UNIVERSITY of RWANDA

College of Medicine and Health Sciences

SCHOOL OF PUBLIC HEALTH

COMMUNITY HEALTH DEPARTMENT

PREVALENCE OF STUNTING AND ASSOCIATED FACTORS AMONG CHILDREN OF UNDER FIVE YEARS WITH DISABILITIES IN BUGESERA DISTRICT, EASTERN PROVINCE OF RWANDA

NKURUNZIZA Emmanuel

Student Number: 220020495

A Dissertation Submitted in Partial Fulfillment of the Requirements Master's Degree in

PUBLIC HEALTH

Supervisor: Dr. Rutayisire Erigene

Co-Supervisor: Dr. Michael Habtu

August 2023

Declaration

I do hereby declare that this report submitted in partial fulfilment of the requirements for the Master's degree in Public health at the University of Rwanda College of Medicine and Health Sciences, is my original work and has not previously been submitted elsewhere. Also, I do declare that a complete list of references is provided indicating all the sources of information quoted or cited.

Student name: NKURUNZIZA EMMANUEL

Number:220020495

Date and signature: 21/08/2023

Co-Supervisor: Dr **Michael Habtu**

Date and signature: …./08/2023

Supervisor: **Dr. Rutayisire Erigene**

Date and signature: …/08/2023

Dedication

I dedicate this book to my lovely wife and daughter for being patient, loving me and being by my side all late, irrespective of the time this project stole them from me.

Acknowledgement

Words cannot explain how grateful I am to my supervisor and co-supervisor for their tremendous patience and criticism that levelled up my research skills. All professors and lecturers who I learnt from while pursuing this master's degree. Furthermore, without the tremendous support from community health officers and community health workers from Bugesera district. I am also grateful to my fellow students and cohort members, for editing assistance, late-night feedback sessions, and moral support.

Abstract

Background: There are nearly 240 million children with disabilities globally among numerous challenges they face nutrition difficulties are very common and this leads to inadequate nutrition which seriously affects disabled children in terms of thriving, brain development, physical growth and prone to diseases. Stunting is still a public health problem among the general population in LMIC. The burden doubles among children with disabilities due to inadequate or excess dietary intake which worsens their nutrition status and deterioration of their conditions. The aim of this study was to assess prevalence of stunting and associated factor among disabled children under five years in Bugesera district.

Method: This was a cross-sectional descriptive study with the main objective of assessing prevalence of stunting and associated factors among children under the age of five years with disabilities in Bugesera District. Multistage sampling technique was applied where 8 sectors have been randomly selected and from each sector probability proportion to size sampling (PPS) was applied to identify the study participants in each sector. Weight was obtained using standard electronic balance scale, height was measured using wooden height board and children less than 24 months lengths were obtained in recumbent position. Height for age was classified according WHO z-score standards. Socioeconomic factors and sociodemographic were obtained through an administered questionnaire. Description of independent variables was done through Percentages and frequency tables. Height for age(haz) was obtained by zscore06 stata function, bivariate analysis was obtained with chi-square (X^2) test to determine the associated factors among children with disabilities. Logistic regression was used for multivariate analysis to test the strength of association of multiple factors.

Results: In total 265 children were recruited and the majority were aged between 25-59 months. The high attained level of education by the parents was primary school 51.70% and 53.96% father and mother respectively. The most occupation for both parents was farming. Prevalence of stunting among disabled children under the age of five in Bugesera district was 44.91%. A positive association of being stunted was found in: age 25-59 months (aOR = 4.18 [95% CI: 1.71 - 10.23]), incomplete child immunization (aOR = 4.4 [95% CI: 1.16 - 16.69]) and rural residence (aOR = 3.08 [95% CI: 1.05 - 8.99] and parents education.

Conclusion: The prevalence of stunting among under five children with disabilities is high and being in preschool age, incompletely immunized, living in rural and no formally educated parents are associated with high risk of stunting among these children. There is a need to address stunting among disabled children through a strong program on parental education about nutritional guidance and support, quality healthcare including child full immunization. Further studies on magnitude of stunting among disabled children on national level are also needed.

Keywords: Stunting, children with disabilities, prevalence.

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List of acronyms and abbreviations

ADHD: Attention deficit Hyperactivity Disorder

aOR: Adjusted Odds ratio

BMI: Body mass index

CFSVA: Comprehensive Food Security and Vulnerability and Nutrition Analysis Survey

CI: Critical interval

DHS: Demographic Health survey

FANTA: Food And Nutrition Technical Assistant

HAZ: Height for age

LMIC: Low- and middle-income countries

MOH: Ministry of Health

MUAC: Middle upper arm circumference

NCPD: National Council of Person with Disability

SDG: Sustainable Development Goal

UNCRPD: United Nations Convention on the Rights of Persons with Disabilities

UNICEF: United Nations International Children's Emergency Fund

WAZ: Weight for age

WHO: World Health organization

WHZ: Weight for height

Definition of key terms

***Stunting*: (**Height for age) is a form of chronic or recurrent under-nutrition as result of failure to reach linear growth potential and was defined as Standard deviation (SD) below -2 by WHO child growth standards median.

Malnutrition: Malnutrition refers to deficiencies or excesses in nutrient intake, imbalance of essential nutrients or impaired nutrient utilization. The double burden of malnutrition consists of both under-nutrition, overweight, as well as diet-related non-communicable diseases. Undernutrition manifests in four broad forms: wasting, stunting, underweight, and micronutrient deficiencies [1].

Anthropometry*:* is defined by CDC as a science that defines human body physical measures that determines human size, form and functional capacities [2]

Disability: "Persons with a disability include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others."[3]

Associated factors*:* Sociodemographic and socioeconomic factors that are linked to occurrence or development of stunting among children with disabilities below the age of five.

Prevalence*:* Proportion that indicated the magnitude of stunting among children with disabilities who are under the age of five.

CHAPTER 1. INTRODUCTION

1.1. Background

Nutrition is a vital requirement of daily life for growth and development, especially in children with disabilities. Better nutrition helps children perform better in schools and are protected from different health conditions like non communicable diseases associated with obesity, cognitive dysfunction. Today all forms of malnutrition both undernutrition and overnutrition, are public health problems, especially in the low and middle income countries [4].

Recent WHO reports says that globally 149.2 million children under the age of five are stunted and the big percentage among these children is found in low and middle income countries where 75% of the stunted children are found in Asia. The global nutrition target 2025 for children under 5 years of age is to reduce stunting prevalence by 40% [5]. In general, the population prevalence of stunting among children under five years has been declining between 2000 and 2020. Current reports by UNICEF/WHO/World Bank on prevalence of stunting in 2000 was 33.1% which is currently reduced to 22% in 2020 and the number of children affected were 203.6 million in 2000 to 149.2 million by 2020 [6].

There are nearly 240 million children with disabilities globally among numerous challenges they face nutrition difficulties are very common and this leads to inadequate nutrition which seriously affects disabled children in terms of thriving, brain development, physical growth and prone to diseases. Studies shows prevalence of stunting among children with disabilities between the ages of 24-59 months is more than two times than those without disabilities [7]. A systematic review research on prevalence of stunting, wasting and underweight in low- and middle-income countries done by E. Emerson et al. among children with disabilities found a high prevalence of stunting of 49% [8].

In developed countries like Swaziland a research done by *C. Holenweg-Gross et al*. on prevalence of undernutrition among children with profound intellectual and multiple disabilities shows different findings of low prevalence 8% of stunting among the study participants [9]. In Turkeys

it was found that there is a high prevalence of malnutrition among children with disabilities [10]. Feeding difficult is one of the challenges children with disabilities meet and it was found that it is associated with malnutrition, especially stunting and underweight [11].

In lower income countries like Ethiopia, Egypt researches on nutrition status among children with special needs shows a positive correlation between stunting and disability [12] and in other study done in Egypt shows 46.2% were stunted, this shows how stunting is a prevalent issue among children with disabilities[13] Other Studies done on nutrition status among children with disabilities in Nepal, Bangladesh and Egypt all indicated a high burden of stunting among children with disabilities[14][15][13].

In East Africa Uganda a study done to assess nutrition status among children with cerebral palsy found out that most of the children were malnourished stunting was common 38 percent [16]. Similar findings were also found in Kenya Turkana in a research done on childhood and disability where children with disabilities had a high tendency of becoming stunted with prevalence of 54% [17].

