Elucidation of Food Security as a Determinant of Malnutrition and Stunting on Children under Five Years: A Case of Insiza District, Matabeleland South, Zimbabwe

Beauty Ncube¹, Greanious Alfred Mavondo²*, Gwendolin Kandawasvika³ and Judith Audrey Chamisa⁴

¹Faculty of Commerce, Institute of Development Studies National University of Science and Technology, Bulawayo, Zimbabwe.
²Department of Pathology, Faculty of Medicine, National University of Science and Technology, Bulawayo, Zimbabwe.
³Department of Pediatrics, College of Health Sciences, Zimbabwe.
⁴Department of Midwifery and Nursing Sciences, Faculty of Medicine, National University of Science and Technology, Bulawayo, Zimbabwe.

Authors’ contributions

This work was carried out in collaboration among all authors. Author BN conceptualization, data curation, formal analysis, investigation, methodology, validation, writing, original draft writing, review and editing. Author JA conceptualization, formal analysis, methodology, supervision, validation, writing, review and editing of original draft MS. Author GAM conceptualization, formal analysis, methodology, validation, writing, review and editing of original MS. Author GK original MS draft writing, review and edition of critical content to the MS. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Malnutrition remains a childhood scourge in Sub Saharan Africa, Southern Africa, Zimbabwe and in the Insiza District, in particular. The district is rich in mineral (gold) deposits, vibrant agricultural (animal husbandry) and diverse ecosystems that has potential support self-
sufficiency of its population. However, the cause to <5-year-old malnutrition and stunting remain to opaque requiring elucidation.

**Materials and Methods:** A mixed method approach, where both qualitative and quantitative research methods were used to elicit and describe in-depth people’s experiences on determinants of malnutrition and stunting in the Insiza District among the <5-year-olds. Statistical comparisons were performed by one-way analysis of variance (ANOVA), followed by Tukey-Kramer multiple comparison post hoc test using Graph Pad In Stat Software. Both probability and purposive sampling were used to triangulate and corroborate findings deriving meaning to explain the factors associated with wasting/underweight.

**Results:** Children with birth weights ±2.4kG were predominant in the study sample (57%) when compared to those who were born with 2.5-3.0 kG or >3.1 kG birth weights [19 fold more]. Two meals per day were taken frequently (57%) among adults comparable with birth weight underweight frequencies and feeding habits of infants <5-year-olds (53%), showing food insecurity in Insiza District. Households that lived on < US$1.00/day formed relatively the most prominent majority (73%) when compared to those who lived on US$0.87-1.67/day (23%) or US$1.87-2.50 (2%) or US$2.53-3.33 (2%). Health-related expenses (18.3%), education expenses (25%) and staple food related expenses (56.7%) took the bulk of the income without meaningful effect on child malnutrition. Fathers were over represented as household income usage decision markers in households with malnourished and stunted <5-year-olds (43%) compared to mothers, the family or both parents. Poverty was present in 65% of the households which had malnourished and or stunted children. Malnourishment was from nutritional deficit and non-nutritional lack (25%) while 20% had malnutrition from other determinants other than food consumption score.

**Conclusion:** More than half (57%) children who developed malnutrition were underweight at birth and born in families with who had two meals a day (57%). Malnutrition was influenced negatively by marital status, household leadership, household income, size, religion, educations status and consumption scores.

**Keywords:** Insiza District; malnutrition; under-five-year-olds; Matebeleland South; Zimbabwe; stunted growth.

1. INTRODUCTION

Adequate nutrition is essential in early childhood to ensure healthy growth, proper organ formation and function, a strong immune system, and neurological and cognitive development [1,2]. Economic growth and human development require well-nourished populations who can learn new skills, think critically and contribute to their communities [3,4]. However, over one third of Zimbabwean children under the age of 5 years are stunted and the continuing economic recession seem to worsen issues even further [5]. The infant mortality rate of 57/1000 births remain short of the desired MDG target of 22/1000 births [6]. The Transitional Stabilization Programme (STP)is a proposition to set the economy on a recovery path after years of stagnation runs from October 2018 to December 2020 with the aim of operational zing Vision 2030 which seeks to transmute Zimbabwe into a middle-income country with a per capita income of USD 3,500.00 per person [7] with the hope of reducing <5-year-olds malnutrition and stunted growth. In 2018, infant mortality rate for Zimbabwe was 33.9 deaths per 1,000 live births. Infant mortality rate of Zimbabwe fell gradually from 74.1 deaths per 1,000 live births in 1969 to 33.9 deaths per 1,000 live births in 2018[8].

Adequate growth and nutritional status of children are monitored by the use of anthropometric measurements, specifically height and weight, which in combination with the age of the child, forms the anthropometric indices. Further classification these as weight-for-age, length/height-for-age, weight-for-length/height and body mass index(BMI)-for-age (BAZ) and can be interpreted using the z-score classification system [9]. Thus, a child with weight-for-age (WAZ) or weight-for-height (WHZ) less than -2.0 Standard Deviation (SD) is classified as being underweight or wasted, respectively. Similarly, a height-for-age (HAZ) < -2.0 SD indicates stunting or chronic under nutrition. On the other hand, a BMI-for-age (BAZ) less than -2.0 SD and one greater than 2.0 SD indicates underweight and overweight, respectively.

Apart from the use of anthropometric measurements, the nutritional status of a child is also reflected by the haemoglobin level, which
1.1 Study Background

Under micronutrition has been experienced worldwide in 2012. Globally, 162 million <5 year-olds were stunted, 99 million were underweight, 51 million were wasted and 17 million were severely wasted [3]. Malnutrition contributes to between 3.5 and 5 million annual deaths among under-five-year children with the biggest brunt borne by the Sub Saharan Africa [11]. Most of the damage caused by malnutrition occurs in children before they reach their second birthday, a time when the quality of a child’s diet has a profound impact on his or her physical and mental development and when they are transiting from breast feeding to solid food diets requiring strategic interventions to avoid malnutrition and or stunting [12].

