diversity. Most of the children (70.9%) received ongera micronutrients. Only 15% of children received fortified blended food. Most of children (83.4%) received vitamin A. More than half of children (55.6 %) received de-worming tablets. Most of children (97.3%) received all vaccines. About 25.7% of children were sick in last 2 weeks. Children affected by diarrhea in past 2 weeks were 8%. Majority of children (28.1%) took care to Community Health Workers

Variables	Frequency	Percentage
Breast feeding started within 1 hour of birth		
Yes	340	90.9
No	34	9.1
Exclusive breastfeeding up to 6 months		
Yes	337	90.1
No	37	9.9
Age of starting complementary feeding(in months)		
< 6	40	10.7
6	234	62.6
>6	100	26.7
Minimum Meal Frequency(MMF)		
MMF for children aged 6-8 months		
Yes	52	92.9
No	4	7.1
MMF for children aged 9-23 months		
Yes	213	67
No	105	33
Minimum Dietary Diversity(MDD)		
Yes (> 4 dietary diversity)	104	27.8
No(<4 dietary diversity)	270	72.2
Using Ongera micronutrients		
Yes	265	70.9
No	109	29.1
Receiving Fortified Blinded Food(FBF)		

Yes	56	15
No	318	85
Receiving vitamin A in the last 6 months		
Yes	312	83.4
No	62	16.6
Receiving de-worming tablets in last 6 months		
Yes	208	55.6
No	166	44.4
Receipt of all vaccines for child		
Yes	364	97.3
No	10	2.7
Being sick in the past 2 weeks		
Yes	96	25.7
No	278	74.3
Episodic diarrhea in the past 2 weeks		
Yes	30	8
No	344	92
Place to take care for child if he/she was sick		
Hospital	0	0
Health centre	47	90
Health Post	11	11.5
CHW	27	28.1
Did not	11	11.5

3.1.3. Environmental factors of the study population

Table 4: Environmental factors

On the Table 4: Most of the mothers (92.5%) washed their hand with soap before eating and after visiting toilet. Majority of households (74.1 %) use clean water for drinking. About two-thirds (65%) of households use improved toilet.

Variables	Frequency	Percentage
Hand washing with soap before eating and after visiting toilet		
Yes	346	92.5
No	28	7.5
Use of clean water to drink		
Yes	277	74.1
No	97	25.9
Use of improved toilet		
Yes	243	65
No	131	35

3.1.2.Prevalence rate of stunting among children aged 6 -23 months in Nyanza District, 2019

Table 3 shows that the prevalence rate of stunting among children 6-23 months involved in this study in Nyanza District is 28.1%.

Table 3: Prevalence rate of stunting

Stunting	Frequency	Percentage
Yes	105	28.1
No	269	71.9
Total	374	100

3.2.Bivariate analysis: Stunting and socio demographic characteristics of study population

Table 4 shows the bivariate analysis of the factors associated with stunting among children aged between 6 -23 months in Nyanza District. Of the 29 independent variables analyzed, 6 were found to have an association with stunting at $p < 0.05$); the following variables were: children age, level of education of mother, ubudehe category, de-worming, hand washing and use of improved toilet those variables were retained for multivariate analysis found on table 6.

Table 4: Bivariate analysis of stunting and socio demographic characteristics of study population

Variables	(n=374)	Stunting		P-Value
		Yes	No	
Age (in months)	6-11	21.0	79.0	
	12-17	25.5	74.5	0.001*
	18-23	42.9	57.1	
Sex	Male	30.2	69.8	
	Female	25.6	74.4	0.322
Sectors	Busasamana	21.3	78.7	
	Busoro	33.3	66.7	
	Kibilizi	25.0	75.0	
	Mukingo	25.8	74.2	0.412
	Muyira	33.9	66.1	
	Rwabicuma	34.4	65.6	
Birth order category	1-3	27.0	73.0	0.149
	4-6	27.7	72.3	
	7-9	62.5	37.5	
	10-12	50.0	50.0	