The high prevalence of stunting among children with disabilities has many factors that are attributed to it, like child inability to feed themselves, children who were able to feed themselves had low prevalence of stunting than children fed by caretakers [18]. Multiple disabilities, choking while swallowing were the most independent associated factors with stunting[9].Parental education, improved socioeconomic status, children with father as head of the family, home versus institutional care, being male, children above 24 months and parents occupation are found in different literatures as the associated factors which are attributed to high prevalence of stunting among children with disabilities who are under the age of five[12][19][20][9].

Malnutrition among children under the age of five remains a public health issue in Rwanda, despite significant progress in reducing the prevalence of stunting among the general population. Trends of stunting in children under the age of five in Rwanda from 2000 to 2020 declined like the following 47.4 %(2000), 44% (2010), 38% (2015) and 33.1% (2020) respectively [21]. However these are the general population results, there is a lack of studies on stunting magnitude among children with disabilities in Rwanda.

Rwanda has adopted the terminologies “person with disabilities” and “Children with disabilities” to properly address people with disabilities, through Rwanda National Council for Persons with a Disability (NCPD) has developed other terminologies that replaced the traditional known ones that were sounding discriminative of people with disability among other community [22]. Rwanda has initiated program in 2012 of “Tubarere mumiryango”(Let's raise them in families) through national child development agency (NCD) which targeted children with disabilities to have homes, families or small group in residential institutions. Rwanda Demographic Household Survey 2019/20 has shown that at least 14% of household members in the ages of 5 and above has some form of disabilities[21].

1.2.Problem statement

Rwanda have shown a significant trend in fighting against malnutrition among the most vulnerable children age between six months and 59 months for the last decade, prevalence of stunting among this age category have decreased from 44% in two thousand and ten to 33.1% in 2020 reports from Rwanda Demographic Health Survey reports[23][21] and acute malnutrition was ranked by the ministry of health as the tenth leading cause of death among children who are less than 5 years [23]. The determinants of persistent chronic malnutrition have a lot of complexity however inadequate diet, repeated infection, lack of medical care, inadequate medical care are attributable factors [24]. Long term exposure to malnutrition especially during the early development of a child leads to irreversible damage in mostly all body immune, cardiovascular, gastrointestinal, muscular and psychological systemic functions [25].

Children with disabilities have more risk of being malnourished due to different factors like the morphology of the digestive system, anatomic features, mental retardation, lack of family attachment and discrimination. The conditions worsen from inadequate nutrient intake to absorption and assimilation of nutrients [4]. Lack of adequate nutrients in children results into serious health related conditions including delayed growth, increased risks of diseases and in worst condition death this gets worse in children with disabilities[4][20].The problem to be addressed through this study is the magnitude and associated factors of stunting among children with disabilities. It has been shown that countries with high numbers of disabilities also have high

prevalence of stunting and this occurs at multi-level, during pregnancy, breastfeeding, child growing and adolescents [4].

CFSVA and Nutrition Survey, 2018 showed that in Bugesera stunting prevalence among all children under five is 25% [26]. A recent report about children with disabilities in Bugesera district has shown a high number of children with disabilities, 2022 mapping report of children with disabilities between the age of 0 and 18 was found to be 3736 in all sectors making it among the districts with high prevalence of children with disabilities among these 1012 were less than 5 years.[27] . At the time of this research there is no recorded research or report about prevalence of stunting among children with disabilities in this district. Stunting assessment among children with disabilities under the age of five, has very limited information on the country level also.

Knowledge on prevalence of stunting and associated factors among children with disability will help to address a modified nutrition approach for children with disabilities to address their issues. The problem to be addressed by this study again is to show how stunting and disability relationship is a public health issue to be addressed to the policy makers.

1.3.Justification of the study

There is limited research about prevalence of stunting among under five years children with disabilities in Rwanda however research done in our neighbouring countries like Kenya found prevalence of stunting 1.6 times more among children with disabilities compared to the control group[28], similar findings were also found in Uganda where children with cerebral palsy had prevalence of stunting of 33% which is high compared to the general population trend of 29%[29][30].

In Rwanda there are programs and initiatives addressing needs for people with disabilities for them to have access to equal education, however little is known about their nutrition status and associated factors in this age category. WHO classification for assessing malnutrition severity by prevalence shows that in Rwanda malnutrition is an important public health problem and should be raised as a priority health problem among all children including both disabled and their

counterparts in the age below 5 years [31].

Therefore, assessment of stunting prevalence and associated factors among children with disabilities in Bugesera district will yield information that will help stakeholders in that field to base decisions and policy development. Further studies to understand undiscovered information on stunting among children with disabilities in Rwanda. .

1.4.Study objectives

Main Objective

- To assess the prevalence of stunting and associated factors among children with disabilities based on anthropometric measures.

Specific Objectives

- To determine the prevalence of stunting among children with disabilities in Bugesera district.
- To identify sociodemographic factors associated with stunting among children with disabilities in Bugesera district.
- To identify socioeconomic and Wash factors associated with stunting among children with disabilities in Bugesera district

1.5.Research questions/Hypothesis

- What is the prevalence of stunting among children with disabilities in Bugesera district
- What are sociodemographic factors associated with stunting among children with disabilities in Bugesera district?
- What are socioeconomic and Wash factors associated with stunting among children with disabilities in Bugesera district?

CHAPTER 2: LITERATURE REVIEW

2.1 Theoretical literature review

2.1.1 Definition of disability

Among WHO international classifications there is ICF (international classification of functioning, disability and health) defines disability as a "condition of the body or mind (impairment) that makes it more difficult for the person with the condition to do certain activities (activity limitation) and interact with the world around them (participation restrictions)" [32]. Other definitions include one by Disability Discrimination Acts (DDA) which states that a "disabled person has a physical or mental impairment that has a substantial and long-term adverse effect on his or her ability to carry out normal day-to-day activities" [33].

2.1.2 Categories of disabilities

Disability classification depends mainly on its cause. An individual may have more than one or multiple disabilities and it has shown that the more disabilities an individual has, the more limited day to day activities. Multiple disabilities means having one or more than one of mental, physical, emotional needs that requires medical and psychosocial support[34].These categories of people with multiple disabilities depend on someone/caregiver supporting daily activities like eating, drinking and knowing what and what not to eat. There are 13 major categories of disabilities under Individual with Disabilities Education Act (IDEA) which are [35].

Autism: is a developmental disorder that negatively impacts a child's educational progress by severely impairing verbal and nonverbal communication and social interaction, as well as hyper sensory and hypo-sensory, which are often noticeable during developmental periods. Other symptoms of autism include repetitive actions and movements, resistance to environmental change or changes in daily routines, and atypical responses to sensory events. All these impairments in addition they affect child's ability to feed her/himself

Deaf-blindness: Concurrent hearing and vision impairments, the pairing of which produces such severe communication and other developmental and educational demands that they cannot be met in special education programs simply for deaf or blind children.

Deafness: This occurs when a kid has significant hearing loss, which makes it difficult to receive linguistic information through hearing, with or without amplification, and has a negative impact

on a child's school performance and other activities.

Hearing impairment: a hearing impairment, whether permanent or variable, that has a negative impact on a child's educational achievement but is not included in the definition of deafness

Intellectual disabilities: Markedly below-average general intellectual functioning, coexisting with deficiencies in adaptive behavior and manifesting throughout the formative period, which has a negative impact on a child's educational success.

Multiple disabilities: Concurrent disabilities (such as mental retardation-blindness, mental retardation-orthopedic disability), the combination of which creates such significant educational needs and normal routines.

*Orthopedic impairment***:** A serious orthopedic defect that interferes with a child's daily activities. Impairments may be caused by a congenital abnormality, impairments induced by illness like polio and pot disease and other causes like amputation, cerebral palsy, fractures.

*Specific learning disabilities***:** A disturbance in one or more basic cognitive functions, such as memory, comprehension, and communication, caused by brain injury, mild brain malfunction, dyslexia, or developing aphasia.

