



**ASSESSMENT OF RISK FACTORS CONTRIBUTING TO CHILD UNDERNUTRITION
IN SOUTH KAYONZA, RWANDA**

By

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MASTERS OF SCIENCE IN NURSING (PEDIATRICS)

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In the College of Nursing and Midwifery

Supervisor: Dr Patricia Moreland

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DECLARATION

I do hereby declare that this proposal entitles “**Assessment Of Risk Factors Contributing to Child Undernutrition In South Kayonza**” submitted in partial fulfillment of the requirement for the Masters degree in Pediatric Nursing, at University of Rwanda/College of Medicine and Health Sciences (UR/CMHS), School of Nursing and Midwifery, is my own original work and has not previously been submitted elsewhere. Also i do declare that a complete list of references is provided indicating all resources of information quoted or cited.

Name: Elias SEBUTARE

Signature

DEDICATION

I dedicate this work:

To God Almighty,

To my beloved wife Fortunee and my son Annibale for their emotional support throughout the studies

To my classmates and academic staffs for the nice moments we spent together sharing knowledge,

ACKNOWLEDGEMENTS

I do thank God Almighty who gives me strength, knowledge and keeps me in every single step through all my life.

I thank the government of Rwanda through the Ministry of Health and HRH program for funding my studies

I truly express my special thanks to the CMHS staff, especially the faculty of the school of Nursing for their valued knowledge and skills which have been a major tool for guidance to achieve this level. I am highly thankful to my Supervisors, Dr. Patricia Moreland for her guidance in this research. May the Lord remain on your side in all.

KEY WORDS

Undernutrition: weight for age z-score equal or under -2.

Participants: Undernourished children whose parents participated in this research

Ubudehe: Economic categorization system of households set up by the government of Rwanda for identifying the most vulnerable families for special support. The ranking is done in 4 categories, from 1 to 4. Cat 1 is poorest while cat 4 is the richest

LIST OF ACRONYMS AND ABBREVIATIONS

GPD: Gross domestic Product

UNICEF: United Nations Children's Emergency fund

WHO: World health organization

NISR: National Institute of Statistics of Rwanda

ECD: Early child development

ANC: Antenatal care

ABSTRACT

Introduction: In Rwanda malnutrition is responsible of 21.9 % of child mortality and an estimated loss of 11.5% of the national GDP. In Kayonza 9.2% of all under-five children are underweight and 4.9% of inpatient mortality at the DH in 2016 was due to child malnutrition. Identifying risk factors for malnutrition will orient specific interventions to reduce morbidity and mortality in children.

Objectives: The aim of this study is to assess the risk factors contributing to child undernutrition in South Kayonza, Rwanda.

Methodology: A cross sectional descriptive design was used. The sample included 346 children, aged 0-59 months with weight for age Z-score of -2 or less ,who were currently enrolled in nutrition rehabilitation programs at the 3 levels (community level, health centers or district hospital) in the southern part of Kayonza District, Rwanda. Descriptive analysis was done using frequencies and percentages, and inferential statistics using Chi-square test was used to determine relationship between causal and outcome variables.

Results:

The findings indicated a positive correlation between family size and number of children's meals (p-value 0.035); a positive correlation between category of ubudehe and number of child's meals per day (p-value of 0.000) and positive correlation between ubudehe category with frequency of consumption of balanced diet (p-value of 0.000) . Also, there was positive correlation between maternal education and children's frequency of consumption of fruits & vegetables (p-value of 0.000).

Conclusion & recommendations: Higher family size was associated with fewer meals; low ubudehe category was associated with fewer meals and fewer consumption of balanced diet, while low maternal education was associated with both low number of meals, low frequency of consumption of balanced diet and low frequency of consumption of fruits and vegetables. Socio-economic interventions in place should be strengthened and health education on child nutrition should be regularly provided to all mothers in ECDs and women in ANC services.

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CHAP I. INTRODUCTION

Overview

This chapter explains the need for the study, basing on international, national and district data .It comprises four parts, background, problem statement, objectives and significance of the study

I.2. Background to the study

Decreasing child malnutrition is a major international commitment of the current century (World Bank group, 2015). Millennium Development goal I was aimed to eradicate extreme poverty and hunger by significantly reducing the percentage of children with stunting by 2015, while Sustainable Development Goal II, aims to eradicate all forms of malnutrition by 2030 (Sanjiv Kumar, 2016). However, despite the progress made by Rwanda to achieve some MDGs, malnutrition remains a challenge to public health and a major contributor to child morbidity and mortality (Byaruhanga *et al.*, 2013). Elsewhere , in 2015, ninety five million children worldwide were underweight with over a half of them , around 48,2 million, lived in Central and West African and Asian regions (United Nations Emergency Children's Fund , 2015). In those areas, 22 percent of all under- five children are underweight compared to 15 % worldwide. Chronic malnutrition signaled by stunting had risen from 19.9 million in 1990 to 28.0 million in 2014 (World Bank, 2015) .

Globally in 2011, child undernutrition contributed directly or indirectly to nearly half of all under five deaths estimated about 3 million annually (United Nations Development Programme, 2012). Furthermore, child undernutrition contributed to the increased prevalence of infectious diseases morbidity such as diarrhoeal diseases among under- five population (Faye O, 2012). Other chronic consequences of child malnutrition include inadequate mental development and school performance, abnormal behaviour as well as high risk for cardiovascular diseases such as hypertension, hyperlipidemia, and obesity due to low ability of the body to breakdown fats (Martins, 2011) . Although whether these long term consequences are permanent or temporary is a subject of scientific controversy, the likelihood to develop is higher when malnutrition is not treated before age of 6 years (Anon., 2006)

Although Rwanda has made significant improvements in reducing child undernutrition , current rates are still high and its reduction is one of the major priorities of the government (Byaruhanga *et al.*, 2013). In 2015, the percent of under-weight children was 9 percent of all under five children down from 19 percent in 2010 with 38% stunting rate down from to 44 percent in 2010 and anaemia at 37% slightly down from 38% in 2010 (National Institute of Statistics of Rwanda, 2014) but further reduction is one of the government's top priorities. The same institute (2014) mentions Kayonza as one of the most affected districts with child malnutrition where 9,2 % of under-five children are underweight and 42% stunted.

Since there are many factors influencing child nutrition in different areas, targeting specific causes for each area could be effective and efficient unfortunately there are to date no studies conducted to identify the real causes of undernutrition in the context of Kayonza.

I.2. Problem statement

Although recent statistics show improvements in reduction of children undernutrition rates in Rwanda (National Institute of Statistics of Rwanda, 2014), the burden of malnutrition to the national economy is still heavy. A recent study on the cost of hunger in Rwanda showed that 21.9 percent of child mortality is directly or indirectly associated with undernutrition, while the social and economic impact of child undernutrition has lead to an estimated loss of \$820 million, equivalent to 11.5 percent of the country's GDP in 2014 (Byaruhanga, 2015).

In south Kayonza, data from HMIS showed that child malnutrition was responsible of 4.9% of inpatient mortality, and was ranked N^o 7 overall inpatient killer. Multidisciplinary interventions for fighting against child malnutrition are already in place but without targeting specific causes they can be very costly and end up being not effective.

I.3. Objectives

I.3.1. General Objective:

To assess risk factors contributing to child undernutrition in south Kayonza

I.3.2. Specific objectives:

1. To assess the relationship between family size and number of child meals per day,
2. To determine the relationship between “ubudehe” category of households with number of children’s meals per day and consumption of fruits and vegetables,
3. To determine the relationship between ubudehe category and child menu
4. To determine the relationship between maternal education level and consumption of balanced diet, fruits and vegetables, and number of child meals.

I.4. Significance of the study:

This study will contribute in generation of knowledge

To education: The study findings will provide readers with knowledge about factors associated with malnutrition of under- five children in the context of south Kayonza

To research: This study finding will be a baseline for further research

To practice: The study findings will provide clinicians, leaders, stakeholders and other health planners in Kayonza district with orientation on exact causes of malnutrition so as to orient preventive and control strategies

CHAP II. LITTERATURE REVIEW

Overview

This chapter provides an insight to child malnutrition causes according to other researchers. It emphasizes on studies conducted in other societies and also comprises conceptual framework and research hypothesis.

II.1. Definition

The term undernutrition is used for referring to the form of malnutrition with insufficient nutrients to meet body requirements and associated health conditions. According to UNICEF (2012), malnutrition results from one or a combination of inadequate food intakes and diseases.