The global burden of disease study estimated that under-fives malnutrition alone has caused approximately half of the global loss of Disability Adjusted Life Years (DALYs), that is the sum of years of life lost from premature mortality years lived with disability adjusted for severity [13]. This consequently affects the intelligence level of children, their behaviour and school performance and the whole developmental process and milestones per se. The impaired mental development is taken as the most serious long-term handicap associated with <5 five years age malnutrition [14].

Malnutrition among under five years children is one of the most intractable public health problems in developing countries especially Sub-Saharan Africa. About 35% of under-fives deaths in the world are associated with malnutrition [15,16]. Similarly, increasing incidences of deaths amongst <5 years ages is associated with malnutrition in developing countries being led by poor environmental conditions, increased insect and protozoan infections contributing to environmental deficiencies in micronutrients [17, 18]. Overpopulation, more commonly seen in developing countries, reduce food adequacy leading to inadequate food intake or intake of foods of poor nutritional quality and quantity [19]. Conversely, the effects of malnutrition on individuals create and maintain poverty, which further hampers economic and social development [20]. The advent of the HIV infection has brought another dimension to the malnutrition dilemma which is faced by developing countries and, by the pun of fate, have relatively higher incidences and prevalence of diseases associated with the pandemic, moreso in Sub Saharan Africa [21-23].

In Zimbabwe 27% of children aged 0 to 59 months are chronically malnourished giving rise to children who are too short for their age or stunted [24]. One in every three children suffers from chronic malnutrition or stunting in Zimbabwe and most likely contribute to more than twelve thousand child deaths yearly, according to the country’s Ministry of Health and Child Care [25,26].

The proportion of children who are stunted is several times the level expected in a healthy, well-nourished population. There are several influences that have aggravated Zimbabwe’s food security situation as indicated by the 2016 Global Hunger Index which showed a widespread poverty. HIV/AIDS, limited employment opportunities, cash liquidity challenges, recurrent climate-induced shocks and economic unpredictability all contribute to limiting adequate access to food [27] affecting the <5-year-olds more drastically. Low-productivity agricultural practices and the nonexistence of access to external markets also affect the nutriment security of most rural Zimbabweans who rely on own food production for livelihoods. Moreover, the country’s food production depreciated dramatically. This was a result of trade embargoes imposed on the country for land reforms, expropriation and redistributions causing unnecessarily agricultural output slump and affecting <5-year-olds nutritional status [28].

However, on the general malnutrition burden, Zimbabwe is on course to meet the global targets for <5-years-olds wasting and infant exclusive breastfeeding, but is off course to meeting the targets for all other indicators. Although it performs relatively well against other developing countries, Zimbabwe still experiences a malnutrition burden among its under-five population. The national prevalence of under-five stunting is 27.1% is greater than the developing
country average of 25% and contrariwise, Zimbabwe's < 5-year-olds wasting prevalence of 3.3% is less than the developing country average of 8.9%. Moreover, 47.1% of infants under 6 months are exclusively breastfed, which is well below the Eastern Africa average of 58.5% [29].

In Bulawayo, Zimbabwe's second city, Harare, Mashonaland Central, Mashonaland East, Midlands and Masvingo provinces, the incidence of underweight among children is increasing [30]. A rather disconcerting factor is the rather high mortality obtaining in Zimbabwe is the < 5-year-olds child mortality rate level of 46.2 deaths per 1,000 live births in 2018, down from 49.3 deaths per 1,000 live births previous year showing a change of 6.29% which indicates that approximately 5% of children born will die before their fifth birthday most possibly from all cause malnutrition [31]. However, both under-five and infant mortality rates are improving but very slowly: declined from 102 deaths per 1,000 live births in 1999 to 84 per 1,000 in 2010/2011 for under-fives and infant mortality rate declined from 65 deaths per 1,000 live births in 1999 to 57 deaths per 1,000 live births in 2010/2011 [32].

There are 21 districts with a chronic malnutrition rate of 30% making this condition a public concern. Insiza falls within the 20-30% medium prevalence stunting range at 29.7% as mapped by the Food and Nutrition Council [5, 26]. Insiza District is in Matebeleland South Province juxta positioned between the Matebeleland North and Midlands Provinces to the east. The district shares boundaries with Gwanda (15.8% stunting), Mzingwane (21.5% stunting), Umguza (28.3% stunting), Bubi (31.6% stunting), Gweru (26.7% stunting), Shurugwi (28.9% stunting), Zvishavane (29% stunting) and Mberengwa (31.2% stunting) Districts which show the admixture of a stunting profiles most inherently driven by varying determinants intra and extra district boundaries [5].

However, Insiza District does not exceed the <5% acceptable Global Acute Malnutrition (GAM). The acceptable threshold GAM is unenviably exceeded by Makoni (7.4%), Mutare (5%), Seke (5.7%), Mhondoro-Ngezi (5.8%), Sanyathi (5.5%), Binga (6.1%), Lupane (5.2%), Masvingo (7.4%) and Goromonzi (19.3%) Districts showing possibly different factors obtaining in these districts comparatively to Insiza District [5].

In general, there was an increase in the proportion of households with at least one member living with HIV/AIDS from 12% (2018) to 27% (2019) with Insiza District sharing the spoils of disease driven poverty as well. The presence of a member living with a chronic condition is likely to increase the household's financial burden with < 5-year-olds most likely to be affected more than other family members.

While the information on malnutrition and concerted effort to mitigate it effects in Insiza District has steadily increased over the years, its eradication amongst <5-year-olds remains a pipe dream without a identification of specific determinants of this disease and directing of targeted resources to affected individual children. Reasons why malnutrition in Insiza District is proving difficult to eradicate remain unclear and very much contrived in a region endowed with rich gold mineral deposits, vegetation and fawner require elucidation and delineation. The broad objective of the study was to examine the determinants of malnutrition among < 5-year-olds in the Insiza district through ascertaining food security and associated paradigms.