Speech or language impairment: A disturbance in one or more of the basic psychological processes involved in comprehending or using spoken or written language, which might emerge as difficulties listening, thinking, speaking, reading, writing, spelling, or doing mathematical computations. Perceptual difficulties, brain damage, mild brain malfunction, dyslexia, and developmental aphasia are all included in the phrase.

Traumatic brain injury: This disability results from an acquired injury to the brain that results into partial or total functional impairment or psychosocial impairment like lower limb paralysis, repetitive seizures.

Visual impairment: Is the loss of ability to see including blindness that cannot be corrected and affects child’s education performance

Other Health Impairment: owing to acute or chronic diseases, having restricted vigor, energy, or alertness, including heightened awareness to external stimuli, resulting in limited attentiveness in the educational environment

2.1.3 Methods of nutritional assessment

Knowledge on nutritional status among a certain community or society is very crucial because it indicates the prevalence of nutrition disorders and their geographical distribution within the community to plan for a proper intervention including prevention, treatment and rehabilitation [36] It enables us to identify the alarming signs of children who may need urgent interventions[37].

Nutrition assessment involves indirect and direct nutrition assessment where direct nutritional assessment method contracts with individuals and measures the objective criteria while the indirect approach overseas the community health indices indicating nutritional indices [38] Nutritional assessment involves different interpretation approaches and either or all may be applied depending on the assessment objectives. It includes determining the Anthropometric measures, Mid Upper Arm circumference, dietary intake, biochemical, hematological, physical and clinical assessment [39]. Brief definition and approach to interpretation of some approaches.

Mid upper arm circumference (MUAC)-for-age: Is the circumference of the upper arm taken at the midway between the shoulder and elbow; it is a rapid and easy method that is suggested for use in children and adults to identify nutritional status such as severe acute malnutrition. MUAC cut-off carries according to age and is classified into severe, moderate and normal malnutrition. According to WHO child growth standards[31] MUAC –by-age classification children between 6-59 months whose measurements below 115mm are considered to be severely wasted, those belonging in the range of 115mm and 125 are moderately wasted while the children who have above 125mm are considered to be normal[31]. Between the age of 5 and 18 years are categorised into two age groups of 5-9 years and 10 to 18 years, for the first age category the cut off MUAC below 135mm are considered to be severely wasted and above 145mm belongs to the children who are in normal range. With the second age category MUAC cutoff is 160mm and normal is above 185mm.

Body mass index (BMI)-by-age: This is the most suitable basic indicator for relating weight to height to health outcomes. Based on WHO (2010), BMI is a basic metric of weight-to-height used to define individuals as underweight, overweight, or obese in adults. Underweight is defined when the BMI is below -2SD , overweight when BMI is greater than +1SD while Obesity is when the BMI is above +2SD, when plotted on WHO,Z-score charts [40][41].

Anthropometry: This is a scientific study that helps in measurements and proportions of the human body; this method is used for interpreting nutritional status assessment by measuring height/length, weight, skin-fold thickness, and head circumference, among other things. It can detect body composition changes to assess nutritional status in specific groups of people. This is universally applied in all age categories.

2.1.4 Malnutrition and disability

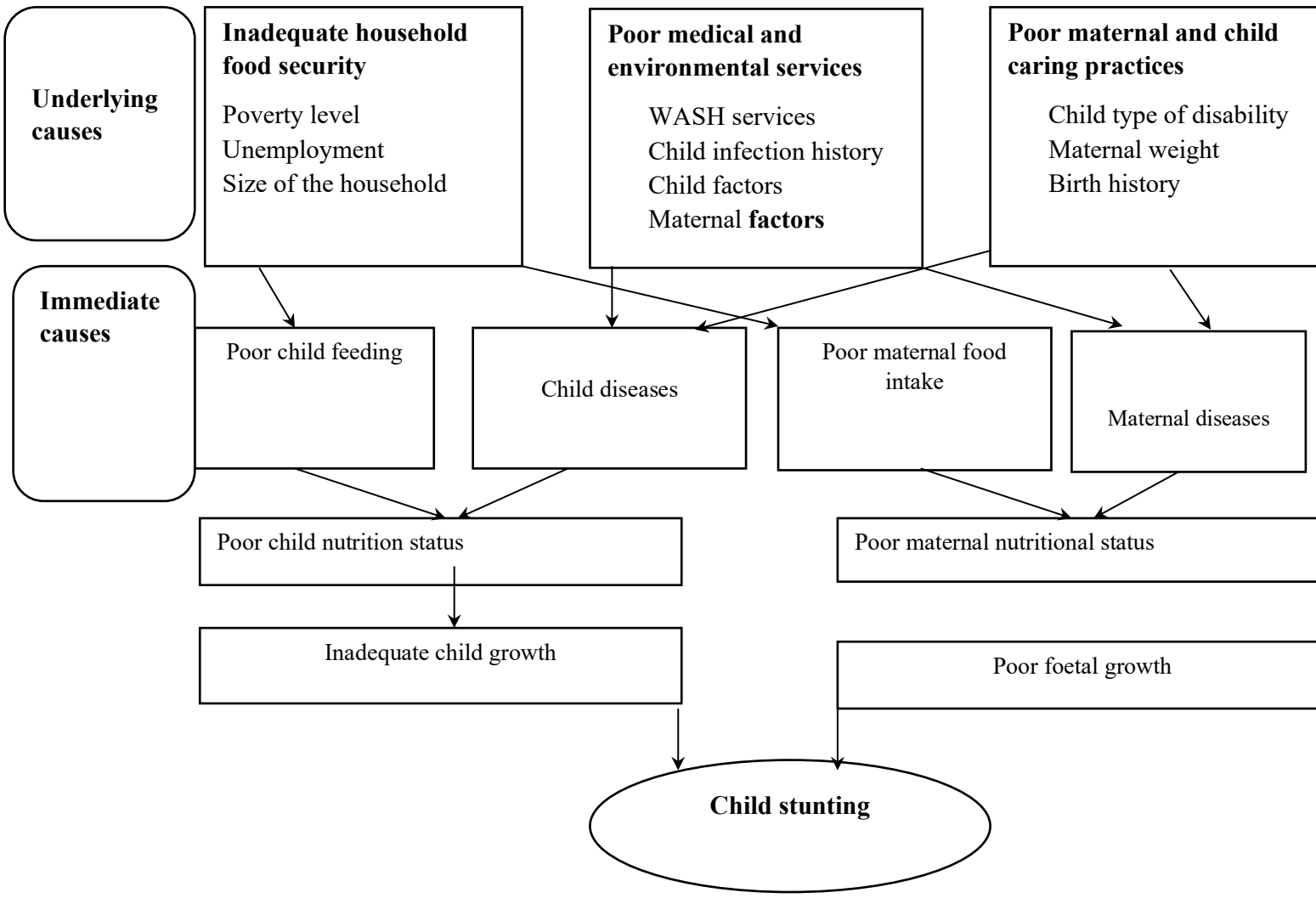
Most national and international guidelines for management of malnutrition among children do not put into special consideration of children living with disabilities irrespective of their required special attention due to their required medical intricacy [42]. A longitudinal study done in Malawi among children with disabilities and severe acute malnutrition survival rate has shown that children with SAM were six times more likely to die than those without disabilities, and among those discharged after recovery only 18% made it to their seventh birthday [43]. Lack of nutrients in the body due to poor absorption also may lead to deficiency of vital body requirements which can lead to other disabilities like lack of vitamin A and D and their deficiency may lead to blindness and rickets[28].The contributing factors begin at early age and during pregnancy, lack of sufficient vitamins, minerals, nutrients by a pregnant woman increases chances and vulnerability of the unborn child into health problems resulting in physical, sensory or intellectual disabilities. Countries with high prevalence of disabilities and developmental delays also have high prevalence of malnutrition[44].Children with physical disabilities are prone to malnutrition like those with cerebral palsy due to difficult chewing, swallowing, hypersecretion and those with congenital malformation experience like larger tongue, short teeth, lack of food taste all contributing to poor intake of food nutrients[45]. The situation worsens with the severity of disability among children with disabilities that are severe, children with severe motor and intellectual disabilities require active and tube feeding and the challenge that no standardized required feeds for these children categories receiving inadequate leads to increased risks of malnutrition [46]. Feeding children with disabilities caregivers finds it very stressful, especially the mealtime worrying on how much they can feed their children which nutrients to give them,[47].