II.2. Inadequate Food Intakes

Inadequate food intakes is a complex phenomena that itself results from multiple other factors including those affecting affordability of foods for families and those affecting the families' capacity to use available foods to prepare and administer a balanced diet to child.

II.3. Factors that cause insufficient access to foods:

II.3.1 Extreme Poverty:

Extreme poverty, defined by the United Nations (1995) as a daily income of less than 1USD/day per individual is associated with inability to afford sufficient food. Although poverty and extreme poverty often go hand in hand with other socio-economic factors of malnutrition such as poor hygiene, its role has been emphasized by some researchers.

A study conducted in 2001 in Nigeria on Prevalence and Determinants of Malnutrition among Under-five Children of Farming Households has shown that children from households with the higher incomes had less prevalence of stunting (23.6%) and severe stunting (6.3%) compared to those from households with less incomes (21.4%) and 0.0% respectively. The same study also

demonstrated notable differences in prevalence of underweight and severe underweight whereby children from higher income families had less prevalence of underweight (3.6%) and severe underweight (0.0%) compared to 22.1% and 7.1% respectively among those from households with less income while wasting and severe wasting were also more common among those from poorer families 14.2% and 11.8% respectively versus 3.6% and 3.6% respectively among the richer families (Babatunde *et al.*, 2011).

II.3.1. Insufficient cultivation land:

Demographic factors including population growth and leading to progressive reduction of agriculture land and deforestation play a role in food insecurity and prevalence of malnutrition (Goudet *et al.*, 2011). According to one experimental study done in Guatemala, distribution of agriculture land to a group of families with children suffering from malnutrition reduced significantly the prevalence of child malnutrition over the following years compared with those who did not receive it (control group) . Before the study, 37 percent of children aged less than 38 months had moderate malnutrition, with 7 % severely malnourished, and then the researchers distributed agriculture land to one group. After 20 months, prevalence of malnutrition prevalences reduced significantly among children belonging in the same age category. 19 % had moderate malnutrition, and 5 % had severe malnutrition. It was also noted that older children not breastfeeding during the time when their family received land experienced the best nutrition status improvement. For the control group (children of families who did not receive land and remained in initial settlements demonstrated even worse malnutrition prevalences (Agulnik, 2011).

II.3.1. Food Trade issues:

Inadequate distribution of food within and between communities are also caused by poor transport infrastructures and food trading policies all contributing to inaccessibility of food (Cannella and Costa, 2005). In one longitudinal study conducted in Bangladesh to explore the association of household rice expenditure (as the most common food in the area) with child nutritional status, there were no significant changes between rice consumption of households between periods when prices were highest and lowest. However, the researcher noted a

remarkable decrease in the percentage of underweight children between the two periods. The prevalence fell from 74.1 when the price was highest (US\$ 0.54/individual/week) to 65.7% when the price of rice was lowest (USD 0.35 individual/week) and a sharp rise of malnutrition rates from 65.7% when the rice price was low (USD 0.35) to 70.3% when the price was high (USD 0.47). The changes were explained by the increased capacity of households to afford non rice foods during the time when the later prices were down .The researcher concluded that close regulation of food prices could contribute to reduction of malnutrition rates in Bangladesh. (Torlesse, Kiess and Bloem, 2003)

II.3.2. Environment:

Climate changes, nature of soil and degree of soil care influence food production and food safety through various mechanisms ranging from direct impact on plants production such as insufficient rainfall causing droughts or excessive rainfall causing floods, abnormally hot or cold weather temperatures causing changes in growth of plants to disruption in food commerce (United states agriculture department, 2001). According to a study done in Cameroon to determine the role of socio-economic and environmental factors in child malnutrition , it was observed that children from households with improved environment including water, sanitation and cooking fuel were less prone to develop malnutrition while the regions with less rainfalls of the country had the most malnourished children (Pongou, Ezzati and Salomon, 2006).

II.3.3. Political issues:

In sub-Saharan Africa, recurrent wars and other political instabilities lead to displacements of population ,reduced productivity, hunger and enhanced susceptibility to diseases (Satterthwaite, 2014). Corruption, inadequate use of public funds are other political factors that may aggravate poverty and hunger (Luchuo, Paschal et al., 2013)

(Tranchant, Justino and Müller, 2014) analyzed nutritional status of children in Andhra Pradesh region of India during the period of conflicts and again after the war was ended. Their results showed that the percent of stunted children was up during the war period (30%) and then went down to 22% after that the war. Similarly wasting was up from 47% and fell to 32%.

II.3.4. Gender inequality:

Gender disparities in some societies of Africa and Asia where agriculture livestock activities directly related with food production is reserved for females may play a big role in inadequate food production and food insecurity (Yetunde, 2008) while gender based violence between male and female parents have also been associated with poor child care (Scaglioni, Salvioni and Galimberti, 2008). Gender discrimination has also been discussed as a possible factor in societies where male children are more valued and fed better than females or are prioritized for feeding either breastfeeding or complementary feeding especially when the families think there are not enough quantities for both (Angadi and Jawaregowda, 2015).

A study conducted in India to assess disadvantages in breastfeeding and child food distribution and their impact on higher mortality of female children has shown that girls consumed less fresh milk (14%) , less breast milk (21%), and their breastfeeding was withdrawn 0.45 months earlier than males (Choudhury *et al.*, 2000). Findings from another research done in Bangladesh on gender inequality and child malnutrition has given comparable results. The researcher saw that female children had more probability (0.44) of developing severe malnutrition than boys (Fledderjohann *et al.*, 2014)

II.3.5. Cultural beliefs

Culture may have important implications in selection of foods, their preparation and feeding. Restriction of some foods in communities may reduce food choices (Alonso, 2015). One study done in Nigeria to determine the effects of cultural beliefs and forbidden food on nutritional status of children found that food restrictions and prohibition were strongly involved in under nutrition of children with mainly those living in the rural regions (Onyesom *et al.*, 2008). In fact choices of foods are guided by what is available, and what is preferred or forbidden by the family's culture. When it comes to giving children balanced diet , beliefs that some foods or others are banned in the culture or harmful to children , especially those of animal origin like fish, poultry or eggs as well as vegetables and fruits (Kruger and Gericke, 2003; Onyesom *et al.*, 2008), It is important to mention though that acquisition of knowledge in parents throughout their life experiences improves food selection through better understanding of good nutrition

concept rather than being guided by just cultural views (Aboud, 2011). Researchers have identified many controversial practices Vis a Vis child feeding some of which starting right at birth. The same author has identified an example of such practice in Ethiopia and Kenya whereby before administering breast milk to a newborn or child, parents first gave him/her some butter or warm water and sugar to humidify vocal cords. In some urban settings newborns are fed with bottles of artificial milk instead of breastmilk for mothers to keep the shape of breasts, (Stevens, Patrick and Pickler, 2009) while in some rural societies, they give them cows' milk, in addition to breastmilk under pretext that "mothers do not have enough quantities of breastmilk to meet nutritional requirements of the baby who needs more to grow" which further contributes to reduction of breastmilk secretion since babies do not get opportunities to stimulate breastmilk production (Alice Ayawine, 2015)

They are many taboos surrounding maternal and child nutrition in Africa. In many societies they avoid such as Masai, Fulbe, Nuba milk is thought to represent a particularly wholesome food for children and think they do not need more food. In mid-west Nigeria they do not feed children with meat and eggs, because parents believe it would make their children thieves while in some tribes of south Uganda, female children are exclusively fed with milk until they are 5 years old yet at this age breast milk is not sufficient to meet all nutritional requirements (Meyer-rochow, 2009). Likewise some Asian cultures believe that children should be breastfed exclusively until they develop teeth and it is when they can get complementary feeding (Alonso, 2015). Beliefs surrounding appetites of children may also have a role to play since some mothers refer to whether their child has or does not have interest in eating, while others perceive them as passive and prefer a combative approach of feeding them. Another common belief is that since children are not very active, they do not need to eat as much as adults do so they give them few meals per day (1-2) instead of small and more frequent (5) required until the age of 3 years (Aboud, 2011). There are also some beliefs surrounding nutrition of infants and children during illnesses such as diarrhea.

Although it is recommended that food and drinks should be continued and even increased, some parents instead believe that many foods especially vegetables and fluids must be avoided when the child has diarrhoea (Saunders, 2005).

II.3.6. Religious beliefs

Some religious beliefs include restriction of foods and beverages. The restriction can be closed or wide depending on religion. Some religions for instance ban consumption of animal products including cows' milk, all forms of meat etc. When there are no adequate options to replace them, this may be a factor contributing to malnutrition.