2. MATERIALS AND METHODS

2.1 Materials

2.1.1 Research design

The study used a mixed method approach, where both qualitative and quantitative research methods were used as popular methods to better opportunities to answer the research questions. The descriptive approach brought out data on people’s experiences on projects, their feelings and emotions using a flexible language, allowing for in-depth investigation with probing further of the determinants of malnutrition in children. The quantitative data collection allowed for the quantification of certain characteristics of the sample and its environment.

2.1.2 Research architype

Triangulation, that is, the use of several means (methods, data sources and researchers) to examine the determinants of malnutrition in 5-year-olds brought in the quantitative and qualitative paradigms enabling advantageous characterization of the phenomena surrounding the research questions.
2.1.3 Research approach

A descriptive approach was used where one or more guiding research questions were generally not driven by structured research hypotheses. As the research type frequently aims to describe characteristics of populations based on data collected from samples, the use of a probability sampling technique, such as simple random sampling was necessary. The descriptive research data was qualitative or quantitative. Quantitative data presentations were in the form of frequency distributions, summary. Statistical visual aids such as graphs and charts, to aid in understanding the data distribution, were used in the descriptive approach. Large mass of raw data was reduced to manageable form yielding detail that led to important recommendations.

2.1.4 Study population

Insiza District has 15 health centres including a hospital. The furthest client or patient is about 25 km from the clinic. The total number of units from which data was collected was Insiza District Ward 9 community with a population 6264 and 436 household in 7 villages. Ward 9 is approximately 60 km East of Filabusi Centre. The ward is communal made of villages Ukuthula, Mpumelelo, Gwenyimo, Vukuzenzele, Sibambene, Bambanani and Nyezi. One clinic serves 3 wards making a big catchment.

The data collection centre was Sanale Rural Health Centre which handled a total of 140 malnourished children during the data collection period.

2.1.5 Sample

A proportion of the Insiza District population from Sanale Health Clinic in Ward 9 was used to infer characteristics of the population. The sample size was 83 respondents comprising of 60 mothers or caregivers of any child < 5 years of age, 10 pregnant and lactating mothers, 10 male partners and 3 technical experts on malnutrition. The < 5-year-olds, whose mother of caregiver were selected, had to be chronically malnourished, registered in the malnutrition register at the health facility and or stunted. The technical experts selected were the Clinic Sister in Charge, Environmental Health Technician and Clinic Nutritionist.

2.1.6 Data collection instruments

Face to face interviews with key informants, mothers and care givers were used to capture the quantitative aspect of the study. Focus Group Discussions (FGDs) were used to capture qualitative aspect of the study.

2.2 Methods

2.2.1 Sample size estimation

The research used the Raosoft sample size calculator where margin of error was 5%, confidence level was 95%, population size was N, sample size was n, r was the fraction of responses that were selected, $Z(c/100)$ was the critical value for the confidence level c such that:

$$x = Z(c/100)^2 r (100-r); \ n = N x/((N-1) E^2 + x); \ E = Sqrt [(N - n) x/n(N-1)]$$

2.2.2 Sampling design and procedure

The study used probability sampling also known as ‘random sampling’ or ‘chance sampling’. Under this sampling design, every item of the universe had an equal chance of inclusion in the sample. Simple random sampling and systematic sampling were used. A non-probability sampling (deliberate sampling, purposive sampling and judgmental sampling) was used as well.

2.2.3 Simple random sampling technique

Simple random sampling was used to select 10 males during the Ante Natal Clinic (ANC) visit days, 60 caregivers and mothers of malnourished children as they come to get their food supplements from the clinic on the food distribution days giving every household an equal chance of being drawn. In this technique, Gold fish bowl procedure was used where all individuals in the population were numbered. These numbers were written on cards, put in a bowl and then mixed. Articles were then drawn one at a time until the desired number of individuals to constitute the sample was obtained. Drawing was without replacement and probability of each remaining items being picked increased because the total number of items was reducing.

2.2.4 Systematic sampling

This sampling method was used to select ten pregnant and lactating mothers during ANC days from the clinic register and ten lactating mothers during Post Natal Clinic review. The method made it easier to draw a sample and was easier to execute without mistakes. The cost was low and the selection of units was simple.
2.2.5 Convenience sampling

This sampling method was used to select Ward 9 because of its location in Insiza District and the presence of the Health Centre in the constituent. The choice of this ward was influenced by its accessibility and also the lower resources and costs that were used in conducting the study as compared to other wards.

2.2.6 Purposive sampling

The sampling method was used on the basis of the knowledge of the population, its elements, and the nature of the research aims. Key informants, (the Nutritionist, the Nurse in Charge, the Environmental Health Technician) operating in the district were purposively selected.

2.2.7 Face to face interviews

Structured interviews were used to extract information through a conversation from mothers and caregiver of the malnourished children. The method was suitable as the respondents were either illiterate or semiliterate and would have found it difficult to read or write when responding to other forms of interviews. All the respondents were asked the same questions in the same way increasing data reliability. Creating codes and interpreting data was made easier by the consistent and standardized nature of the interviews. Non-verbal cues, feelings and emotions from the respondents were noted and captured during the interviews.

2.2.8 Focus group discussions (FGGs)

The study used two focus group discussions to capture the qualitative aspect of the study. The FGGs composed of 10 pregnant lactating mothers and a group of 10 male partners who had come for ANC visits. Rich data emerged through interaction within the groups. People developed and expressed ideas they would not have thought about on their own or outside the group.

2.2.9 Key informant interviews

Key informant interviews were qualitative in-depth interviews with people who know what is going on in the community on malnutrition among the <5-year-olds. The conversation was loosely structured as the people had specialized knowledge about the topic explored on malnutrition in the 5-year-olds. Technical data from key stakeholders was gathered from the Nurse in Charge, Environmental Health Technician (EHT) and the Nutritionist. These experts, with their particular knowledge and understanding provided insight on the nature of the problem with regards to determinants of malnutrition.

2.2.10 Data collection procedures

Permission and authority were sought from the Ministry of Health and Child Care (MoHCC) and the local leadership to collect data from Sanale Health Clinic and Insiza District Ward 9 community. Pregnant mothers and lactating women were interviewed at the clinic when they came for ANC visits and Post Natal Care, respectively. Key Informant Interviews were hand delivered to the Nurse in Charge, EHT and the Nutritionist to ensure receipt. The food distribution point for the health and nutrition program were used to conduct the face to face interviews to the mothers and caregivers of malnourished children.