2.2 Empirical literature

2.2.1 Prevalence of stunting among children under five with disability

Prevalence of stunting among under five years children is a public health problem that should be put among the health priorities, in Kenya a case control study on malnutrition and childhood disability found out that stunting among the children with disabilities were 1.6 times more of being stunted than the control group with prevalence of stunting of 34% compared to 23% non-disabled children [28]. In a systematic review on association of malnutrition and child disability in low and middle income countries 53% of reviewed articles had positive findings on association between stunting and disability. The average prevalence of stunting among children with disabilities from all eligible articles ranged between 28% to 69% and these findings of prevalence of stunting were 1.82 times more than the controls [19]. A cross sectional observation study of malnutrition among children with cerebral palsy in Saudi Arabia prevalence was 33.8% compared to the general public prevalence of stunting under the age of five in Saudi Arabia in 2018 which is 11.6% making prevalence among children with cerebral palsy three times higher the general population[51][52]. Similar findings have been observed in Nepal where prevalence of stunting among children with disabilities was reported to be 49.5%. In Bangladesh and Egypt, the same studies were done and prevalence of stunting among study participants 75% and 33.5% respectively [14][15][13].

Theoretical framework of stunting and associated factors



2.2. Sociodemographic factors associated with stunting.

There are various types of disabilities occurring to children like anatomical anomalies especially those manifested on the face, the respiratory digestive systems severely affect the child's ability to take in food, chewing and swallowing. Neurological disabilities like flaccid paralysis, intellectual disability and motor disability limit the children from seeking for food when hungry, also affects child's ability to participate in recreation games, sports, such children are very highly prone to stunting [57].

Factors that cause the children with disabilities be prone to stunting differ according to the type of disability, some face anatomical or oral mechanical anomalies like cleft lips, cleft palate, micrognathia, microtia which results into poor chewing capacity, sucking and feeding difficulties [28]. Intestinal parasites, recurrent infections, lack of knowledge of feeding the children with a balanced diet by caretakers [53]. Increased vulnerability to stunting among children with disabilities is associated with different factors like neglect and violence, inadequate child care, lack of motivation by the parent, lack of appropriate information on how to care a disabled child, socioeconomic status of the household and lack of education [54][4].

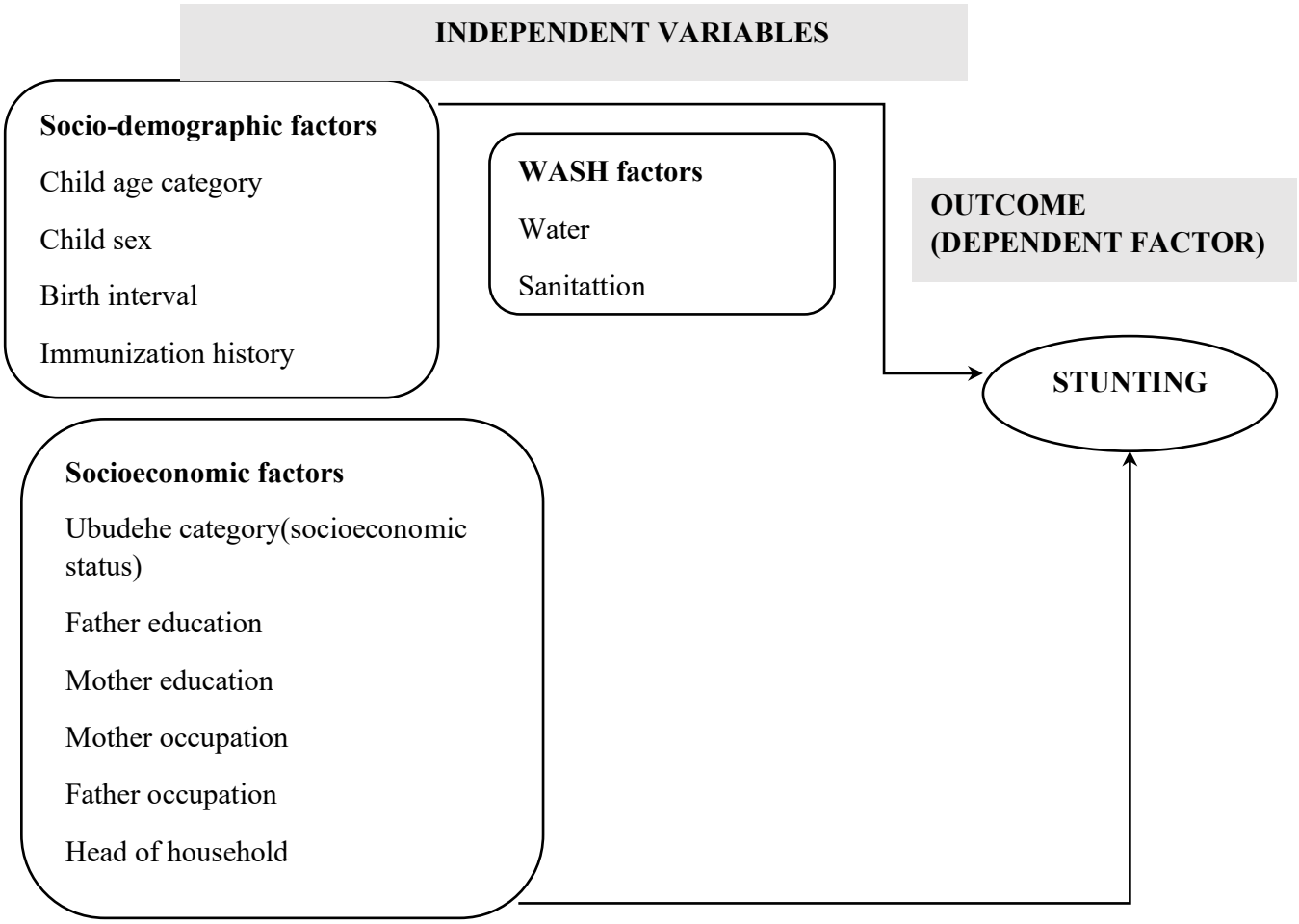
Child factors like sex, age, breastfeeding, self-feeding and choking during swallowing have shown to be highly attributed to stunting among children with disabilities [9]. Studies show that age is associated with stunting where high prevalence is mostly found in children with more than one year [18]. Also research shows that children who exclusively breastfeed up to six months have less odds of being stunted than those who were not exclusively breastfeed[55]. As children get older, especially disabilities related to cerebral palsy, the children are at more risk of being stunted than the young one, and families with parents who are educated are a protective factor for stunting among children with disabilities [56]. Maternal education is one of the elements influencing under-five children's nutritional status; fundamental understanding about the standard of care and nutrition impacts the child's nutritional result. Children of non-educated mothers are more likely to be stunted.

2.2.1. Socioeconomic and wash factors associated with stunting

Children with disabilities from poor socioeconomic status are 2.0;95%CI (1.3–3.1) times more risk of being stunted than other socioeconomic categories, households with both parents with desk jobs, blue collar jobs and farming their children with disabilities are less likely to develop stunting compared to unemployed parents [15]. Studies show that families with disabled children have high risks of spending extra income on his/her medical care, institution care centers, and special nutrition supplements; these may lead the family into catastrophic expenditure or impoverishment [15][7].

Children with disabilities who live in families with improved sanitation and water both factors have shown to be the protective factors on child stunting. One study finding show that children from families with improved sanitation and water were 29% less attributed to stunted [58]. According to the evidence reviewed, children with disabilities household with limited WASH are prone to recurrent chronic exposure to enteric pathogens [15].

2.3 **Conceptual framework**



CHAPTER 3. METHODOLOGY

3.1 Research Design

This was a descriptive community based cross-sectional study which mainly focused on children with disabilities in the age category from 0 to 5 years mapped between the year of 2021 and 2022 in Bugesera district.

3.2 Study setting

Rwanda's administrative divisions are provinces, districts, sectors, cells, and villages, and it is located in eastern-central Africa. Bugesera district is located in the eastern province, 15 kilometers from Kigali's capital city. It has a population of 523,999 people. Its economy is rapidly expanding as a result of its proximity to the capital city, the continuing development of an international airport, and improved agriculture.

