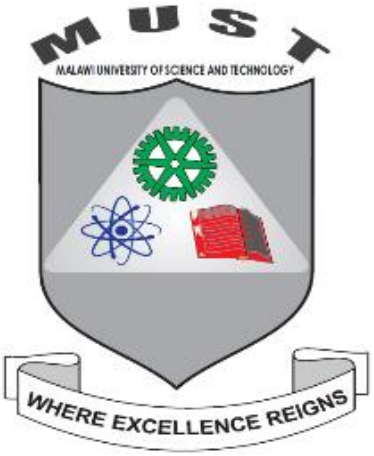


INVESTIGATING HOW FLOODS EXPOSURE EXACERBATE POOR NUTRITIONAL STATUS IN CHILDREN, A CASE STUDY IN CHIKWAWA DISTRICT

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ABSTRACT

Floods have become more common in the lower shire areas of Southern Malawi as a result of climate change. Chikhwawa district face flood events yearly, and this has led more households to suffer from poor living standards and requiring humanitarian support from various government and non-governmental agencies during the disaster. Although, Malawi has put more effort in improving child survival and maternal health. In flood-prone areas of Chikwawa district, little is being done in terms of nutrition support for children under the age of five. Hence, the Study aimed to understand the influence of floods on nutrition status of under5 children.

The study used a cross-section approach in which 20 households with children aged 6 and 5 months were targeted through face-to-face interviews in the two villages (flood prone and non-flooded) respectively. Furthermore, the study enrolled 20 primary care givers of under 5 children each from flood prone and non-flood prone areas. 90% of flooded households had a poor level of food consumption during floods. Data was analysed using SPSS software version 26.0, descriptive statistics were conducted, and Chi-square test (or fishers Exact test) was used to compare the variables between the groups. Findings show that more children in flooded households are prone to suffering from malnutrition. In which 90% of flooded households have poor diet during floods.

This study has generated evidence that supports the existing ideology that relates flooding events to nutritional deficiencies in under 5 children. The study recommends that long-term malnutrition prevention programs should be implemented to assist households with under 5 children in flood prone areas in Chikhwawa district. Nevertheless, the study used a small sample size; therefore, further studies with larger sample size should be conducted for a more representation outcome.

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TABLE OF CONTENTS

1. INTRODUCTION……13
1.1. Background……13
1.2. Problem statement……14
1.3. Main Objective……15
1.3.1. Specific objectives……15
1.4. Research questions……16
1.5. Significance of the study……16

2. LITERATURE REVIEW……17
2.1. The food security and vulnerability……17
2.2. Nutritional indicators in Malawi……19
2.3. Impact of natural Disasters iChildren……20

3.METHODOLOGY……22
3.1. Research design……22
3.2. study area……22
3.3. Inclusion Criteria……23
3.4. Exclusion criteria……24
3.5. Study period……24
3.6. Sample Size……24
3.7. Data Collection……24
3.8. Ethical Consideration……26
3.9 Data Management & Analysis……26

4. RESULTS AND DISCUSSION……28
4.1. Results……28
4.1.1 General characteristics of the population……28
4.1.2 Determination of food insecurity……28
4.1.3 The Nutritional practices & Knowledge ……32

4.1.4 Comparison of nutrition status of children in both study areas……38

4.2 Discussion……40
4.2.1 introduction……40
4.2.2 Food insecurity ……40
4.2.3 Nutrition knowledge and Practices……41
4.2.4 Nutrition status of Children……42
4.2.5 Limitation of the study……43