Level of education of mother	No education	30.5	69.5	
	Primary school	31.5	68.5	0.007*
	Secondary or University	11.5	88.5	
Residence	Urban	21.1	78.9	0.127
	Rural	29.9	70.1	
Religion of the mother	Catholic	37.2	62.8	
	Protestant	27.8	72.2	
	Adventist	25.6	74.4	
	Muslim	20.0	80.0	0.132
	Others	10.5	89.5	
Age category of mother	15-24	25.6	74.4	
	25-34	27.0	73.0	0.222
	35-44	34.3	65.7	
	45-54	100	0.0	
Ubudehe category	Category 1(poorest)	36.8	63.2	
	Category 2(poorer)	35.0	65.0	0.000*
	Category 3(middle)	15.7	84.3	
Occupation of the mother	Farmer	28.2	71.8	
	Trader	37.5	62.5	0.582
	Employed/ salaried	25.0	75.0	
	Others	0.0	100	
Health insurance	Yes	27.8	72.2	0.820
	No	29.2	70.8	
Number of children under 5 years in the Household	One child	29.4	70.6	
	Two children	27.0	73.0	0.400
	Three children	0.0	100	
Number of household members	1-3	29.2	70.8	
	4-6	26.0	74.0	0.595
	7-9	34.4	65.6	
	10-12	20.0	80.0	
Breast feeding started within 1 hour of birth	Yes	28.2	71.8	
	No	26.5	73.5	0.827
Exclusive breastfeeding up to 6 months	Yes	26.7	73.3	
	No	40.5	59.5	0.75
Age of starting complementary feeding	< 6 Months	32.5	67.5	
	At 6 Months	29.1	70.9	
	>6 Months	24.0	76.0	0.516
Minimum Meal Frequency(MMF)	< 2 times per day	23.3	76.7	0.359
	2 times per day	33.3	66.7	
	≥ 3 times per day	26.4	73.6	
Minimum Dietary	> 4 MDD	21.2	69.3	0.065

Diversity(MDD)	< 4 MDD	30.7	69.3	
Ongera Micronutrients	Yes	29.8	70.2	0.244
	No	23.9	76.1	
Fortified blinded food	Yes	35.7	64.3	0.168
	No	26.7	73.3	
Receive Vitamin A in the last 6 Months	Yes	29.8	70.2	0.94
	No	19.4	80.6	
Receive de-worming tablets in last 6 months	Yes	34.6	65.4	
	No	19.9	80.1	0.002*
Receipt of all Vaccines for child	Yes	28.6	71.4	
	No	10.0	90.0	0.197
Child was sick in the past 2 weeks	Yes	35.4	64.6	0.063
	No	25.5	74.5	
Episodic of diarrhea in the past 2 weeks	Yes	43.3	56.7	0.520
	No	26.7	73.3	
Place of destination for child if he/she was sick	Hospital	0.0	0.0	0.708
	HC	31.9	68.1	
	Health Post	27.3	72.7	
	CHW	40.7	59.3	
	Did not	45.5	54.5	
Hand washing with soap before eating and after defecation	Yes	25.7	74.3	0.000*
	No	57.1	42.9	
Use of clean water for drinking	Yes	27.1	72.9	0.467
	No	30.9	69.1	
Use of improved toilet	Yes	24.7	75.3	0.047*
	No	34.4	65.0	

3.3. Binary logistic regression analysis

Table 5 summarizes the results of binary logistic regression model with regard to the observed variables in association to the outcome (stunting). It is important to note that all variables were statistically significant (P-value<5%). Hand washing with soap, age category, and use of improved toilet were positively associated with stunting, while deworming, ubudehe category, and maternal education were negatively associated with stunting.