3.3 Study population

The study has been conducted among children with disabilities mapped by chance for childhood, a non-governmental international organization operating in Rwanda and works in partnership with Bugesera district by supporting children with disabilities.

3.4 Sample size

Sample size calculation

The sample size was obtained using the Cochran *(1977)* formula assuming the prevalence of stunting among children with disabilities under the age of 5 to be **(p) 34%** in relation to similar studies in same context done in Kenya[28] with desired level precision of **(d)** 0.05, critical value of desired confidence level (Z) (1.96) and 95% confidence from targeted children with disabilities in Bugesera of 1012.

$$n = \frac{z^2 pq}{d^2}$$

q=1-p

$$n = \frac{3.8416x0.34x(1-0.34)}{0.0025}$$

$$n = 345$$

a correction formula to calculate the actual sample size was used because the one found was below 10,000.

$$fn = \frac{345}{1 + (345-1)/1012}$$

$$fn = \boldsymbol{257}$$

$$fn = final\ sample\ size$$

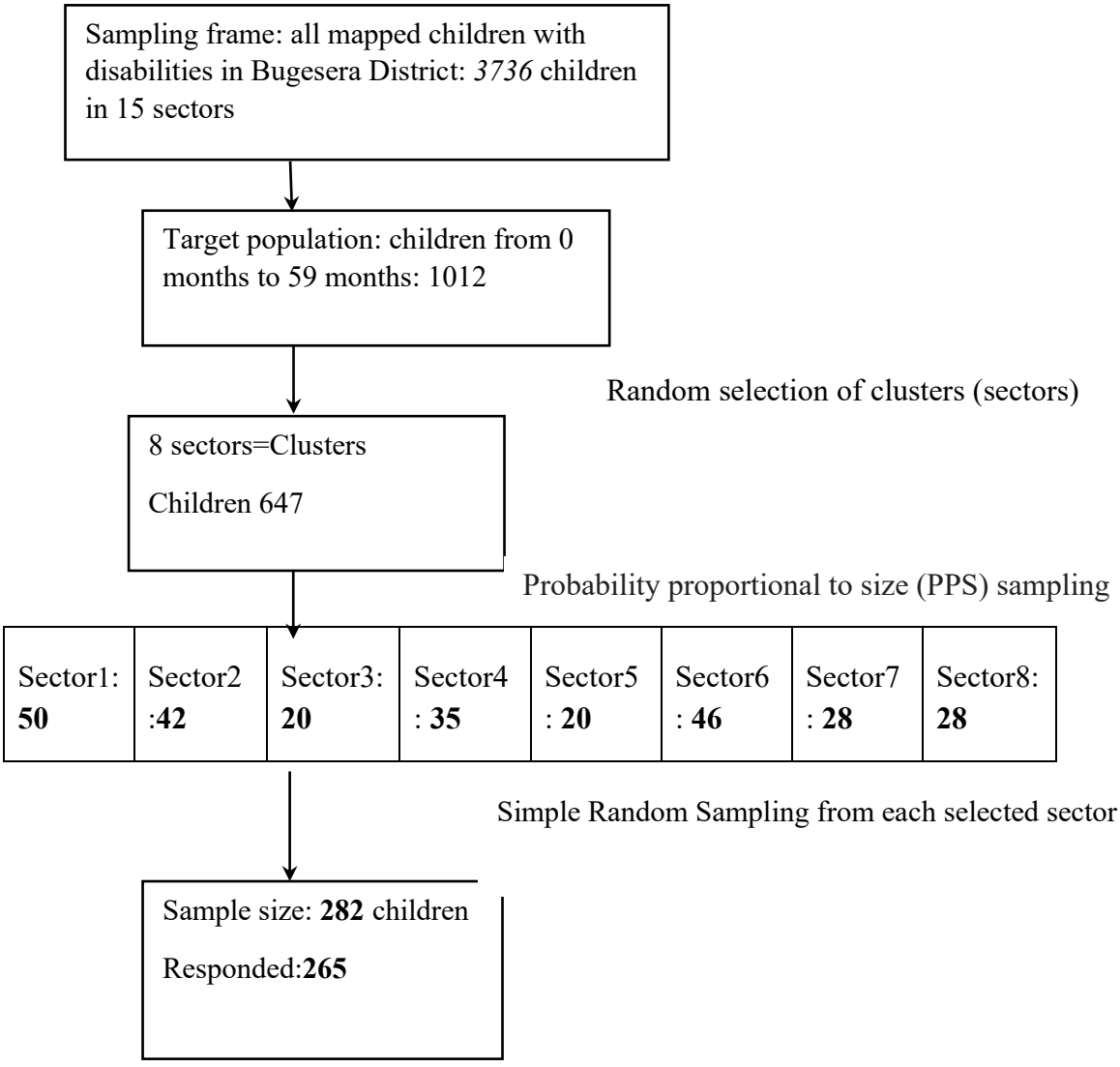
***N**: the population size*

*10% was added as predicted non respondent and the final sample size 254+24=**282***

3.5 Sampling technique

Multistage sampling technique was applied where 8 sectors were randomly selected and from each sector probability proportion to size (PPS) sampling to identify the number of children from each cluster was used. The representative sample size was obtained from each cluster by simple random technique from the list of all children with disabilities under the age of five. Excel was used to generate random numbers to sample target populations differently.

Schematic representation of sampling strategy



3.6. **Data collection method**

Weight was obtained using standard electronic balance scales with children's heavy clothes and shoes removed, height was measured using wooden height board and children less than 24 months lengths were obtained in recumbent position and those who couldn't support themselves were supported by their caretakers. To ensure reliability of data, data collectors were trained on how to measure height and weight and repeated practices were done, measuring instruments were set at standards and multiple measures were taken to insure accuracy. Classification of anthropometric measures was obtained according to WHO z-score standards. To collect data on socio-demographic, socioeconomic, and Wash factors a questionnaire was used in each interview, and each interview took less than 30 minutes from each participant. The Kobo toolbox application was used to collect data, which was then downloaded in the form of Excel for cleaning before being entered into STATA software for analysis.

Dependent variable:

Height-for-age (HAZ) were calculated using the anthropometric calculator command in Stata software and findings were classified according WHO zscore, the research outcome variable stunting was obtained as a dichotomous variable where 1 was stunting HAZ<-2SD and 0 no stunting HAZ >2SD.

Independent variables:

Socio-demographic factors: *Age, sex, order of childbirth, immunization history, type of disability and child deworming history*: age was categorized into two main groups' child age less than 24 months the second group was between 25 months and 59 months. Immunization history was also grouped into completely immunized and incompletely or no immunized in one category.

Socioeconomic and WASH factors: *Ubudehe category (socioeconomic status)***,** *Father education, Mother education, Mother occupation, mother occupation, father Occupation, location, Access to safe drinking water and Sanitation*: Mother and father education was categorized into No formal education (those who haven't attended formal education), primary education, those who attended secondary school and higher were grouped into secondary and

upper education category. Location was categorized into dichotomous variables as urban and rule. Urban was defined according to the location of the district headquarter which is located in Nyamata sector, children from this sector were classified as urban and the rest were rural. Access to safe water was categorized into basic (those who obtain drinking water from improved tap water at their home or at least those who use community tap water), and unimproved was categorized for families who use dam, river and lake water. Sanitation classified as basic (flash toilet with treated disposal or improved pit latrine with slab) and unimproved pit latrine without slab or no toilet.

3.8 Data analysis procedures

After obtaining the row data, completeness was cross-checked and the data were entered into STATAMP.v015 for analysis. Description of variables was obtained through Percentages and frequency and tables for all independent variables. Height for age was obtained by the zscore06 function in stata. For bivariate analysis cross tabulation was done between dependent variables with independent variables and chi-square (X^2) test was used to determine the associated factors among children with disabilities. For multivariate analysis logistic regression was used to test the strength of association of multiple factors to stunting

3.9 Ethical considerations

Ethical approval was obtained from the University of Rwanda Institutional Review Board (IRB) with *Ref: CMHS/IRB/2802023,* a full protocol and ethical approval letter were provided to all authorities necessary that had an direct influence on the research. Before data collection a written consent form was assigned by the child caretaker.

CHAPTER 4: RESULTS

4.0. Introduction

A total of 265 of children under the age of five with disabilities participated in this research which is equivalent to 94% response rate.