2.2.11 Delimitations

The investigation focused on the determinants of malnutrition on the under five children of Sanale Rural Health Centre and in Ward 9 community of Insiza District. Data was gathered from the mothers and care givers of children <5-year-olds who were malnourished. Key informants, pregnant women, lactating women and men were from the same geographical location.

2.2.12 Limitations of the study

The study was affected by the fact that some of the households in the study practice are artisanal gold mining and making it difficult to be located during the study. Resources, time, human and finances were limited although strides were made to completed the study on schedule.

2.2.13 Ethical considerations

This researcher sought written permission from the gate keepers (District Development Committee [DDCO]) and the MoHCC to carry out the research. Research ethics and principles of privacy, beneficence and rights of respondents were adhered to. This included on issues of doing no harm, getting informed consent, maintaining privacy and confidentiality of participant data before, during and after
3. RESULTS

3.1 Households Demographics

Headship of households was dichotomous dominated by males at 57% (n = 34) and with the rest being women (n = 26).

3.2 Marital Status of Household Head

Married women at law were relatively over represented as compared to single, separated and divorced (**P < 0.05, Married at law vs single or vs separated or vs divorced, respectively). Combined, (separated, divorced and single women), did not form a sizable majority when compared to either legally married women or those who were widowed. Widows were relatively higher represented as compare to the single or the separated or the divorced (**P < 0.05, widowed vs single or vs separated or vs divorced). Being widowed or married at law equally contributed to < 5-years-olds to malnutrition and or stunted growth (Fig. 1).

3.3 Household Size

There was a wide variance in the size of households with the least number of people in a household where there was at least one malnourished or stunted growth was 3 people and the highest household number being 11 people. This gave an average number of people per household with at least one <5-year-old with stunted growth, malnourishment or both being 6.3 people.

3.4 Household Religion

Households with <5-year-old suffering from malnutrition or stunted growth were most likely to be from the Orthodox Churches (OC) as compared to those from Pentecostal Churches (PC) or from Traditional Religious Practices (TRP) or be none religious (**P < 0.05, OC vs PC or vs TRP or vs none religious). Belong to the Apostolic Church (AC) predisposed children under the age of five years to malnutrition or stunted growth in comparison to being a Pentecostal Church (PC) member or Traditional Religious Practices (TRP) or not having no religion at all (**P < 0.05, AC vs PC or vs TRP or vs None religious) (Fig. 2).

When the mother or care giver of a <5-year-old was none-religious chances of being malnourished or stunted were relatively reduced by half when compared to traditionalists, three times lower when compared Pentecostal believers, twelve time less when compared to Orthodox Church members and ten time less when a member of the Apostolic Church.

During FDGs one mother commented in English” Our religion is a way of life and the spiritual leaders decide when and how children are taken to the clinic for either medication or collection of supplementary feeding” ...to the surprise of the group.

Primary level of education (PEL) showed a relative predominance amongst mothers and caregivers of children under the age of five years when compared to those with secondary education (SE) or no education (NW) or those with non-formal education [NFE] (**P < 0.05, PEL vs SE or vs TE or vs NFE). Secondary education level was also represented relatively higher as compared to those who attained non-formal education or no education in having <5-year-olds who were malnourished and or stunted (**P < 0.05, SEL vs NFE or vs NE). No education
and none-formal education were equally represented in having malnourished and or stunted <5-year-olds. Non or the mothers or caregiver had attained tertiary education level of education (Fig. 3).

3.5 Age and Sex as Determinants of Malnutritional Status

The ages distribution of malnourished or stunted growth children was from 6-23 months (40%) and 24-59 months (60%). A relatively higher frequency of malnourishment and stunted growth was seen in the older children. Key Informants and baby health records revealed that malnutrition manifests soon after being weaned for breast feeding when the children receive complementary feeding.

The sex of the affected child was obtained from the baby health card as all respondents brought their baby health card for reference. Male children (53%) had relatively higher chances of malnutrition and stunting as compared to their female counterparts who constituted (47%).

3.6 Birth Weight and Malnutrition

Children with birth weights ±2.4 kG were predominantly present in the study sample (57%) when compared to those who were born with 2.5-3.0 kG or >3.1 kG birth weights [by 19 times more], (**P < 0.05, 2.4 kG vs 2.5-3.0 kG or vs >3.1 kG). The children who had birth weight between 2.5-3.0 kG were more likely to be malnourished or stunted by a factor of 13 when compared to infants with >3.1kG birth weight (**P < 0.05, 2.5-3.0 kG vs >3.1 kG) [Fig. 4].

Key Informants indicated that most form of malnutrition in the district was underweight and that maternal factors caused most malnutrition. "Malnutrition is commonly seen in<5-year-olds who will be presenting with underweight and associated signs and symptoms. There are a number of maternal factors that are associated with this type of malnourishment which include breast feeding, post breast weaning feeds, hygiene and baby clinic visits regularity among others" one key informant commented.

3.7 Food Security as Determinant of Infant and Adult Feeding Practices

Most adults commonly had two meals with a frequency of 57% which was relatively higher than those who took three meals daily (***P < 0.05, two meals vs three meals daily). Adults who had three meals daily had a twice as lower representation when compared to those who had a single meal per day [17% vs 36%, respectively], (**P < 0.05, three meals < single daily). Fig. 5 shows feeding patterns of households who had malnourished <5-year-olds.
Twice daily meals (53%) were the most popular trend in feeding habits compared to either once daily (1.56 times more at 34%) or thrice daily (4.07 times more at 13%) (**P < 0.05, twice daily vs once daily or vs thrice daily). The malnourished children were 2.61 times less likely to have three meals a day when compared to having one meal a day (**P < 0.05, once daily > thrice daily) as indicated in Fig. 6.