A multi country study done by (Tan, Chan and Reidpath, 2013) on the impact of religious and spiritual beliefs on consumption of fruits, vegetables and fats revealed that there was a significant correlation between religious beliefs with fruit, vegetable, and fat consumption since some religions consumed much fruits and vegetables but less fats than others and this can affect nutritional status of children.

II.3.7. Family Size

According to study done in Nigeria for identifying socioeconomic characteristics of farming households, larger households were likely to suffer food insecurity (Pongou, Ezzati and Salomon, 2006)

II.3.8. Diseases

Diseases affect child nutrition through a series of mechanisms from malabsorption of ingested food to excessive loss of nutrients by the body and excessive calorie expenditures.

II.3.8.1. Malabsorption

The term “malabsorption” refers to errors occurring in digestion and absorption of nutrients from ingested food. It can be traced from both congenital and acquired abnormalities or conditions.(Stephan U Goebel, Francisco Talavera, 2016).

According to the same authors, congenital abnormalities that are associated with malabsorption are those which involve deficiencies of digestive enzymes and anatomical defects of the digestive track.

Acquired disorders include various infectious and non infectious diseases of the Gastro intestinal tract. Bacterial growth, Giardia are examples of infectious while non infectious etiologies include Crohn diseases, lymphomas etc (Fan and Sellin, 2009).

(Nützenadel, 2011) investigated the role of malabsorption as a cause severe malnutrition of children. He found out that 2% of children had other underlying conditions including pancreatic disorders causing malabsorption and failure to thrive.

II.3.8.2. Intestinal parasites:

A number of parasitic infestations which are common in tropical regions have been found to be associated with child malnutrition through deprivation of child from nutrients. Ascaris Lumbricoides, Trichirus Trichiura, Hookworm infestations , the relatively common helminthes all consume nutrients from the child 's digestive tract (Feleke, 2016). One study investigated the prevalence of intestinal parasitic infestation among children with severe acute malnutrition. The results showed that 20% of children had 1 or more intestinal parasite. The most common were Ascaris lumbricoides (8%), hookworms (4%) and Entamoeba coli (8%). (Kesetyaningsih *et al.*, 2015)

II.3.8.3. Chronic diseases

Chronic diseases especially febrile conditions, HIV can cause excessive calorie expenditures which can lead to malnutrition status especially if the losses are not recovered. Unfortunately many of these conditions also cause a decrease in appetite and therefore make it difficult to make adequate calorie replacements causing a negative balance (Correia *et al.*, 2016)

(Fan and Sellin, 2009) noted high rates of malnutrition among long term care patients. Up to 15% of all patients with chronic conditions were affected.

Among outpatients visiting for chronic care, 25% were undernourished versus 35%–65% among hospitalized patients receiving long-term care. Since the study was done in the United States which is a rich country, we would expect it to be even worse in our low income settings.

II.3.9. Inadequate Maternal and Child Care:

II.3.9.1. Care of pregnant mothers

Care of pregnant mothers including healthy nutrition has implications on nutrition status of children. According to one study done in Nigeria, has shown that children born from mothers who did 4 antenatal care visits were less likely to have malnutrition than those of mothers who did n't. In the same study it was seen that children born from mothers who rarely or never discussed with husband on pregnancy issues was more likely to get malnutrition compared to those of mothers who regularly discussed with their spouses (Hamel *et al.*, 2015)

II.3.9.2. Maternal education

Higher maternal education improves ability of mothers to select, prepare and administer nutrition correctly to the child. In a study conducted in Tanzania, Malawi and Zambia revealed that children born from mothers who completed secondary school were less likely to get malnutrition (ratio: 0.56) than those of mothers who just did primary ratio:0.82) and those who never attended school (ratio: 1) (Makoka, 2013)

II.3.9.3. Breastfeeding practices:

Exclusive breastfeeding is recommended by to mothers during the first 6 months after birth. At that time, mothers are advised to start initiating complementary feeding since nutrition requirements of the older infants can no longer be met by just breastfeeding .In Rwanda , only 93.5% of mothers respected exclusive breastfeeding during the first 6 months of life (National Institute of Statistics of Rwanda, 2014). Many societies have various cultures vis- a-vis breast feeding and children feeding that can compromise good child nutrition. (Kimani-Murage *et al.*, 2011). Researchers have seen some cultural practices whereby mothers restricted breastfeeding

infants only during the night and giving fluids in addition to breastmilk during the first six months of life even right after birth under pretext that there is no enough breastmilk (Goudet *et al.*, 2011).

In a study done in Uganda to identify the risk factors for early childhood malnutrition, duration of breastfeeding strongly influenced the Weight for Height and Height for Age Z-scores of children. In the study, children who were breastfed till 18 months and longer were least likely to be wasted or stunted while children who had never breastfed demonstrated highest rates of both wasting and stunting (Amini *et al.*, 2013)

II.3.9.4. Weaning practices

The weaning period is a critical time when the child should be strictly cared for and closely observed in order to maintain health .Mothers are advised to wean children gradually between the 6th month to 2nd year of life. This enables children to continue enjoying advantages of breastfeeding, while also eating the required nutrients from the complementary diets (Amini *et al.*, 2013). With inadequate practices of weaning as well as a child's poor appetite and vulnerability to diseases malnutrition occur (Kruger and Gericke, 2003).

In a study done in Tanzania to identify factors contributing to malnutrition among children aged less than 2 years, it was seen that 62% of children had been withdrawn from breastfeeding earlier than 2 years of age. The same study said that there had been abrupt drop of growth curves in those children right after cessation of breastfeeding (TA Ogunlesi, VA Ayeni, AF Adekanmbi, 2014)

II.4 Conceptual framework

Causal & outcome model (Adopted from UNICEF)