Table 5: Binary logistic regression for stunting and independent variables in association

Variables	Crude OR [CI for 95%]	P-value
Age category(in months)		
06-11	Ref	
12-17	2.82[1.26 - 3.83]	0.006
18-23	2.19 [1.57- 5.05]	0.000
Maternal education		
No education	0.29 [0.11 -.77]	0.013
Primary education	0.28[0.12 - 0.65]	0.003
Secondary or University	Ref	
Ubudehe Category		
Category 1	0.32 [0.16 - 0.65]	0.002
Category 2	0.35 [0.20 - 0.60]	0.000
Category 3	Ref	
Receive deworming tablets in last 6 months		
Yes	Ref	0.002
No	0.47 [0.29 - 0.75]	
Hand washing with soap before eating and after visiting toilet		
Yes	Ref	0.001
No	3.85 [1.75 - 8.45]	
Use of improved toilet		
Yes	Ref	
No	1.60 [1.00 - 2.54]	0.048

3.3. Factors associated with stunting among children 6-23 months in Nyanza District, 2019

Table 6 presents the factors associated with stunting among children aged between 6 to 23 months in Nyanza District. Some socio-demographic were significantly associated with stunting, those were: level of education of mothers (primary school) [OR=3.14, CI 1.31 - 7.51], there was a significant association between education level of mothers who had primary school and stunting; mothers with primary education were 3.14 times more likely to be stunted compared to those with secondary or university education level, Ubudehe category 1 [OR=2.96, CI 1.39 - 6.29] was 2.96 times more likely to be stunted and Ubudehe category 2 [OR=2.83, CI 1.59 - 5.03] was 2.83 times more likely to be stunted compared to ubudehe category 3 considered as richer. However washing hands with soap before eating and after visiting toilet [OR=2.30, CI 0.13 – 0.72] was 2.3 times more likely to be stunted to children of mothers who do not wash their hand before eating and after visiting toilet compared to those whose mothers washed their hands with soap before eating and after visiting toilet.

Table 6: Multivariate analysis of factors associated with stunting among children aged 6 - 23 months, Nyanza District, 2019

Independent variables	OR(95% CI)	P- Value
Age category(in months)		
6-11	Ref	
12-17	0.54[0.30 - 1.00]	0.051
18-23	0.55[0.26 - 1.16]	0.116
Level of education of mother		
No education	2.41[0.86 - 6.77]	0.095
Primary school	3.14[1.31 - 7.51]	0.010*
Secondary or University	Ref	
Ubudehe category		
Category 1(poorest)	2.96[1.39 - 6.29]	0.005*
Category 2 (poorer)	2.83[1.59 - 5.03]	0.000*
Category 3 (middle)	Ref	
Receive de-worming tablets in last 6 months		
Yes	Ref	
No	1.52[0.82 - 2.82]	0.188
Hand washing with soap before eating and after visiting toilet		
Yes	Ref	
No	2.30[0.13 – 0.72]	0.007*
Use of improved toilet		
Yes	Ref	
No	1.27[0.77- 2.12]	0.350

4. Discussion

4.1. Prevalence of stunting

The findings of this study reveal that 28.1% of children aged between 6 - 23 months in Nyanza District are stunted. Different findings showed that stunting is a major public health problem in many developing countries as it has been found in the study conducted by Rajilakshmi Nair et al in the state of Maharashtra, India in 2012 where 22.7% of children under 2 years were stunted (21). Similar finding was reported in the study conducted by Sandra Nkurunziza et al in Burundi in 2014 where 53% of children 6 -23 months were stunted (18).

The prevalence rate of stunting in this study was lower than the findings from RDHS 2014-2015, where Nyanza District the prevalence rate of stunting was 33% and even lower than the national stunting level 38% (10). However stunting still remains a major public health problem in Nyanza. The decrease of the prevalence rate in Nyanza District may be due to nutritional interventions implemented in Nyanza District to improve nutritional status of children under five years.