Children were also given the same food as adults and ate at the same time as adults…... "we do not do prepare meals at different time for adults and children. All food is prepared at the same time for everyone. Children share their own portions of food which they share"... a woman in the FGDs said when explaining meals preparation and feeding processes.

3.8 Sources of Non-cereals

Ability to purchase (22%) non-cereals was rated relatively higher when compared to casual employment (15%), donations (12%),
remittances (13%), subsistence (13%), hunting and gathering (5%), and gifts (3%) [***P <0.5] of the same. Borrowing of non-cereal foods was more common to hunting or gathering of these or receiving then as gifts (**P <0.05, borrowing vs hunting and gathering or vs gifts). Non-cereals from casual labour rendered, donations received, remittances received and subsistence harvests (total 52%) had no noticeable variances amongst themselves but were overly represented practices used for obtaining the same when compared hunting, gathering and gifts (8%) [*P <0.05]. Casual labour, hunting, gathering and subsistence combined (33%) which constitute form of effort and time expending activity were relatively lower than activities that displayed a “dependence syndrome” like the grouping of donations, remittances, gifts (45%) received. Fig. 7 shows the various distributions patterns described.

Fig. 4. Birth-weight of <5-year-olds with malnutrition or stunted growth

Fig. 5. Adults number of meals a day.
3.9 Household Average Monthly Incomes

Households that lived on < US$ 1.00/day formed relatively the most prominent majority (73%) when compared to those who lived on US$0.87-1.67/day (23%) or US$1.87-2.50 (2%) or US$2.53-3.33 (2%) [***P <0.05). The US$26.00-50.00 per month average income had a fairly higher representation amongst the mothers and caregivers of malnourished <5-year-olds compared to the relatively higher income brackets (US$51.00-75.00 per day and US$76.00-100.00 per day) [**P <0.05]. Overall, 96% of the households lived on <US$1.66 as shown in Fig. 8.

3.10 Major Priority Uses of Income

The three major uses of income emerged as education expenses (25%), health related expenses (18.3%) and staple food related expenses (56.7%). Food requirements took the bulk of the income.

In an impoverished community living on less than one US$ a day per household of six people the amount is insignificant by world standards.
leading to malnutrition of the <5-year-olds regardless of whatever measures the family may take necessitating food handouts.

One woman during FDG’s said…….” interpreted to say that staple food was of first priority followed by school expenses and then medication which are very expensive when available and we buy to save lives and anything else is a luxury ill afforded.

3.11 Decision Making on Income Usage Per Household

FGDs also pointed that even the money sent by the husband from abroad come with the instructions from the father on how it has to be used…..”Even the remittance come with strict rules on how it will be used, when and by who”……said on mother during the discussion. The discussion with man showed that man are the decision makers as they said women waste money on luxurious things…….” a man of the house needs to decide how money will be used in the home or else money will be used on trivial things’”…….intoned one man.

Fathers were relatively over represented in households with malnourished and stunted <5-year-olds as the income usage decision markers in comparison to mothers, the family or both parents taking the role (**P <0.05, fathers vs mothers or vs family or vs both parents). Mothers were relatively higher as decision makers in income usage in households with malnourished children as compared to family or both parents making these decisions (**P <0.05, mothers vs family or vs both parents). The frequency of both parents combined in income usage decision making were lower by half when compared to family making the same decisions (*P <0.05, 2[both parents] vs family).

3.12 Food Consumption Score

The lowest food consumption index score (0-21) was relatively over represented by 2.6 and by 3.25 when compared to the 21.5-35 and above 35 index score, respectively (**P < 0.05, 0-21 vs 21.5-35 or vs above 35). Poverty was present in 65% of the households which had malnourished and or stunted children under five years, 25% malnourishment could have been from both nutritional deficit and non-nutritional lack while 20% had malnutrition from other determinants other than food consumption score.

From the FDGs mothers commented and conceded that consumption of diversified food was not a priority but that consumption was for survival for all and sundry when they said…….” We eat to pacify or satisfy our hunger pangs only and eat whatever is there. Even children we give them what is available on a daily basis. We eat so as to live”…….explaining that eating was not a luxury.

Fig. 8. Percentage average monthly income distribution amongst mother and caregivers
4. DISCUSSION

Determinants of malnutrition and stunting in <5-year-olds were closely associated with human socialization and relationships in as far as they influenced food availability. These included household headship, marital status of household head, household size, household religion, age and sex of malnourished child, birth weight of malnourished child, food security, infant feeding practices, sources of non-cereals, major priority uses of income, household average monthly incomes, decision making on income usage per household and food consumption score.

There is a normal trend in Zimbabwe that most homes are headed by men who are viewed as the major provider of resources that is needed by the family [33] although there is a perceptible departure to this in some areas especially in the light of land reform [34]. Where men tend to be irresponsible and not provide for the family, scarce resources reach the <5-year-olds last which may result in malnutrition. The presence of a men in a household where stunted growth and or malnutrition has been sited may indicate the inability of the particular men to turn over the resources from rural-related enterprising towards family needs.
With gold mining being a major activity that may keep artisanal miners away from home for days on end, the men are usually the last to be aware of the state of the family to take action or use the resources in providing meaningful diet to the family. Results of the ZIMVAC 2016 reflects that most households in Zimbabwe are male headed [26] a fact that has been proven by this study in Insiza District. Malnutrition was more represented in male headed families may speak of possible irresponsibility towards the family by the man of the house which leads to <5-year-olds suffering more as they would be at the end of the food chain and food accessibility.

The relative over representation of malnutrition in legal marriages, who make 52.4%of the Insiza District population, followed closely by widows (9.2% of the population) [35,36] may display the pivotal role marriage play in the family unit driven by the dual patriarchic and matriarchic nature of households in the area coining < 5-year-olds malnutrition exposure. Married women, although having a higher population representation tended also to have higher ratio of malnourished children whilst widowed, with a smaller proportion had almost an equal representation of malnutrition. There is also a possibility of bigger household numbers sharing shrinking incomes leading to malnutrition of vulnerable household members. When malnutrition shows up in a household, serious underlying causes which are beyond the family unit may be at play.