4.1.Prevalence of stunting of under five years children with disabilities in Bugesera district

Prevalence of stunting (HAZ <-2 z-score) among children with disabilities under the age of five in Bugesera district was found to be 44.91% (95%CI; 38 – 51).

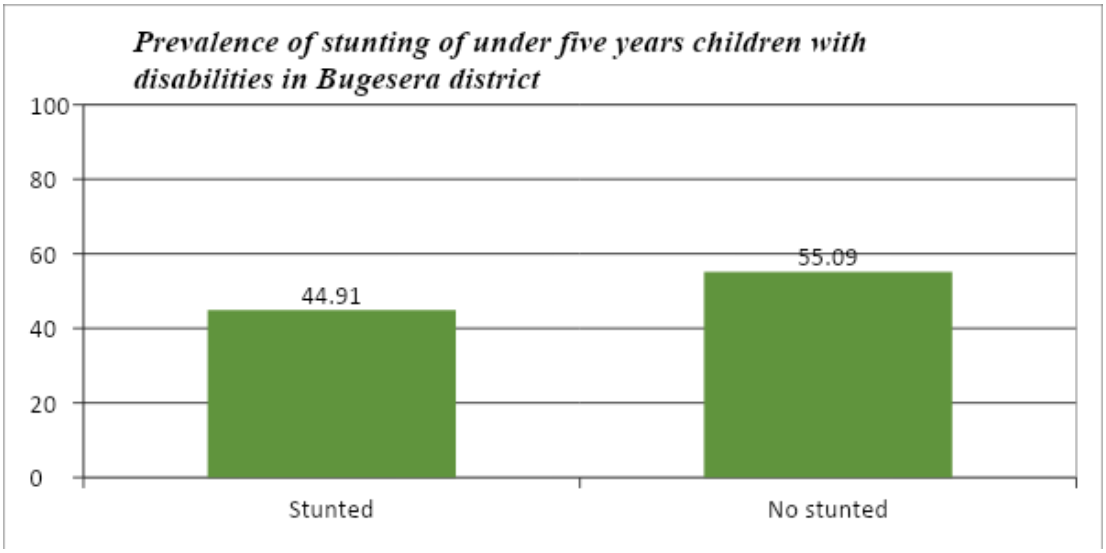


Figure 6. Graph showing Prevalence of stunting

4.2. Sociodemographic characteristics of under 5 children with disabilities.

Among 265 children with disabilities who participated in the research male to female ratio was 1.2:1 respectively. The mean age was 43 months with standard deviation of ±13.86 and (225) 86.42% were between 24 and 59 months. There were more children born after the fourth child among the participants 107(40.38%). Most of the children 238(89.51%) had normal birth weight. There was a big percentage of 251(94.72%) of children who completely got all required child immunization. A big percentage of 239(90.19%) of children were found in the rural area. Household size of members between five and seven were 94(35.47%) and families composed of more than seven members were 97(36.60%). Orthopedic and multiple disabilities were the most

common disabilities among the children who participated in the research 92(34.72 %) and 73(27.55 %) respectively. Children with a history of getting at least one tablet of albendazole every three months were 181(68.30%). (see **Table 1**).

Table 1.Table sociodemographic characteristics of study participants

Characteristics	Number	Percentage(%)
	265	**100**
Gender		
Female	119	44.91
Male	146	55.09
Age group(months)		
0 – 24	36	13.58
25-59	229	86.42
Childbirth order		
First born	40	15.09
Second	54	20.38
Third	41	15.47
Fourth	23	8.68
After the fourth Child	107	40.38
Childbirth weight		
Low birth weight	27	10.9
Normal birth weight	238	89.81
Vaccination History		
Completely immunized	251	94.72
Incomplete immunized	14	5.28
Place of residence		
Urban	26	9.81
Rural	239	90.19
Type of disability		
Autism	2	0.75
Hearing disability	7	2.64
seeing disabilities	43	14.96
Mental health problems	6	2.26
Hearing and seeing disabilities	2	0.76
Multiple disabilities	73	27.55
Orthopedic disabilities	92	34.72
Speech disorders	4	1.51
Cerebral Palsy	24	9.06
History of deworming		
Get Albendazole single dose every 3 months	181	68.3
Do not receive Albendazole every 3 months	84	31.7

4.3. Socioeconomic and wash characteristics

Children with disabilities from families in the first, second and third ubudehe categories were 43(16.23%), 135(50.14%) and 87(32.82%) respectively; more children with disabilities came from second ubudehe category families. The findings also found that 95.47% of children came from families that use community health insurance (CBHI) than other insurances and no insurance. Primary school was the most optimal education level; both father and mother achieved 127(51.70%) and 143(53.96%) respectively; there were very few who attended higher education. research also found that farming was the most occupation for both mother 177(66.79%) and father 183(69.06%). (see **Table 2**)

Table 2. Socioeconomic characteristics of under 5 children with disabilities and WASH factors

Characteristics	Number	Percentage (%)
	265	**100**
Ubudehe category		
One	43	16.23
two	135	50.94
three	87	32.83
Health Insurance		
Community based health insurance	253	95.47
Private health insurance	4	1.51
No health insurance	8	3.02
Mother's education		
No formal education	103	38.87
Primary education	143	53.96
Secondary and upper education	19	7.17
Father's education		
No formal education	99	37.36
Primary education	137	51.7
Secondary and upper education	29	10.94
Mother's occupation		
Office job	2	0.75
Blue collar job	9	3.40
Farmer	177	66.79
No job	77	29.06
Source of drinking water		
Basic tap water	209	78.87
Unimproved	56	21.13
Sanitation		
Flash toilet/pit latrine with slab	258	97.36
Pit latrine without slab/no toilet	7	2.64

The findings shows that 209 (78.87%) of children come from households which at least have access to basic tap drinking water and the rest use unimproved water sources like dams, lake and rivers. Percentage of children from families with at least basic sanitation flash toilet or pit latrine with slab 258 (97.36%) and the rest were unimproved pit latrine without slab or open defecation 7(2.62%)

4.4. Factors associated with stunting among the study participants

4.5.Sociodemographic factors associated with stunting among disabled children Factors

Factors associated with stunting among the children with disabilities were obtained through bivariate analysis using *Pearson chi-square test.*Among demographic characteristics child age (p=0.001),immunization history (p = 0.001) and place of residence were significant : (see **Table** 3)

Table 1. Showing Sociodemographic factors associated with stunting

Characteristics	Stunting		Chi2	p value
	Yes n(%)	No n(%)		
Gender			1.82	0.177
Male	71(59.66)	75(51.37)		
Female	48(40.34)	71(48.63)		
Child birth order			4.37	0.357
First born	15(12.61)	25(17.12)		
Second	29(24.37)	25(17.12)		
Age group(months)			10.91	0.001
0 - 24	7(5.88)	29(19.86)		
25-59	112(94.12)	117(80.14)		
Child order			4.37	0.357
First	15(12.61)	25(17.12)		
Second	29(24.37)	25(17.12)		
Third	17(14.20)	24(16.44)		
After the fourth Child	45(37.82)	62(42.47)		
Child Birth weight			3.89	0.24
Low birth weight	15(12.61)	12(8.22)		
Normal birth weight	104(87.39)	134 (91.78)		
Child immunization history			6.77	0.009
Completely Immunized	108(90.76)	143(97.95)		
Incompletely Immunized	11(9.24)	11(9.24)		
Place of residence			3.7	0.005
Urban	7(5.88)	19(13.01)		
Rural	112(94.12)	127(86.99)		
Type of disability			7.03	0.855
Autism	2(1.68)	0(0.00)		
Hearing disability	4(3.36)	3(1.37)		
seeing disabilies	15(12.61)	22(15.07)		
Mental health problems	2(1.68)	4(2.74)		
Hearing and seeing disabilities	1(0.84)	1(0.84)		
Multiple disabilities	31(26.05)	42(28.77)		
Orthopedic disabilities	41(34.45)	51(34.93)		
Speech disorders	2(1.68)	2(1.37)		
Cerebral Palsy	11(9.24)	13(8.90)		
Autism	2(1.68)	0(0.00)		
History of deworming			0.04	0.848
Every 3 Months	82(68.91)	99(69.81)		
None received	37(31.09)	47(32.9)		