4.2. Factors associated with stunting

In this study, children whose mothers had a primary education were 3.14 times more likely to be stunted than those whose mothers did secondary or university education. These results are supported with findings from a study conducted by Peter Austin Morton Ntenda and Ying Chih Chung in Malawi, in 2017 which revealed that children born in households where mothers had low level of education were more likely to be stunted (22).This fact was also found by Abera L et al. from Ethiopia in 2018 (23). Similar findings were given in the study conducted by Nkurunziza S. et al. in Burundi 2014, where children whose mothers had no education were more likely to be stunted than those whose mothers reached secondary school and above (18).This can be explained by the best practices done by mothers with high level of education to take care and provide good nutrition to their children.

This study shows that children belonging to households of low social economic status of ubudehe category 1(poorest) were 2.96 times more likely to be stunted and those from ubudehe category 2(poorer) were 2.83 times more likely to be stunted compared to children living in households of ubudehe category 3 which is considered as middle social economic status.

Similar study conducted in Bangladesh showed that children living in the poorest households were 2.17 times more likely to be stunted, and those who lived in poorer households were 1.79 times more likely to be stunted compared to those born in the richest households (24). This is also supported by a study conducted in Madagascar that revealed that children belonging to poorer household were more likely to be stunted(25). This can be explained by the fact that households with financial accessibility can afford easily nutritious foods to their children. However children from richer households can be stunted, this may due to insufficiency knowledge on foods, and feeding practices, but also lack of time to take care of their children can be among factors of stunting of children from richer households.

The results of our study shows that washing the hands with soap before eating and after visiting the toilet was 2.30 times more likely to be stunted for the children of mothers who do not wash their hands before eating and after come from toilet compared to children born to mothers who wash their hands before eating and after visiting toilet.

Jennifer Saxton et al. in a study conducted in Eastern India in 2010 found similar results that washing hands by using soap was associated with stunting use of a hand washing agent (soap/ash/mud) compared with water alone was strongly and positively related to height of age (26). But study conducted by Jee Hyun Rah et al. in rural area of India in 2015 showed that washing hands with soap before eating was negatively associated with stunting [OR=0,85, CI 0.76 -0.94] and washing hands after visiting toilet was also negatively associated with child stunting [OR=0.86, 95% CI 0.80 to 0.93] (27).

Insufficient hygiene and poor sanitation are among principal cause of diarrhea which is frequently affect children less than 24 months, and diarrhea is the leading cause of death to children, even food consumption is sufficient diarrheal cause inhibits nutrient absorption and diarrhea cause undernutrition and it also reduce child's resistance to infections.(28)

3. Study limitation

This study had some limitations; qualitative study was not included in this study for assessing knowledge, skills of mothers and behavioral factors on nutrition.

Despite these limitations, this study has identified factors associated with stunting which will be taken in consideration by Nyanza administrative leaders and stakeholders for effective nutritional interventions in order to decrease the prevalence of stunting in Nyanza District.

Conclusion and Recommendations

Conclusion:

The specific objectives of our study were:

To calculate the prevalence rate of stunting among children aged 6 -23 months in Nyanza District.

To identify associated factors with stunting among children aged 6-23 months in Nyanza District.

The results of our study showed that the prevalence rate of stunting among the target population was 28.1%.

Factors associated with stunting were: level of education of mothers and Ubudehe category were more likely to be stunted. And washing the hands with soap before eating and after visiting toilet, this factor was less likely to be stunted; children of mothers who washed their hand before eating and after visiting toilet were less likely to be stunted compared to children of mothers who did not wash their hands with soap before eating and after visiting toilet.

Recommendations

To Nyanza District Administrative leaders and its partners:

To implement appropriate nutrition interventions in the community in order to improve nutrition to the pregnant women, lactating mothers and children during the window of opportunity of the 1000 days in order to cut of the cycle of stunting.

To improve the socio economic status of the population, particularly to those who are in ubudehe category 1 and ubudehe category 2, by increasing income generating activities in the community in order to address poverty.

To health care providers in health facilities of Nyanza District:

To promote nutrition education to mothers and caretakers for rising their awareness with the aim of improving best practices for feeding their children.

To increase awareness of mothers and caretakers of children for individual hygiene practice especially hand washing with soap before eating and after visiting toilet.

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