Single motherhood is not necessarily frowned upon in a Ndebele culture-oriented family unit and usually share the same features of bigger households like any other family with a proportionally higher representation at 32.6% of the population [35,36]. However, the middle of the road culture that is permeating the district through population movements and resettlements may be responsible for influencing the distinctively lower rates of malnourished children (10%) of single mothers. Single mothers spend more time fending for the family exposing the more vulnerable <5-year-olds to irregular feeds which may contribute the malnourishment of inadequate feeding patterns although to a lesser extent as compared to married and widowed women who may not have inadequate food. Conversely, single mothers may have multiple sources of income in the gold-rich district including working in the mines to feed a smaller family thereby proscribing malnutrition. Married and widowed women may not have the same opportunity or privilege requiring male relatives’ approval to do the same and hence why higher malnutrition rates were observed in the two groups.

Divorce and separation are frowned upon in the Christian society Insisa District seem to profess and hence the low representation in the population (6.5%) [35,36] as well in having malnourished children which may not mean that divorced or separated women have better capacity to fend off malnutrition in their households’< 5-year-olds. Moreover, the higher rates of malnourished under five-year-old children in the legally married and widowed households may indicate other factors at play other than the male factor’s presence or absence.

The widows’ household having higher malnourishment statistics may reflect the widows’ inability to provide for the household members or underlying condition affecting both mother and children or general lack of support from extended family male members due to HIV/AIDS related stigma. Societal awareness and knowledge towards the high risks of HIV/AIDS spread through customary marriage of deceased spouse or wife inheritance may also contribute towards widows lacking male support from extended family and therefore potential revenue sources support loss predisposing <5-year-olds to malnutrition and stunting. Furthermore, single, separated and divorced women were less likely to have a malnourished <5-year-old compared to the women married at law or widowed showing a potential of male partners support that averts food shortages or a general freedom to use whatever means for self and family sustenance which will not be available in the legally married and widowed women. The married and widow women had a higher chance of having a bigger family household.

The average household size (6.2 person) was higher than current family size of four people (two children and two parents) per household [36]. The household size of a family may determine the amount of resources and the budget to be used in relation to the nutritious foods in a household. The maximum household size (12 persons) was most likely a burden for the family as it was approximately four times more than the minimum household (one parent and two children) in the study. While the study did not disaggregate by household headship, larger households with at least a 5-year-old with malnutrition or was stunted, would most probably
be from a legally married or widowed women group showing relatively the highest propensity for the condition. A higher household will inevitably increase in the normal food basket, a challenge to provide such by most families and hence the unbalanced diet, poor dietary diversity affecting children mostly. The Apostolic Church Sect tend to encourage polygamous marriages and hence higher potential for larger families and were represented highly in Matebeleland South Province (38.3 %) [36] as well as having similar malnutrition figures (38%). Most likely, <5-year-olds from Orthodox or Apostolic households had relatively higher chances of developing malnourishment and or stunting.

Religion has a strong bearing on many people's way of life, behavior, eating habits and types of foods taken which may have an influence on the one's health status but also may dictate types of food taken and duration of intake with some religions prohibiting meat eating at all or on particular days [37,38]. Such practice expose <5-year-olds to malnutrition. Malnutrition in <5-year-olds may invariably be attributed to mothers or caregivers’ choice of foods, feeding times, availability of balanced diet and abstinence from intake certain types meats, traditional and naturally nutritious foods and beverages.

The Orthodox Churches or Main Line Churches had the highest but dubious fame of over representation in and propensity for having children suffering from malnutrition and or stunted growth followed by the Apostolic Church. The latter discourages it members from attending health clinics or receiving medications. However, non-religious mothers and caregivers representing 13.4% of the population in Matebeleland South, were the least likely to have a stunted or malnourished <5-year-old (3.3%) in their household[36] which finding flew in the face of reason. Questions on whether religion predisposes to malnutrition and stunting in <5-year-olds though their intrusion into a household income come to mind. Or do they influence followers into dubious belief on the miraculous provision at the expense of gainful production engagements and hence poverty?

Orthodox Churches (Roman Catholic and Protestant combined 21.1% in Mat South), contrary to their multimillion-dollar religious enterprises and wealth, such opulence did not translate into educated and well-off members able to provide for their families food protection against malnutrition and stunting [36]. The Apostolic Church members were expected to have higher rates of malnourished children, a sequelaeto low formal educational levels and medical care. However, the influence of religion on malnutrition and or stunting prevalence may go beyond the face value of common assumptions, knowledge and practices engrained in other facets in the district.

Education plays a critical role as a determinant of a child’s health status. Ability to read or write is measured by the education level one will have attained although the ability to read or write does not always translate to an indicator of education level as non-formal level of education does not render itself to the educational grading system. As such, the education level of 10% mothers and caregivers of <5-year-olds with malnutrition could have influenced the condition’s development as they had attained none-formal education. Towards malnutrition and stunted growth in <5-year-olds contributions, none-educated women (10%) were equalt to none-formally educated ones compared to higher ratios seen among their educated counterparts. Combined educated (secondary and primary) mothers and caregivers represented 80% of the stunted and malnourished children <5-year-olds. Normal assumption will be that those who had no education or had none-formal education (20%) would be more represented in the adverse growth of their children, but it seems the converse is holding.

Education empowers women to work for themselves or for others for a fee which may remove them from a total commitment towards looking after their children although making an income towards family food security. However, the need for supplementary food receipts discounts food security amongst these households. Primary and secondary educational levels (which did not guarantee sufficiently high remuneration) predisposed to <5-year-olds under development when compared to lack or having non-formal education.

None educated and none-formal educated women may not be motivated to look for employment outside their home and therefore have ample opportunity to ensure children do not unnecessarily miss meals. On the contrary, primary and secondary educated women may forage for household food, but where food is naturally scare and incomes low, patterns seen in Insiza, nothing or little is yielded for efforts expended. A double damage may thus be inflicted at home with children suffering from
malnutrition with the male child being more
make them more vulnerable to under
children, weaning and less breast milk
receive complementary feeding. In the growth life
weaned for breast feeding when the children
that malnutrition manifests soon after b
Key Informants and baby health records revealed
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uneducated or tertiary educated counterparts
increased chances of malnutrition unlike their
educated mothers
and stunted childr
higher inordinate tendency towards malnourished
an anachronism par excellent. The relatively
level with regard to malnutrition in Insiza District,
formal education
malnutrition among <5-year-olds
in Insiza.