4.6.Socioeconomic and WASH factors associated with stunting among disabled children Factors

Among socioeconomic and WASH characteristics father education (p=0.001) and mother education (p=0.001) were significant (see **Table 4**)

Table 4.Socioeconomic and WASH factors associated with stunting

	stunting			
Characteristics	**Yes n (%)**	**No n (%)**	**Chi2**	**p value**
Ubudehe category			0.51	0.773
One	21(17.65)	22(15.07)		
two	58(48.74)	77(52.74)		
three	40(33.61)	47(32.19)		
Health Insurance			3.52	0.171
Community based health insurance	116(97.48	137(93.84)		
Private health insurance	2(1.68)	2(1.37)		
No health insurance	1(0.84)	7(4.79)		
Mothers's education			6.19	0.045
No formal education	56(47.06)	47(32.19)		
Primary education	55(46.22)	88(60.25)		
secondary and upper education	8(6.72)	11(7.53)		
Mother's occupation			6.48	0.045
Office job	2(1.68)	0(0.00)		
Blue collar job	6(5.04)	3(2.05)		
farmer	72(60.50)	105(71.92)		
no job	39(32.77)	38(26.03)		
Fathers' education			7.21	0.027
No formal education	51(42.86)	48(32.88)		
Primary education	51(42.86)	86(58.90)		
Secondary and upper education	17(14.29)	12(8.22)		
Father's occupation			4.26	0.235
Office job	3(2.74)	4(2.74)		
Blue collar job	3(2.52)	8(5.48)		
farmer	78(65.55)	105(71.92)		
no job	35(29.41)	29(19.86)		
Source of drinking water			2.15	0.142
Basic tap water	89(74.79)	120(82.19)		
Unimproved	30(25.21)	26(17.81)		
Sanitation				
Flash toilet/pit latrine with slab	114(95.80	144(98.63)	2.04	0.153
Pit latrine without slab/no toilet	5(4.20)	2(1.37)		

4.7. Multivariable logistic regression analysis on factors associated with stunting among children under five from Bugesera District

Logistic regression was used to assess the strength of association of all independent variables which were statistically significant, child age category, Location, Immunization history, father and mother education with P-value <0.05. Children between the age category 24 to 59 months (preschooler) were 4 times more likely to be stunted than the children below the age of 24 months ([aOR=4.18 [95% CI: 1.71 - 10.23]). Children who have a history of partially/not immunized were four times higher risk of being stunted compared to those who were fully immunized ([aOR=4.4 [95% CI: 1.16 - 16.69]). Children who are in rural areas were positively associated with stunting ([aOR=3.02 [95% CI: 1.05 - 8.99]). compared to those in urban areas. Mothers who at least had primary school education study shows that their children were 0.52 times less likely to be stunted ([aOR=0.51 [95% CI: 0.24 - 1.06]) than mothers who have not attended school and this was also observed among the educated fathers where those who attended primary school was a protective factor for stunting ([aOR=0.52 [95% CI: 0.30- 0.90]) (see **Table 5).**

Table 5. Showing Multivariable logistic regression analysis on factors associated with stunting among children under five from Bugesera District

Characteristics	AOR [95% CI]	P value
Age group(months)		
0 - 24 (infants)	1	
25-59 (Preschooler)	4.18[1.71 - 10.23]	0.002
Vaccination History		
Complete immunization	1	
Incomplete immunization	4.4[1.16 - 16.69]	0.029
Location		
Urban	1	
rural	3.08[1.05 - 8.99]	0.039
Mothers' education		
No formal education	1	
Primary education	0.51[0.24 - 1.06]	0.072
secondary and upper education	0.42[0.12 - 1.40]	0.055
Fathers' education		
No formal education	1	
Primary education	0.52[0.30- 0.90]	0.021
Secondary and upper education	1.26[0.53 - 2.91]	0.59

CHAPTER 5: DISCUSSION

5.0. Prevalence of stunting among children with disabilities

This study aimed at determining the prevalence of stunting and associated sociodemographic, socioeconomic and wash factors among children with disabilities who are under the age of 5 years in Bugesera district in Rwanda. The prevalence of stunting among children with disabilities was 44.91% [95%CI; 38 – 51] compared to the current national prevalence of stunting in the same age category reported in DHS 2019/20 prevalence of stunting was 33.1% [59], this significantly shows that prevalence of stunting is much higher among children with disabilities according to WHO recommended significance cut-off, height-for-age of below -2 standard deviation(SD) of the WHO standards[1].

Research findings have been shown to be similar in Nepal where they did a comparative study of nutrition status among children with disabilities and found prevalence higher among children with disability of 45% and this was more attributed to disability type, severity of disability, parental economic status and feeding abilities[14] the similarity reflects the same characteristics and context of this study participants who had multiple disabilities and came from low socioeconomic status families. A correlating study done in Zambia to assess burden of malnutrition among children with disabilities challenges and opportunities found similar findings of high prevalence of stunting among children with disabilities of 46%[60]. The similarity in findings both Zambia share common socioeconomic characteristics, poverty and unequal distribution of resources within the household, access to sufficient healthy food is frequently a subject of concern for families with a disabled member in both contexts. [60].

However there is a similar study that found less prevalence compared to the research findings done in Kenya Turkana by Hannah *Kuper et Al*. to associate malnutrition and disability among children where they found out that prevalence of stunting is higher in children with disabilities compared to the control group 34% and 23% respectively[28]. The reason behind less findings is that in Kenya some children were selected from a rehabilitation centre making them exposed to more improved healthcare and diet than in the study population whereas study participants were cared for by their families. Higher prevalence of stunting among disabled children was reported in a

research done in Bangladesh where the prevalence was 1.7 times more than this research findings and this can be attributed to high percentage of illiteracy of the children's mothers [15].

5.1. Socio-demographic associated factors

The main Factors like child age category, immunization history, urban versus rural child residence were statistically significantly associated with stunting among children with disabilities. Although gender was not statistically significant between male and female children, the prevalence was higher among male 59.66% (CI 95%; 40.28 - 57.03) children with disabilities than female 40.34 %(95%CI; 31.44 - 49.71). Male children are more likely to grow stunted than girls in Rwanda and Sub-Saharan Africa, which may be attributed to biological differences between male and female boys more often having higher metabolic rate and energy expenditure than girls. They might require more calories to maintain their growth rate, and if their nutritional intake is inadequate, they could be more susceptible to stunting [61][62].

Factors which contributes to stunting among children with disabilities found during the study were child age category, older children between 25 months and 59 months were 4.4 times more risk of being stunted than children under 24 months of age and similar findings were reported by other researchers from Saudi Arabia, Bangladesh and Kenya[51][15][28].Children with disabilities who are above the age of 2 years are prone to stunting due to many general reasons but this is normally where a child start supporting him or herself like feeding, playing with others which have a big contribution to the child body metabolism, this is also the time where most parent wean the child off the breastfeeding which have been playing a big role in term of providing nutrients to the child[63].

Immunization history of the child, the study findings shows that children who have not received or partially immunized are 4.4 times more prone to stunting than those who are fully vaccinated. A research in Nigeria association of child vaccine uptakes and under nutrition showed that vaccination adherence was consistently associated with a lower risk of stunting [64], similar findings were also reported by Thai researchers where children who incompletely immunized were 1.47 higher to be stunted than those fully immunized [65]. Child immunization provides immunity to the body to fight different ranges of infections; lack of child vaccines can indirectly contribute

to stunting through its impact on overall health and immunity of the child. Infections can lead to decreased appetite, nutrient mal-absorption, and increased nutrient requirements for recovery from repeated infections which may result in chronic gut inflammation, leading to poor nutrient absorption and utilization, which can ultimately lead to stunted growth.

5.2. Socioeconomic associated factors

Mother and father education, children with disabilities from families with both parents at least attended primary school were 0.5 times less likely to be stunted ([aOR=0.52 [95% CI: 0.30- 0.90]). The higher the education status of the parents was associated with a reduced trend in prevalence of stunting of their children. Other researches also are in connection with the research findings where both educated parents correlates with less prevalence of stunting, similar studies show the same trend, done in Bangladesh and Egypt [15][66]. Low level of education and lack of nutritional education of caregivers of disabled children may worsen the severity of health challenges they face due to lack proper information and guidance on providing adequate nutrition to meet their child's specific needs. Children from educated parents are less likely to be stunted due to a variety of factors related to knowledge, awareness, socioeconomic status, and healthcare access. Educated parents often have a better understanding of the importance of proper nutrition for child growth and development. They are more likely to be aware of the nutritional needs of their children and make informed choices regarding their diet, hence parental education can influence a child's likelihood of stunting [67].