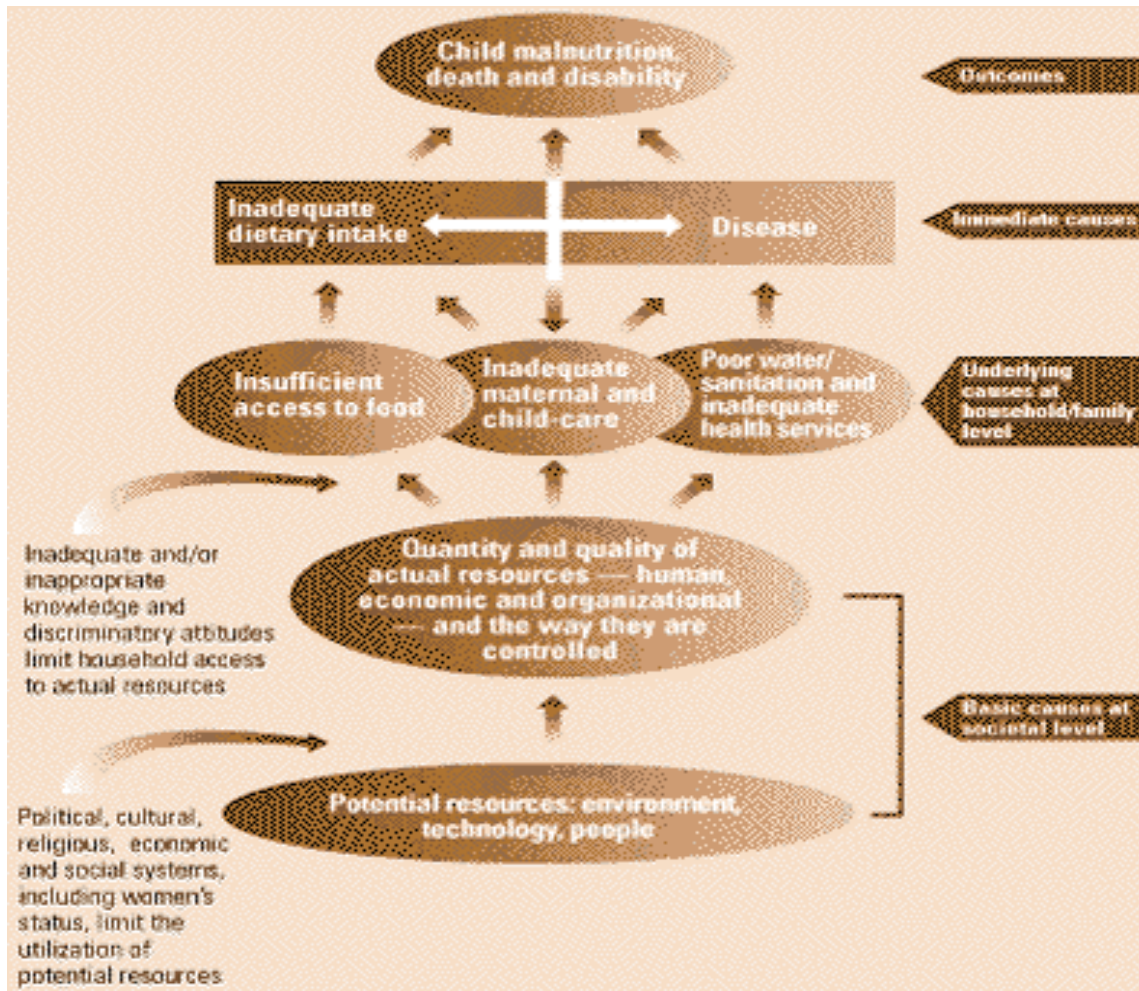


Figure 1 : Causal & outcome model

Independent variables	Dependent variables
Access to food: - Family income - Food production of family - Family size - Source of family income Maternal and child care: - Breastfeeding - Child's food intakes - Education level of mothers - Family child care - Complementary feeding practices - Weaning - Family responsibilities of child care - Cultural food restriction in family - Religious food restriction in the family Water , sanitation and use of health services: - Access to health care - Family waste management - Child morbidity - Immunization and Deworming - Growth monitoring	consumption of balanced diet Fruits and vegetable consumption Number of meals per day

Table 1: Independent and dependent variables

II.5. Research hypothesis:

It is assumed that:

1. There is a relationship between large families and low number of child meals per day
2. There is a relationship between low ubudehe category of households and low number of children's meals per day
3. There is a relationship between low ubudehe category of households and low consumption of balanced diet
4. There is a relationship between low maternal education level and consumption of fruits and vegetables

CHAP III. METHODOLOGY

Overview

This chapter describes how, where and when the study was conducted. It indicates the study design, area, population, sample size and sampling strategies, procedure for data collection and data analysis, ethical consideration, validity and reliability and problems & limitations.

III.1. Study area:

The study was conducted in the catchment area of Rwinkwavu hospital, southern part of Kayonza district, Eastern province of Rwanda, inhabited by 211,251 people

The area's economy is mainly based on agriculture and the local livestock is dominated by banana (29%), maize 16%, beans 24%, cassava 12% and vegetables (4%), while the main livestock being cattle raising (National Institute of Statistics of Rwanda, 2012).

In addition to locally produced food, the majority of population of Kayonza district have geographical access to food bought from other parts of Rwanda through road transport where they are sold in markets and trade stores (National Institute of Statistics of Rwanda, 2012).

Child morbidity is dominated by malaria, diarrheal diseases and respiratory infections. Health care services are offered by 14 health centers, 8 health posts with community health workers delivering curative and health promotional services in the villages (National Institute of Statistics of Rwanda, 2014).

The main challenges to agriculture include scarcity of rain and the limited agriculture land. According to the NISR (2012), 46.4% of households in Kayonza cultivate the very small areas, (under 0.3 ha land) compared to 46% at the national level

III.2. Design

The study used a cross sectional descriptive design with quantitative approach

III.3. Population

The study population was comprised by under- five children who have been residing in the region since the last six months and have been screened underweight or severely underweight with weight for age or weight for height Z-score equal or under -2 with undernutrition by community health workers, health centers and district hospital within the last three months, currently being enrolled in nutrition rehabilitation program at the 3 levels (community level, health centers or district hospital).

Population estimates

South Kayonza overall population estimate: 211251 people (NISR, 2012)

Under-five population is 15, 78% of the overall population which is equal to 33,335 children

Underweight population (the study population) is estimated 9,2% of the under five-population (NISR, 2015).

III.4. Sampling

A representative sample of 346 mothers U-5 was chosen from eight sectors with stratified random sampling technique (CI=95%). The 8 strata were used because there are 8 health centers. The sampling frame was the mothers whose registered children in the nutrition program .the sample size was extracted from these registers

The following formulae have been used:

$$n_0 = Z^2 pq / ME^2$$

$$n_f = n_0 / [1 + (n_0 / N)]$$

$$n_l = n_f (1 + 0.05)$$

Where: n_o is correction factor 1, Z stands for Z-score, p =probability of being selected, q =probability of not being selected, ME = margin of error, nf = correction factor 2, and nl is sample size

While 346 children will be chosen from 8 strata, the following formula has been used to obtain the sub-sample size required for each stratum.

Sub-sample size called $nk = (nl \times Nk) : N$

where nl is the sample size, Nk stratum population and N the study population.

Strata sub-sample sizes

Table 2: Strata population and sample sizes

Facility	Population	Under-5	Underweight	Strata Sample
Ruramira HC	19247	3037.1766	279	32
Nyamirama HC	34724	5479.4472	504	57
Ndego	21496	3392.0688	312.	35
Karama HC	22703	3582.5334	330	37
Kabarondo HC	34582	5457.0396	502	57
Cyarubare HC	38831	6127.5318	564.	64
Rutare	4884	770.6952	71	8
Rwinkwavu HC	34784	5488.9152	505	57

III.5. Instrumentation for data collection

Data collection was done using questionnaires with closed ended questions administered by research assistants

III.6. Validity and reliability

The study adopted a questionnaire that was used previously by other researchers in Haiti and Somalia and was adapted to the Rwandan context. Questions that were withdrawn included that involved ethnicity as one of the factors affecting children's weight.

The questionnaire was tested on a group of 37 mothers at Kabusunzu health center in December 2016 and underwent corrections to facilitate understanding

III.7. Data collection procedure

Data collection lasted 2 months starting from 21st February to 15th April 2017.

The student chosen assistants, and explained how to use the questionnaire.

The research assistants went on field to patients.

They met the heads of health facilities and presented approvals to collect data

They explained the purpose and procedure of research to patients, and obtain their consent.

After explaining the purpose of research and rights of participants, the assistant first sought participants signing consent forms one by one

Then the assistant administered the questionnaires

The assistant submitted filled questionnaires and signed consent forms to the researcher

The researcher selected a sample (20% of the participants) from the consent forms and made control visits and phone calls

III.8. Ethical consideration

Approval to conduct research was sought from Institution Review Board (IRB) of University of Rwanda, College of medicine and health sciences, School of nursing and midwifery

Authorization to collect data was obtained from the director of Rwinkwavu district hospital, in charges of health centers and Heads of departments (in charge of pediatrics and nutritionist at the hospital, in charge of nutrition and community health officer at health centers)

Patients were explained the purpose of the study, their rights including right to accept or refuse participation, to withdraw from the study at any time without providing explanation of reasons and signed consent forms.

Confidentiality of patients' information was respected by using professionally licensed research assistants who already have and know responsibilities of keeping privacy of health informations (nurses),

Privacy was provided during data collection from patients

No participants' names, numbers or any identification method was written on questionnaires

Participants were requested the best way to help them know findings from the survey

Data collected was used only for the agreed purpose (academic research)

III.9. Data analysis

Questionnaires were coded

Data was entered (computerized) in SPSS.

Descriptive analysis was done using frequencies and percentages, and inferential statistics using Chi-square test was used to determine relationship between causal and outcome variables.

III.10 Problems and limitations

The major limitation is that the study was done only on participants who were enrolled in nutrition rehabilitation program at health facilities and community health workers ignoring those who are not

CHAP IV. PRESENTATION OF RESULTS

Overview

This chapter describes the results from the survey. Results are presented according to the objectives of the study.

Demographic data

IV.1. Age of children

Table 3: Age frequencies and percentages

Age	Frequency	Percent	Valid Percent	Cumulative Percent
0 to 11 months	81	23.4	23.4	23.4
12 to 23 months	171	49.4	49.4	72.8
24 to 59 months	94	27.2	27.2	100.0
Total	346	100.0	100.0	

Table 3 shows that 49.4% of children (N=346) were aged between 1 year and 2 years while those aged less than 1 year and more than 2 years were 23.4% and 27.2% respectively.