The <5-year-olds from mothers or caregivers with tertiary education did not qualify for
supplementary feeding and did not fit the
malnutrition identifying criteria at the clinic.
Indirectly, tertiary education was shown to
provide enough income and or knowledge to
protect the <5-year-olds in their care from
malnutrition. Therefore, having no education or
being none-formally educated or having a tertiary
education may have a relatively significant
advantage over the combined effect of primary
and secondary education on the malnutrition and
stunted growth occurrences in Insiza District [9].

Semi-education (primary and secondary) is
inferior to having no and none-formal education
level with regard to malnutrition in Insiza District,
an anachronism par excellent. The relatively
higher inordinate tendency towards malnourished
and stunted children with primary and secondary
educated mothers while none tertiary educated
counterparts had that problem shows inadequacy
of this level of education in prevention of the
condition.

More likely, the primary and secondary education
mothers would wean the babies and sought
income generating processes while leaving the
child without adequate care as they did not have
enough resources to pay a caregiver resulting
increased chances of malnutrition unlike their
uneducated or tertiary educated counterparts
who could look after their own children or hire a
employee to do that for them, respectively.
Where mothers are unable to be there, working
to feed the children in an average family of six,
as in this study, <5-year-olds tend to be
neglected as the family may end up being child-
headed [5].

Key Informants and baby health records revealed
that malnutrition manifests soon after being
weaned for breast feeding when the children
receive complementary feeding. In the growth life
cycle of children, weaning and less breast milk
make them more vulnerable to under-five
malnutrition with the male child being more
affected than the girl child. The risk of
malnutrition increases with age of a child.
Children in the youngest age group 0-11 months
tend to have significantly lower risk of being
stunted, underweight and wasted than children in
the older age groups [39]. Children aged
between one and three years are most
vulnerable to poor nutritional status as this is the
transitional period from being fed and feeding on
their own, which find some children not ready for
independent feeding requiring mother’s attention
to ensure their feeding is achieved at the right
time and in adequate amounts[40].

Findings indicated that underweight was a major
form of malnutrition while complementary feeding
was also a major factor of nutritional need. For
the latter breast milk tend to decrease in
proportion to demand as the baby grows older
such that under feeding may occur if adequate
food is not given. Working women may also feed
their children before or after work necessitating
supplementary feed to reduce malnutrition.

Low birth weight is related to maternal under
nutrition and it may contribute to infections and
asphyxia, which together account for 60 per cent
of neonatal deaths through a tendency of infants
with<2.5 kg developing malnutrition when
compared to >3.1kg counterparts. Children with
2.4 kg and below birth weight had a higher
malnutrition incidence followed by those with 2.6-
3.0 kg showing close association between the
two. Malnutrition was several times lower in
infants with >3.1 kg birth weight showing lower
birth weights as harbingers of future malnutrition
and stunting. Infant mortality increases more in
infants born weighing between 1.2- 2.0 kg by 8
times as compared to an infant born with an
adequate weight of at least 2.5 kg [41] with a
close relationship to malnutrition manifest.

The number of meals eaten by individuals has a
huge bearing in satisfying the nutrition
requirements of an individual’s body and societal
standard or acceptable number of meals in a day
is three although meal type and size can possibly
come into play. However, this study did not go
into detail about latter variables. Poverty and the
recurrent droughts in the area of study often
forces people to reduce the number of meals
eaten in a day as a coping strategy [26]. Nutrition
requirements for the body vary with age with
children having a higher requirement as
compared to their adult counterparts. Pregnant
and lactating females also have a higher nutrition
requirement. When the majority of the adults
resort to reducing the number of meals as a
drought coping strategy, the brunt of this stance
is borne by children from pregnant and lactating mothers, <5-year-old in bigger households with a strong bearing on malnutrition and stunting on children who generally require more frequent to meet the energy demands of the growing bodies.

The pattern of feeding was similar between adults and <5-year-olds which is a recipe for malnutrition. Children naturally will eat smaller portions than adults and of necessity will require more frequent feeds as compared to adults due to their high nutrition requirement for growth and development as well as small stomach size.

Consumption of a variety of food classes is necessary for maintaining a balanced diet and reducing the incident or likelihood of malnutrition. In most rural areas, families concentrate mainly on producing cereal and less of other types of food that contribute to a health plate. Non-cereal food types include items like proteins (milk, fat-based- spreads, cheese, beef, chicken, pork, eggs, legumes), fruits and vegetables (tomatoes, onions, cabbages, potatoes) and other essentials (sugars, tea leaves, jam, peanut butter). This is an unsustainable trend since not all households can maintain the purchases. Promotion of subsistence production of non-cereals needs to be promoted as this constituted a mere 13% of the sources amongst households with malnourished children.

Activities that were associated with production (casual labour, hunting, gathering, subsistence-33%) were not popular amongst mothers and caregivers of malnourished <5-year-olds for acquiring non-cereals. Preferred were little to no effort and time expending assemblage of activities (donations, remittances, gifts- 45%) as source of non-cereals. Such activities may be displaying a “dependence syndrome” life style for non-cereals. The fact that supplementary food collections times were used to recruit these into the studies presupposes the hypothesis to be true.

The purchasing potential for non-cereals was rather low (22%) reflecting the that non-cereals are hard to come by for the community. Non-cereals are sources of major nutrients whose absence in a diet may contribute to malnutrition and or stunted growth among <5-year-olds.

The average income of a household determines the availability of the food and non-food items in the household and is closely associated with nutritional status of the most vulnerable members of the family who will naturally not go out to fend for alternative source of food (<5-years-olds and the elderly). Living on <US$1.00 per day is a sure recipe for malnutrition amongst <5-year-olds. More so, when the source of non-cereals is from an independent source of which one is not in control and not readily acquired on demand such Non-Governmental Organization, food malnutrition is inevitable.