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study aimed at assessing prevalence of stunting and associated factors among disabled children who are less than five years old from Bugesera district in Rwanda. The findings showed that prevalence of stunting among the study participants was 44.91% compared to the current prevalence of stunting among the general population which is 33.1% making it higher. Orthopaedic related disabilities and multiple disabilities were the most common disabilities possessed by the children. The main significant factors associated with stunting were child age category, child immunisation history,parent education level and child residence. Children between 25 months and 59 months had higher prevalence of stunting than children below 24 months of age.

A fully immunized child was a protective factor to stunting. Children with both parents who at least completed primary school were less stunted than the uneducated one and the trend of prevalence got lower with the increased level of education. Stunting in the general population of Rwanda among children under the age of five is still a public health problem however with children living with disabilities the situation is worse. Addressing this public burden requires intervention programs that involve parents, local community and policy makers. Future studies to solve the limitations of this research should be collaborating with experts in disability studies to ensure optimal and specialized approach to these study populations. Future researchers should apply a case control study approach to this type of study to control the possible confounding factors. Funding to optimize the costs of research and involve a bigger sample size of participants.

6.2 Recommendations

Based on the study findings and conclusion, the following recommendations are here by suggested:

- Since preschool children with disabilities are at risk of being stunted than the young children the community administrative should establish public recreation centers for rehabilitation and nutrition support adaptable to age category, where they can have access to different sports, and other activities
- Children with parents who at least completed primary school have been shown to be less prone to high risk of stunting; Bugesera district should implement a parental vocation and education program on nutrition and support for disabled children at the community level. The village leaders should reconsider iga program where adults take evening courses on how to read and write because education of the parents is a basic tool for the child development especially children with disabilities who require special attention and understanding of the nutrition content feed to the children and this will provide basic skills and knowledge for special care of children with disabilities.

- village leaders should implement community campaigns on strict follow up of child immunisation programs during monthly community public activity (umuganda) and focus especially among households having children with disabilities.
- Since residing in the rural region was found to be associated with stunting among disabled children, the government and partners in related fields should implement a comprehensive

collaborative nutrition program of how to use home produced food products to make a balanced diet among families in the rural area having children with disabilities.

- Addressing malnutrition and stunting in children with disabilities requires a holistic approach which includes ensuring access to quality healthcare, offering nutritional guidance and support to caregivers, providing adaptive feeding tools, advocating for inclusion and awareness, and tailoring interventions to the specific needs of each child. Collaboration between healthcare professionals, nutritionists, and caregivers is essential to promote the health and well-being of disabled children
- Future researchers should also do more research in similar context for verification or negation of the study findings

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APPENDICES

Appendix 1: Ethical approval

UNIVERSITY of RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

DIRECTORATE OF RESEARCH & INNOVATION

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 24/07/2023
Ref: CMHS/IRB/280/2023

NKURUNZIZA Emmanuel
School of Public Health, CMHS, UR

Dear NKURUNZIZA Emmanuel,

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled ***"Prevalence and Associated Factors of Stunting Among Under Five Years Children with Disabilities in Bugesera District, Eastern Province of Rwanda".***

Having reviewed your application and been satisfied with your protocol, 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.

FOR

Assoc. Prof. Stefan Jansen (PhD)
Acting Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Cc:

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

Email: researchcenter@ur.ac.rw P.O Box 3286 Kigali, Rwanda www.ur.ac.rw

Appendix 4: Consent/assent form

PREVALEENCE OF STUNTING AND ASSOCIATED FACTORS AMONG CHILDREN WITH DISABILITIES IN BUGESERA DISTRICT,EASTERN PROVINCE OF RWANDA

Nutrition is a vital requirement of daily life for growth and development, especially in children with disabilities better nutrition helps children perform better in schools and is prevented from different health conditions like non communicable diseases associated with obesity, cognitive dysfunction. Globally 149.2 million children under the age of five are stunted and nearly 240 Million children with disabilities globally among numerous challenges they encounter nutrition difficulties is very common and this leads to inadequate nutrition which seriously affected disabled children in terms of thriving, brain development, physical growth and prone to diseases. This study will access the magnitude of stunting and its determinants in Bugesera for better recommendation of this global health challenge.

I……..agree to participate or disagree to participation of my child(**Code**) …….. in the research project *titled* ***prevalence of stunting and associated factors among children with disabilities in bugesera district, eastern province of rwanda***, conducted by ……..who has (have) discussed the research project with me.

I have received, read and kept a copy of the information letter/plain language statement. I have had the opportunity to ask questions about this research and I have received satisfactory answers. I understand the general purposes, risks and methods of this research.

I consent to participate in the research project and the following has been explained to me:

- The research may not be of direct benefit to me
- My participation is completely voluntary
- My right to withdraw from the study at any time without any implications to me
- The risks including any possible inconvenience, discomfort or harm as a consequence of my participation in the research project
- The steps that have been taken to minimise any possible risks
- What i am expected and required to do
- Whom i should contact for any complaints with the research or the conduct of the research
- I am able to request a copy of the research findings and reports
- Security and confidentiality of my personal/child information.
- Publication of results from this study on the condition that my identify will not be revealed

Name:

Signature:

Date:

s

Appendix 3: Data collection tools

The following questionnaire has been developed based on the similar research which has been done somewhere else studying the same population problem, and was also based on the developed research questions and objectives and adopted the same variables in these contexts[15][12]. And was translated in kinyarwanda

I. Demographic factors		
Question	**Response**	**Code**
1. Age in years		
2. Weight(Kg)		
3. Date of birth	Day Month Year	
4. Height(m)		
5. Maternal Age at delivery		
6. Ubudehe category	Ubudehe 1	1
	Ubudehe 2	2
	Ubudehe 3	3
7. Health insurance	CBHI	1
	Private insurance	2
	No insurance	3
8. Child birth order	First born	1
	Second born	2
	Third Born	3
	Forth born	4
	More than four	5
9. Family size	Less than or equal 4	1
	Five to seven	2
	Above seven	3
10. Sex	Male	1
	Female	2
II. Birth History	Birth weight	
	Mode of delivery	1. natural
		2. C/S
	Place of delivery	1. Health care

		2. Home
	Hospitalized in Neonatology	1. Yes
		2. No
III. Vacinnation History	Update vaccines	
	Missing some vaccines or none	
11. Location	Rweru	1
	Rilima	2
	Nyarugenge	3
	Nyamata	4
	Ntarama	5
	Ngeruka	6
	Mayange	7
	Gashora	8
12. Parents	Both	1
	Mother only	2
	Father only	3
	Orphan	4
WASH Factors		
13. Source of drinking water	Available at home	1
	Community source <30minutes	2
	Community source >30minutes	3
	Dam,lake and river source	4
14. Access to sanitation	Flush to proper dispasal system	1
	Pit latrine with slab	2
	Open pit latrine	3
	No facility	4
15. Education level of mother	No Education	1
	Primary education	2
	Secondary education	3
	Tertiary education	4
16. Education Level of	No Education	1

the father	Primary education	2
	Secondary education	3
	Tertiary education	4
17. Occupation of the father	Desk Job	1
	Blue-collar Jobs	2
	Farmer	3
	Business	4
	No job	5
18. Occupation of mother	Blue-collar Jobs	2
	Farmer	3
	Business	4
	No job	5
IV. Disability Type		
19. Type of disability	1. Autism 2. Deaf-Blindness 3. Deafness 4. Emotional disturbance 5. Hearing impairment 6. Intellectual disabilities 7. Multiple disabilities 8. Orthopedic impairment 9. Specific learning disabilities 10. Speech or language impairment 11. Traumatic brain injury 12. Visual impairment 13. Other Health Impairment	
V. History of infections		
1. Infection type	**1.** Does child take albendazole tablet every 3 months	**Yes** **No**