.2. Sex of children

Table 4: Sex of children and percentages

Sex	Frequency	Percent	Valid Percent	Cumulative Percent
Male	147	42.5	42.5	42.5
Female	199	57.5	57.5	100.0
Total	346	100.0	100.0	

According to data provided in *table 4* above, 57.5% of children were females compared to 42.5% of males

IV.3. Family size

Table 5: Family size

Family size	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 4	40	11.6	11.6	11.6
4 to 5	113	32.7	32.7	44.2
6 to 7	154	44.5	44.5	88.7
8 to 10	39	11.3	11.3	100.0
Total	346	100.0	100.0	

According to *table 5* data, 77.2% of children were from families of 4 to 7 members, while those coming from families of less than 4 members and those of 8 members or more represented 11.6% and 11.3% respectively. We used inferential statistics with Chi-test to assess if family size affects food menu, number of meals and consumption of fruits and vegetables:

Table 6: Family size and consumption of balanced food Chi-square

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	38.028 ^a	12	.000
Likelihood Ratio	41.807	12	.000
Linear-by-Linear Association	6.048	1	.014
N of Valid Cases	346		
a. 2 cells (10.0%) have expected count less than 5. The minimum expected count is 3.38.			

The table 6 above shows that the Pearson's Chi-square value is 38.028 and the P-value of 0.000 which is less than 0.05. This means that the relationship between family size and family food menu is statistically significant.

Table 7: Family size and fruits & vegetables consumption Chi-square test

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.745 ^a	12	.054
Likelihood Ratio	20.656	12	.056
Linear-by-Linear Association	4.719	1	.030
N of Valid Cases	346		
a. 5 cells (25.0%) have expected count less than 5. The minimum expected count is 1.35.			

The table 7 above shows that the Pearson's Chi-square value is 20.074 and the P-value of 0.054 which is greater than 0.05. This means that the relationship between family size and fruits and vegetables consumption is not statistically significant.

Table 8: Family size and Number of child's meals per day Chi-Square test

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.026 ^a	9	.035
Likelihood Ratio	17.816	9	.037
Linear-by-Linear Association	1.173	1	.279
N of Valid Cases	346		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.75.			

The table 8 above shows that the Pearson's Chi-square value is 18.026 and the P-value of 0.035 which is lower than 0.05. This means that the relationship between family size and number of child meals is statistically significant.

IV.4. Maternal level of Education

Table 9: Maternal level of Education

Maternal education level	Frequency	Percent	Valid Percent	Cumulative Percent
Higher education	4	1.2	1.2	1.2
Secondary	7	2.0	2.0	3.2
P4 to P6	114	32.9	32.9	36.1
Under P4	221	63.9	63.9	100.0
Total	346	100.0	100.0	

Table 9 shows that 96.8% of children surveyed were from mothers who attended only primary education (N=346). Those whose mothers attended secondary and university education were 2.0 % and 1.2 % respectively.

It is important to note that all of the four mothers who had attended university education and 3 out of 7 who attended secondary school education had given birth while they were still students.

Pearson's Chi-square was used to assess if there is relationship between maternal education level and food menu, fruits and vegetables consumption and number of child meals per day

Table 10: Maternal education and number of child meals per day Chi-square test

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	26.388 ^a	9	.002
Likelihood Ratio	28.080	9	.001
Linear-by-Linear Association	9.322	1	.002
N of Valid Cases	346		
a. 8 cells (50.0%) have expected count less than 5. The minimum expected count is .59.			

The table 10 above shows that the Pearson's Chi-square value is 26.388 and the P-value of 0.002 which is less than 0.05. This means that the relationship between maternal education level and number of child meals is statistically significant.

Table 11: Maternal education and fruits & vegetables consumption Chi-square test

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.674 ^a	12	.000
Likelihood Ratio	29.938	12	.003
Linear-by-Linear Association	13.675	1	.000
N of Valid Cases	346		
a. 11 cells (55.0%) have expected count less than 5. The minimum expected count is .14.			

The table 11 above shows that the Pearson's Chi-square value is 36.674 and the P-value of 0.000 which is less than 0.05. This means that the relationship between maternal education level and fruits & vegetables consumption is statistically significant.

Table 12: Maternal education level and family food menu

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	39.860 ^a	12	.000
Likelihood Ratio	36.301	12	.000
Linear-by-Linear Association	.000	1	.983
N of Valid Cases	346		
a. 10 cells (50.0%) have expected count less than 5. The minimum expected count is .35.			

The table 12 above shows that the Pearson's Chi-square value is 39.860 and the P-value of 0.000 which is less than 0.05. This means that the relationship between maternal education level and family food menu is statistically significant.

IV.8. Ubudehe category of the family

Table 13: Ubudehe category of the family

Category	Frequency	Percent	Valid Percent	Cumulative Percent
Category 3	112	32.4	32.4	32.4
Category 2	98	28.3	28.3	60.7
Category 1	120	34.7	34.7	95.4
Unknown	16	4.6	4.6	100.0
Total	346	100.0	100.0	

We assessed ubudehe categories of the families where children came from. Ubudehe is an economic categorization system of households that was put in place by the government in order to identify poorest households that need special economic support. The first category, ubudehe 1 includes the poorest who difficulty affords food and shelter while category 4 is for the richest.

The table 13 shows that there was none from category 4, while 32,4% of children came from category 3, with 28.3% and 34.7% from category 2 and 1.

Pearson's Chi-square test was used to assess for relationship between ubudehe category of the household and number of child meals, food menu and consumption of fruits and vegetables

Ubudehe category and number of child meals

Table 14: Ubudehe category and number of child meals Chi-square test

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	37.558 ^a	9	.000
Likelihood Ratio	39.175	9	.000
Linear-by-Linear Association	.340	1	.560
N of Valid Cases	346		
a. 2 cells (12.5%) have expected count less than 5. The minimum expected count is 2.36.			

The table 14 above shows that the Pearson's Chi-square value is 37.558 and the P-value of 0.000 which is less than 0.05. This means that the relationship between ubudehe category of household and number of child meals is statistically significant.

Ubudehe category and consumption of fruits and vegetables

Table 15: Ubudehe category and fruits consumption Chi-square test

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.935 ^a	12	.028
Likelihood Ratio	26.599	12	.009
Linear-by-Linear Association	3.043	1	.081
N of Valid Cases	346		

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.935 ^a	12	.028
Likelihood Ratio	26.599	12	.009
Linear-by-Linear Association	3.043	1	.081
a. 7 cells (35.0%) have expected count less than 5. The minimum expected count is .55.			

The table 15 shows that the Pearson's Chi-square value is 22.935 and the P-value of 0.028 which is lesser than 0.05. This means that the relationship between ubudehe category and consumption of fruits and vegetables is statistically significant.

Ubudehe category and food menu

Table 16: Ubudehe category and food menu Chi-square test

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	42.111 ^a	12	.000
Likelihood Ratio	44.387	12	.000
Linear-by-Linear Association	7.400	1	.007
N of Valid Cases	346		
a. 4 cells (20.0%) have expected count less than 5. The minimum expected count is 1.39.			

The table above shows that the Pearson's Chi-square value is 42.111 and the P-value of 0.000 which is less than 0.05. This means that the relationship between ubudehe category of household and consumption of balanced diet is statistically significant.

CHAP V. DISCUSSION OF RESULTS

Overview

This chapter discusses the findings from the survey and makes comparisons with what was found in similar studies. Like results presentations, discussion also was done according to the objectives of the study

V.1. Age of 12-24 months and undernutrition

In the results, the highest proportion (49%) of children were aged 1-2 years. While there are no known direct link between age and undernutrition, high rates of undernutrition in that age group are considered to be due complementary feeding practices. In a study done in Nigeria it had been observed that both early and late initiation of complementary feeding were associated with high rates of child undernutrition during the first and second year of life (TA Ogunlesi, VA Ayeni, AF Adekanmbi, 2014). The same study also showed that early cessation of breastfeeding before age of 2 years was also responsible of child undernutrition. Another study done in Canada, concluded that the appropriate age for introducing complementary feeding is at 4 months (Wafaa Qasem, 2015). In this study, however, we found that 14.6% of children (N=171) had initiated complementary feeding too early before age of 4 months and 38.5% (N=171) too late after 6 months which put children at risk for intolerances because of digestive immaturity and nutritional deficiencies since breastmilk at this age is gradually becoming insufficient to meet nutritional needs of the infant. Furthermore, for the duration of breastfeeding or (age of cessation of breastfeeding), 39.7% of children (N=171) had ceased breastfeeding before age of 24 months.

Although complementary feeding and weaning issues may explain the high proportion of undernourished children in this age group, it was not all. Child morbidity was also highest in this age group since 85.9% of children aged 13-24 months had had at least four episodes of illnesses over the course of 6 months preceding the survey which could be also a cause of undernutrition or just a consequence of it (Rodríguez, Cervantes and Ortiz, 2011).