The Zimbabwe National Statistics Agency (Zim Stat) has indicated that the Total Consumption Poverty Line (TCPL), generally known as the Poverty Datum Line (PDL), which is the cost of a given standard of living that must be attained if a person is not to be deemed poor had increased drastically[42]. The food poverty datum line (FDL) represents a minimum consumption expenditure necessary to ensure that each household member may, when all income is devoted to food, consume a minimum food basket representing 2, 100 calories [42]. The TCPL is higher than the FDL and stood at US$873.00 in Zimbabwe being total income needed for five-membered household (all their income added together). For March 2019, the FDL for one person was US$59.00, FDL for five persons household was US$295.00, the TCPL for one person was US$175.00 [42]. This shows that the malnourished <5-year-olds were coming from households which were deemed poor and the PDL is estimated to continue to rise [43] putting more and more children in the harm of malnutrition in Insiza.

In a community where acquisition of anything outside the realm of staple food, education and medication, is considered a luxury or unnecessary expense, poverty may not be ruled out and this was the case with Insiza. Buying of other nutritious commodities were not considered and as a result malnutrition and stunting become common findings. The food handouts become a perennial requirement and with the erratic nature of the donation from NGO’s the <5-yr-olds are always under threat of malnutrition, stunted growth and associated outcomes.

In such dire situations, children may be saved from nutrition-based anomalies if the food acquisition priorities were based on the mother and female caregivers than on males who will not usually put children welfare first in the family [44].

The household decision making is of paramount importance as that is where most planning on health and nutrition is done. Due to the patriarchal and cultural practices of the Zimbabwean family setup, men tend to dominate...
on all aspects of decision making including how finances are managed in the home. Decision making is usually punctuated with violence where the woman may need to take the lead even without the intention to do so [45].

Males were controlling in terms of decision making and it is highly likely that buying of micro and macronutrients foods for the family were not a priority leading the malnutrition and stunting in the <5-year-olds. Mothers or women were shown to be involved in decision making due the increasing numbers of widows coming on to the scene from HIV related causes of spouse deaths and headship by default. Divorce or separation are not common in rural settings although the male spouse will often leave home for employment or business in faraway places or even abroad making financial remittances to support the family which was shown to be 13% of source of non-cereals. “Remote controlling” how incomes were handled in the household was a common feature in the communities. Women are the ones who care for the children but man decides for them, therefore there is need for consultations to be made on the use of money so that they buy nutritious food [46].

Generally, 65% of the sample were poor, 25% were borderline poor and only 20% were an acceptable category although still having malnourished <5-year-olds which may be attributable to other causes other than the food consumption index score.

The household consumption score is crucial as it reveals the poverty level of a society. Dietary intake must be diverse, including a diversity of plant and animal-source foods, to ensure an adequate intake of essential amino acids and fatty acids, macronutrients, and micronutrients necessary for growth, development and overall health for young children [47,48]. The quality of the diet is particularly important for reducing stunting in children because inadequate nutrition causes physical, cognitive, and immunologic deficits. Particularly, when experienced during the first 1,000 days of life, nutritional setbacks can result in irreversible losses to growth and cognitive potential.

Most household did not eat a variety of nutrients as they mostly concentrated on the starch foods, vegetables with oil for everyone including children. Very few young children consume the recommended number of meals or the recommended number of food groups for their age thus eggs, meat, milk products, and legumes are rarely included in the diets of young children. The proportion of children consuming the recommended four recommended food groups was very low with 9% for 6-23 months and 12% for 24-59 months. As corrective measure and mitigate against malnutrition, nutritional indices and food consumption scores need be developed for supplementary programs that include all dimensions of food and or food groups rather than nutrients, use individual components in the food consumption score and express the intake of healthy and unhealthy food components separately [49] as it was observed that some children remained stunted and underweight even when under the feeding schemes.

5. CONCLUSION

The research found that malnutrition affects infants <5-year-olds as they are the most vulnerable because of their high nutritional requirements for growth and development. Women married at law and widowed tended to have higher rates of malnourished <5-year-olds when compared to single, separated and divorced mothers. Food security was a challenge in the district contributing to the high rise of child malnutrition as the families are failing to have a standard meal and most of them depend on gold panning. Men also move to neighboring countries leaving women, children and the elderly who cannot engage effective agricultural activities for food production and intake by both mother and children. Most children are often fed on carbohydrates which can quickly satisfy hunger without giving any thought to other nutrients necessary for the proper development and growth of children. Households incomes were not adequate necessitating perpetual food handouts. Household headship was mainly male dominated in larger than normal household which could put strain on the income predisposing <5-year-olds to malnutrition and stunting. Orthodox and Apostolic sects featured prominently in association with malnutrition where lower birth weight children ran high risks of malnutrition for infants. Children and adults ate at the same time with twice daily meals being a common diet with increasing underweight as a key manifestation of malnourishment observed. Most non-cereals were obtained from non-effort exertion activities bordering on a dependence modality which give rise to poverty and <5-year-olds malnutrition.

6. RECOMMENDATIONS

Deliberate food support is need to be supplied to legally married and divorced women for they
have a propensity to have malnourished <5-year-olds in the Insiza District. Fortified foods may also be part of the food supplementary schemes given to children of these women. Standard meals provision should be an obligatory aspect as children require frequent intake of food to make up for the small quantities they take in at any particular time as well as the fast-metabolic rates they have.

Balance food diets are a necessity in areas where the staple food is carbohydrates mainly. Protein-based substitutes should be made available to reduce stunted growth seen in the study. Members of the Orthodox and Apostolic churches should be encouraged to provide their <5-year-olds adequate food regardless of their family sizes.

Mechanisms to avail non-cereals in the home through food for work programs introduction should be encouraged in the district aimed at providing children with balanced diets. Proper records for such activities should be kept among households that have <5-year-olds with malnutrition to trace those that abscond and out children’s health at risk unnecessarily.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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