V.2. Child's Sex and undernutrition

(Angadi and Jawaregowda, 2015) pointed out inequalities in feeding of female and males by parents. This study results show that females are predominant (57.5%) compared to 42.5% in males. In this survey, factors that could explain differences such as breastfeeding and child nutrition practices were explored and compared between males and female children. For the time of initiating complementary feeding, we found that 49.2% of females were initiated on complementary feeding around 6 months compared to 50.2 % among boys while 39% of females and 43.8% of males were given complementary feeding late after 6 months. For the age of weaning, 18.5% of females who had been weaned (N=81) were done so after age of two years compared with 33.3% of males (N=54). Looking at the frequency of breastfeeding, 86.2% of females who were still breastfeeding (N=109) were put on breast at least 8 times per day compared with 74% among males. Considering the number of child meals, 52.3% of males (N=147) ate at least 2 times per day compared with 52.7 % for females (N=199). 37.6 % of females consumed fruits and vegetables (N=199) compared with 22.4% for males. Regarding food menu, twenty four point one of females (N=199) ate balanced diet compared with 19.7% for males (N=147) These do not suggest any discrimination in breastfeeding and child nutrition practices, so the predominance of females among the undernourished population could be explained by demographic factors.

V.3. Family size and child undernutrition

Large families can be associated with child malnutrition because available food in families has to be shared among many members resulting in lack of sufficient quantity and appropriate quality of food to weak family members, usually young children (Donald W. MacCorquodale, 1977).

Results from this survey suggested that majority of children (77.2%) were from large families of 5 to 7 members. When we tested for relationship between family size and consumption of balanced diet, fruits and vegetables and number of child meals per day and found that there was significant relationship between family size and consumption of balanced diet containing caloric food, animal or vegetal protein and fruits or vegetables with Pearson's Chi-square value of 38.028 and the P-value of 0.000

However, we did not find any relationship with number of child meals and consumption of fruits, and vegetables, the later being particularly influenced by education level of mothers than family income and size of family. In another study conducted in Nigeria to assess the effects of family size on household food security in Osun state, Nigeria, the results suggested that family size had negative influence on food security manifested by decrease of number of meals served in the family and satisfaction of members with quantity served which appears to be partially conflicting with this study findings. However, considering the fact that even the economic category (ubudehe) of the household did not have impact on the number of meals served by family per day, it suggest that availability of food alone does not justify the frequency of child feeding and that there might be other factors.

V.4. Maternal education level and child undernutrition

Low level of education for the mother is widely regarded as a factor predisposing children to malnutrition. In her study conducted in Nairobi, Kenya, pointed out that children of mothers who had attended only primary school or less were more likely to be underweight or stunted than those of mothers who had completed secondary education.

In our study ,majority of children' mothers (63.9%) had attended less than primary four years education, when we assessed correlation between maternal education level with number of meals per day and consumption of proteins and vegetables, we found statistically significant relationship with all the three aspects. The Pearson's Chi-square value was 26.388 with the P-value of 0.002 for the number of meals and 36.674 with P-value of 0.000 and 39.860 with the P-value of 0.000 for consumption of fruits & vegetables and balanced food menu respectively

V.7. Category of ubudehe and child undernutrition

Poverty is believed to be one of the leading causes of malnutrition worldwide (Yetunde, 2008). In their study conducted in Nigeria, (Eme Owoaje and Desmennu, 2014) pointed out low family income as one of predictors of child undernutrition. This study used ubudehe categories of households to define income levels. Category 4 is the top or richest class, categories 2 and 3 are middle classes and category 1 is the lowest or poorest class. The study showed that there was no children from category 4 households (the richest class), with 32,4% of children came from category 3, while 28.3% and 34.7% were from category 2 and 1 (poorest classes) respectively. Furthermore, correlation test between ubudehe and number of meals showed a Pearson's Chi-square value of 37.558 and the P-value of 0.000 meaning that the relationship between 2 variables is statistically significant while Pearson's Chi-square value of 22.935 with the P-value of 0.028 for the consumption of fruits and vegetables indicated that the relationship between ubudehe and fruits & vegetables consumption was not statistically significant. The correlation with food menu was also statistically significant with a Pearson's Chi-Square of 42.111 and the P-value of 0.000. The study findings appears to confirm that low income of the family contributes to child undernutrition.

CHAP VI. CONCLUSION AND RECOMMENDATIONS

Overview

This chapter provides conclusion basing on presented and discussed results. It also gives recommendations for improving identified gaps.

VI.1. Large families and low number of meals

The relationship between family size and number of meals is not statistically significant, alternative hypothesis rejected. Majority of children come from large families of 5 members or more, but it does not appear to affect the frequency of feeding. Further research is necessary to measure quantitative impact of high family size on child feeding.

VI.2. Low category of ubudehe and number child's meals

There is a statistically significant relationship between ubudehe category of the household and the number of child meals: alternative hypothesis is supported. Being from a low class of ubudehe is a risk factor to taking few meals. Socio-economic development strategies to the most vulnerable such as Girinka, and other related interventions could improve child nutrition.

VI.3. Low category of ubudehe and low consumption of balanced diet

There is statistically significant relationship between ubudehe category of household and food menu, alternative hypothesis supported. Being from a low class of ubudehe is a risk factor to taking non balanced diet. As above socio-economic development strategies to the most vulnerable such as Girinka, and other related interventions could improve child nutrition.

VI.4. Low maternal education level and low consumption of fruits and vegetables

There is a statistically relationship between maternal education level and fruits &vegetables consumption, alternative hypothesis supported. Being born from a mother educated below secondary school is a risk factor for non consumption of vitamins sources including fruits and vegetables. Together with socio-economic development strategies, nutrition education campaigns to all mothers could improve the situation.

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APPENDICES

Appendix 1: Study questionnaire English version

1. *Age of the child*

1. 0-12 months
2. 12-24 months
3. 24-59 months

2. *Sex of the child*

1. Male
2. Female

3. *How many persons live in the household?*

1. Less than 4
2. 4-6 people
3. 6-8 people
4. 8-10 people
5. More than 10

4. *What is the highest education level of the mother?*

1. Higher education
2. Attended secondary school
3. 4 -6 years of primary school
4. 4 years of primary school
5. None

5. *Who cares for the child at home?*

1. Both parents
2. Both parents and siblings
3. Both parents, siblings +someone else eg: house boy or house girl , :relative
4. 1 Parent
5. 1 Parent and siblings
6. 1 Parent, siblings +someone else eg: houseboy or Housegirl

7. Other people than biological parents

6. *In which ubudehe category does the family belong?*

1. Cat 4
2. Cat 3
3. Cat 2
4. Cat 1
5. No category

7. *How many younger children live in the household?*

1. None
2. Only 1
3. Just 2
4. 3 and more
5. No answer

8. *Who is head of the household?*

1. Male
2. Female
3. Other person

9. *What is the main source of money in the family?*

1. Business
2. Public employment
3. Farming
4. Private employment
5. No answer

10. *If farming is the main source of family income, what is the size of the cultivation land?*

1. Less than 0.5 Ha
2. 0.5-1 Ha
3. 1-2 Ha
4. 2-5 Ha
5. 5 Ha or more
6. No answer

11. *How often has the child fallen sick over the last 6 months?*

1. Never
2. 1-3 times
3. 4 -5 times
4. More often
5. No answer

12. *Does the child have a growth chart?*

1. Yes updated
2. Yes last filled 1-2 months ago
3. Yes last filled more than 2 months ago
4. No chart
5. Don't know

13. *Is the routine child immunization updated?*

1. updated
2. Vaccins missing
3. Don't know

14. When was the child last dewormed ?

1. Within the last six months
2. 6-12 months
3. More than 12 months
4. Don't know

15. a Does the child have disease insurance?

1. Yes
2. No

15. b If yes, which one?

1. CBHI
2. RSSB/MMI
3. MMI
4. Private insurance
5. None

16. What is the origin of the household head?

1. Within Kayonza
2. Within the eastern province, outside Kayonza
3. From other elsewhere within Rwanda
4. From abroad

17.a Is there any food restriction by faith or culture of the parents?

1. Yes
2. No

17. b If yes , what food do you restrict?

1. Meat
2. Eggs
3. Milk
4. Vegetables
5. None
6. No answer

18. *What are the main crops grown by family?*

1. Beans
2. Banana
3. Soya bean
4. Maize
5. No answer

19. *How do you rate the quantity of crop produced by the family?*

1. Enough for consumption and sale
2. Insufficient just for sale
3. Just survival but enough for family consumption
4. Insufficient for family consumption
5. Just for sale

20. *What is the main livestock of family?*

1. Cows
2. Goats/sheeps
3. Rabbits/chickens
4. None
5. No answer

22. *What is the most common food menu of the family?*

1. Caloric food, vegetal or animal protein, vegetables / fruit
2. Caloric food, vegetal & animal protein
3. Caloric food & vegetable protein
4. Caloric food only
5. Just what is available

23. How often does the child eat fruits or vegetables?

1. More than once a day
2. Every day
3. 3-5 times a week
4. 1-3 times a week
5. Never

24. How many meals of the child per day?

1. 4-5 times a day
2. 2-3 times
3. 1 per day
4. Often after 1 day
5. After more than 1 day

25. Has the household received supplementary food through a food program during the last 6 months?

1. Yes
2. No

26. If the child is on breastfeeding: how often do you breastfeed your child in 24 hours?

1. 12 times or more
2. 8-12

3. 4-7
4. Less than 4 times
5. Weaned

27. How long did you breast-feed your child?

1. Never breastfed
2. Under 12 months
3. 12-23 months
4. 24-more
5. Still breastfed

28. At what age did you begin complementary feeding of the child?

1. < 4 months
2. 4-6 months
3. > 6 months
4. Not yet

Thank you for your time!

Appendix 2: Questionnaire Kinyarwanda version

1. *Imyaka y'umwana*

1. Amezi 0-12
2. Amezi 12-24
3. Amezi 24-59

2. *Igitsina cy'umwana*

1. Male
2. Female

3. *Mu rugo haba abantu bangahe?*

6. Mu nsi ya 4
7. Hagati ya 4-6
8. Hagati ya 6-8
9. Hagati ya 8-10
10. Barenze 10

4. *Umubyeyi w'umugore yize amashuri angahe?*

6. Kaminuza/amashuri makuru
7. Ayisumbuye
8. 4 -6 abanza
9. Mu nsi ya 4 abanza
10. Ntayo

5. *Ni nde wita ku mwana mu muryango?*

1. Ababyeyi bombi
2. Ababyeyi bombi & abavandimwe
3. Ababyeyi bombi & abavandimwe , undi muntu
4. Umubyeyi 1
5. Umubyeyi 1 & abavandimwe

6. Umubyeyi 1 & abavandimwe, undi muntu
7. Abandi bantu (nyirakuru, etc)

6. *Umuryango uba mu cyihe cyiciro cy'ubudehe?*

6. icyiciro cya 4
7. icyiciro cya 3
8. icyiciro cya 2
9. icyiciro cya 1
10. Nta cyiciro

7. *Hari abandi bana bato kuri uyu bangahe?*

1. Ntawe
2. 1
3. 2
4. 3 cy barenga

8. *Who is head of the household?*

1. Nyina
2. Ise
3. Undi

9. *Umuryango utungwa n'iki?*

1. Ubucuruzi
2. Akazi ka leta
3. Ubuhinzi
4. Akandi kazi
5. Nta kazi kazwi

10. *Mugira ubutaka bwo guhingaho bungana iki?*

1. Mu nsi ya 0.5 Ha
2. 0.5-1 Ha
3. 1-2 Ha
4. 2-5 Ha
5. 5 Ha cy zirenze
6. Nta butaka

11. Umwana yarwaye kanagahe mu mezi 6 ashize?

1. Nta na rimwe
2. 1-3
3. 4 -5
4. Insuro zirenze 5
5. Simbizi

12. Umwana afite ifishi y'imikurire?

1. Iruzuye
2. Iraburamo ukwezi 1 cg 2
3. Iraburamo amezi arenga 2
4. Ntayo
5. Simbizi

13. Is the routine child immunization updated?

1. Yego
2. Oya
3. Simbizi

14. Umwana aheruka ikinini cy'inzoka ryari ?

1. Mu mezi 6
2. Amezi 6-12
3. Amezi arenga 12 months
4. Simbizi

15. a Umwana agira ubwishingizi bw'indwara?

1. **Yego**
2. **Oya**

15. b Niba ari yego ni ubuhe?

1. Mutuel
2. RSSB/MMI
3. MMI
4. Private insurance
5. Ntayo

16. Ise w'umwana aturuka he (ku isambu)?

1. Muri Kayonza
2. Mukandi karere k'iyi ntara
3. Mu yindin ntara
4. Mu mahanga

17.a Hari ibiribwa muziririza guha umwana kubw'umuco cg idini?

1. Yego
2. Oya

17. b Niba ari yego ni ibihe?

1. Inyama
2. Amagi
3. Amata
4. Imboga
5. Nta byo

18. Ni iki mweza kurusha ibindi?

1. Ibishyimbo
2. Ibitoki

3. Soya
4. Ibigori
5. Nta byo

19. *Ubona bingana iki ugereranyije n'ibyo mukeneye?*

1. Birahagije dusagurira Isoko
2. Turagurish gusa
3. Biradutunga gusa ariko biraduhagije
4. Nti biduhagije

20. *Mufite ayahe matungo?*

1. Inka
2. Ihene/intama
3. Inkwavu/inkoko
4. Ntayo

22. *I iki mukunda kugaburira umwana?*

1. Ibitera imbaraga, ibyubaka umubiri biva ku matungo niibihingwa, imboga n'imbutu
2. Ibitera imbaraga, ibyubaka umubiri biva ku matungo n'ibihingwa
3. Ibitera imbaraga, ibyubaka umubiri biva bihingwa,
4. Ibitera imbaraga
5. Ibibonetse (birahindagurika cyane)

23. *Umwana ayahe imbuto cg imboga nka kangahe mu cyumweru?*

1. Birenze 1 ku munsu
2. Buri munsu

3. 3-5 mu cyumweru
4. 1-3 mu cyumweru
5. Gacye cyane

24. Umwana arya kangahe ku munsu?

1. 4-5 ku munsu
2. 2-3 ku munsu
3. 1 ku munsu
4. Ajya amara umunsu atariye
5. Ajya amara iminsi irenga 1 atariye

25. Umuryango wigeze uhabwa imfashanyo y'ibiribwa mu mezi 6 ashize?

1. Yego
2. Oya

26. Umwana yonka kanagahe ku munsu (amanywa n'ijoro)?

1. 12 cg karenze
2. 8-12
3. 4-7
4. Munsu ya 4
5. Yaracutse

27. Umwana yonse Igihe kingana iki?

1. Nti yigeze yonka
2. Mu nsi y'amezi 12
3. Amezi 12-23
4. Amezi 24 cg arenga

5. Aracyonka

28. Yahawe imfashabere angana iki?

1. Amezi < 4
2. Amezi 4-6
3. Amezi > 6
4. Ntakayifata

Thank you for your time!

Appendix 3: Consent form

CONSENT FORM/KINYARWANDA

INYANDIKO YO KWEMERA KUGIRA URUHARE MU BUSHAKASHATSI

Kugira ngo nsoze amasomo y'icyiciro cya gatatu cya kaminuza mu buforomo , Elias SEBUTARE ndashaka gukora ubushakashatsi ku “**Impamvu zituma abana bari mu nsi y’imyaka itanu bagira ibibazo by’imirire mibi mu karere ka Kayonza**”

Ubwo bushakashatsi bukazakorera ku babyeyi b’abana bafite ibibazo by’imirire mibi bari gukurikiranirwa ku bitaro bya Rwinkwavu n’ibigo nderabuzima bibishamikiye ho.

Ni muri urwo rwego mbasaba Kugira uruhare muri ubu bushakashatsi mudufasha gusubiza ibibazo byanditse.

Uburenganzira bwanyu:

Mufite uburenganzira bwo kwemera cyangwa kwanga kugira uruhare muri ubu bushakashatsi no kubwivana mo igihe icyo ari cyo cyose bibaye ngombwa mutabajijwe ibisobanuro.

Ibisubizo byanyu bizagirirwa ibanga kuko mudasabwa kwandika amazina yanyu ku mpapuro zasubirijwe ho ndetse n'ubafasha kuzuza urupapuro rw'ibibazo ntagomba kumenya amazina yanyu.

Muzamenyeshwa kandi ibyavuye muri ubu bushakashatsi binyujijwe ku bigo nderabuzima.

Mbaye mbashimiye ufufatanye bwanyu muri iki gikorwa!

Umukono:

Amazina y'mushakashatsi: Elias Sebutare

Telephone 0788645193

Umubyeyi

Jyeweuhagarariye umwanamaze gusobanurirwa intego y'ubu bushakashatsi, uruhare rwange ndetse nkanabwirwa uburyo uburenganzira bwange buzubahirizwa ,nemeye gushyira umukono kuri iyi nyandiko mu izina ry'umwana, nk'icyemezo cy'uko jye nk'umubyeyi we, umurera wemewe n'amategeko cg undi umuhagarariye kandi umufiteho uburenganzira nemeye gusubiza ibibazo bibazwa muri ubu bushakashatsi..

Nasomye neza iyi nyandiko kandi nayisobanukiwe neza niyo mpamvu nshyizeho umukono nta gahato.

Itariki & Umukono

Appendix 4: Consent form english

Appendix 4: PARTICIPATION CONSENT FORM/ENGLISH

For completing my Masters' studies in Pediatric nursing, I, Elias Sebutare here mentioned as investigator would like to conduct a study entitled” **Assessment of risk factors associated with child undernutrition in south Kayonza”**

The study will be done on parents of children enrolled in malnutrition programs of Rwinkwavu hospital and health centers of the catchment area. I would like request for your participation by answering to questions.

Your rights during this study:

You have rights to accept or refuse participation or withdraw from the study at any time necessary without being required to provide explanations.

Your answers will kept confidentially since you are not required to writte names on the answer questionnaire and even the research assistant who will help you filling the questionnaire shall not have access to your identification.

You will be given feedback from the study through the health center of attachment

I thank you in advance for your contribution in this activity!

Signature:

Principal Investigator: Elias Sebutare

Telephone number 0788645193

Parent

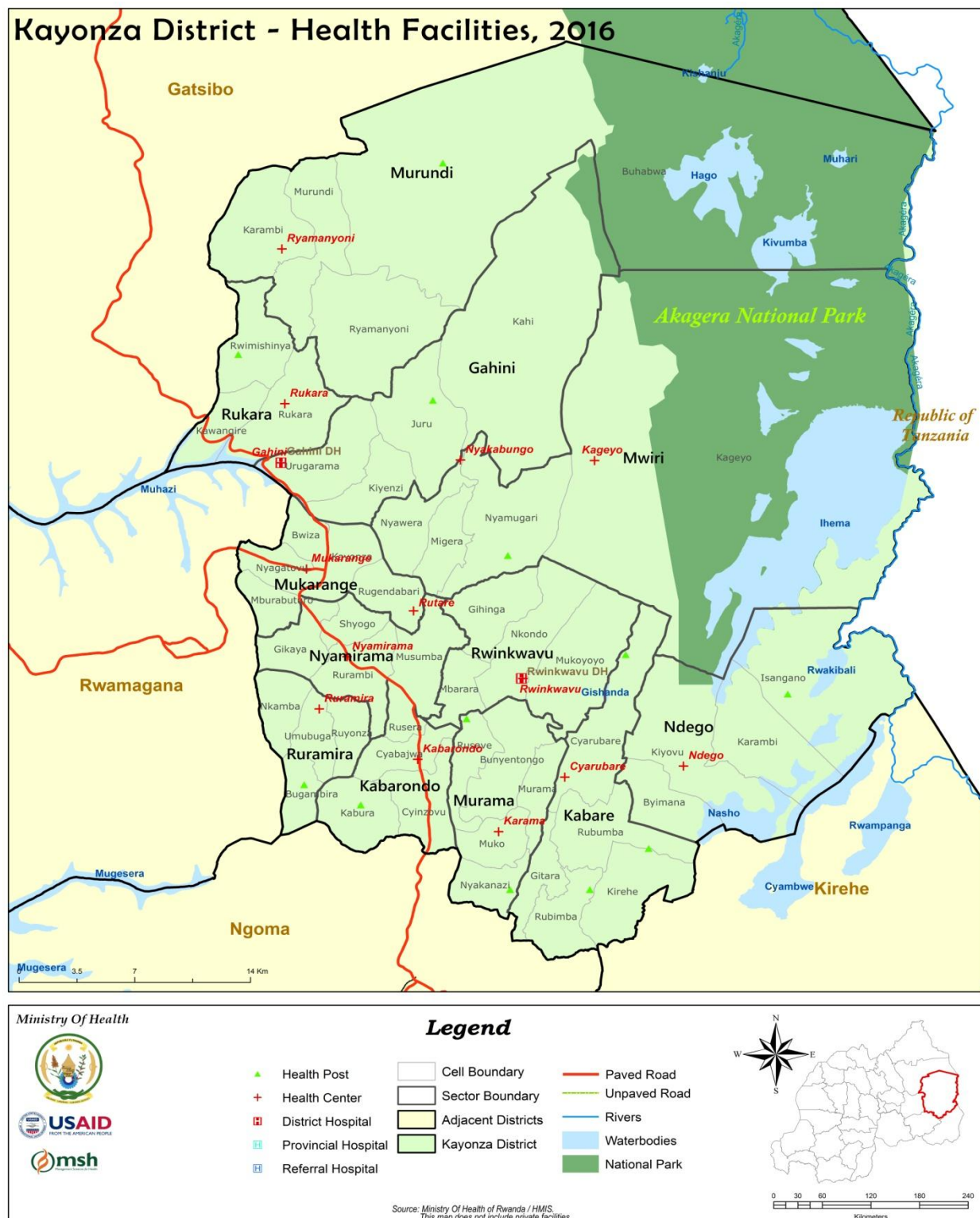
Irepresenting the childhaving been explained about the purpose of this study , my contribution and being reassured that my rights shall be protected, I hereby accept to sign on this sheet as evidence that as a parent, legal carer or any person having official responsibility upon the child I accept to participate in this study by answering to questions asked

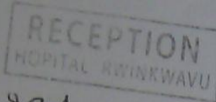
I have well read and understand this document and accept to make signature freely without any oppression from whoever.

Date:

Signature:

Appendix 5: Kayonza District Map





Elias SEBUTARE

Phone 250788645193

E mail: eliebutare@gmail.com

Rwinkwavu, The 23rd Feb 2017

To The Director of Rwinkwavu District hospital

Kayonza District,

Rwanda

RE: Requesting for authorization to conduct a study

Dear Sir,

I would like to request authorization to conduct a study entitled "Assessment of risk factors contributing to undernutrition of Under-Five children in South Kayonza, Rwanda". In fact I am a post graduate student at the University of Rwanda, school of nursing and Midwifery, Masters of nursing program, Pediatrics specialty and the study will be done for academic purpose as a Masters Dissertation

With your authorization, the study will be done from March to April 2017 and it will be a non experimental cross sectional descriptive using quantitative approach. The study population will consist of under-five children enrolled in nutrition rehabilitation centers at the health centers and Hospital represented by their parents.

May you find here attached protocol and ethical clearance for your consideration.

Looking forward to a successful request,

Sincerely,

Elias SEBUTARE

Person to
contact for
permission
Head of Nursing
M d E officer
Head of HCs.

24 March 2017.
Authorization guaranteed
to conduct this
assessment within the
approved framework.
We request to share data
and findings before publication
with the Director of Rwinkwavu D Ho



COLLEGE OF MEDICINE AND HEALTH SCIENCES

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 16/01/2017
Ref: CMHS/IRB/097/2017

SEBUTARE Elias
School of Nursing and Midwifery, CMHS, UR

Dear SEBUTARE Elias

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled "*Assessment Of Risk Factors Contributing To Under nutrition Of Under-Five Children In South Kayanza, Rwanda.*"

Having reviewed your protocol and found it satisfying the ethical requirements, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.

Professor Kato J. NJUNWA
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR



JB Gahutu
IRB Vice-Chair

Cc:

- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR

SCHOOL OF NURSING AND MIDWIFERY

Kigali, on 07 / 02 /2017

Ref. No: 114 / UR-CMHS/SonM/17

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

Re: Request to collect data

Referring to the above subject, I am requesting for permission for **SEBUTARE Elias**, a final year student in the Masters of Science in Nursing at the University of Rwanda/College of Medicine and Health Science to collect data for his/her research dissertation entitled **"Assessment Of Risk Factors Contributing To Undernutrition Of Under-Five Children In South Kayonza, Rwanda"**.

This exercise that is going to take a period of 2 months starting from 13th February 2017 to 12th April 2017 will be done in Kayonza District (catchment area of Rwinkwavu Hospital).

We are looking forward for your usual cooperation.

Sincerely,

Dr. Donatilla MUKAMANA, RN, PhD

Dean, School of Nursing and Midwifery

College of Medicine and Health Sciences