5. CONCLUSION AND RECOMMENDATIONS……44
5.1. Conclusion……44
5.2. Recommendations……44

6. REFERENCES……45
7.APPENDICES……47

ACRONYMS/ABBREVIATIONS

DHS- Demographic and Health Survey

MUAC- Mid Upper Arm Circumference

LIST OF FIGURES

Figure 1. Study area map
Figure 2. Susceptibility map
Figure 3. Elevation map
Figure 4. Differences of sources of income
Figure 5. Differences in Monthly net income
Figure 6: Non-significant differences in the participants' level of food consumption between study sites
Figure 7. Distribution of food consumption levels during the most recent flood event
Figure 8. Non-significant differences in the number of meals between study sites
Figure 9. Non-significant differences in the level of Knowledge
Figure 10. Non-significant differences in provision of food between study sites
Figure 11. Non-significant differences in the knowledge on benefits of consuming all groups of food.
Figure 12. Non-significant comparison of Age ranges of the under 5 children from both study sites
Figure 13. Comparison of significant classes of nutrition status of the under 5 children from both study sites.

LIST OF TABLES

Table 1 The level of food consumption practices in TA Katunga in Chikhwawa district.
Table 2 The classification of the color measurement of MUAC tape
Table 3 The level of knowledge classification of food groups
Table 4 The demographic characteristics of primary care givers in flood prone and non-flood prone areas in Kapasula and William villages.

1. CHAPTER 1: INTRODUCTITION

1.1. Background

In the last decade, floods affected one billion people worldwide (Below & Wallemacq, 2018). According to Fatima, (2018), the impacts of floods are likely to be quite severe in developing countries; suggesting that people from such nations suffer more and find it difficult to live a good quality of life. Malawi is one of the developing countries in sub-Saharan Africa experiencing yearly serious impacts of climate change such as floods and dry spells yearly (Diwakar et al., 2019). In 2019, the Malawi floods post-disaster needs assessment report indicated that the country experienced one of the worst tropical cyclones that brought severe flooding in most of the districts(DoDMA, 2019). Furthermore, the report stipulated that severe flooding negatively affected people's lives, livelihoods, and socio-economic infrastructure, pushing more people into poverty (DoDMA, 2019). In general, almost 975,000 people were affected, with 86,976 displaced, 60 killed and 672 injured (DoDMA, 2019).

Despite flooding having a potential burden on society, the consequences of floods on human health remain rarely investigated, and few studies do suggest the increased short-term risks of mortality, injury, certain communicable diseases, and psychosocial trauma(Rodriguez-llanes et al., 2011). The understanding of the long-term health consequences of flooding and recurrent floods are even more limited, and the impacts of flooding on nutritional health are likely to be quite severe among young children in developing countries (Pauw et al., 2010).

According to Rodriguez-llanes et al., (2011), floods can severely disrupt livelihoods, and flooded households are affected by an excess of adverse conditions including food insecurity due to crop failure, or food affordability due to sudden price changes and may lead to undernutrition. Daily care of children and breastfeeding practices is importantly challenged also during floods as in worst scenarios all basic services become disrupted, including water and sanitation conditions, or the provision of

community basic health and social services. Besides, diarrhea or respiratory diseases, which occur at increased rates during or after flooding have the potential to worsen the child's nutritional status.

According to Kousky, (2016), there is little and geographically restricted evidence on available nutritional impacts of floods on children. And this is particularly worrying since children are especially vulnerable to environmental adversities because of their greater exposure and greater sensitivity to certain exposures and dependence on caregivers. For this reason, increased weather variability predicted by climate models is expected to lead to a rise in the health risks of this age group, associated with more frequent extremes of floods (Pauw et al., 2010). Hence the deleterious consequences of poor nutrition are well recognized for instance undernutrition is a primary cause of ill health and premature mortality among children in developing countries(Fatima, 2018). Malawi Demographic and Health Survey (DHS) 2020, has indicated that almost half (47 percent) of the children under the age of five have chronic malnutrition, coupled with the high prevalence of micronutrient deficiency disorders such as anemia and vitamin-A deficiency and HIV/AIDS, which poses a major challenge to the attainment of the Millennium Development Goals (MDGs) and the Malawi Growth and Development Strategy (Mqsun, 2012). Therefore, this study is aimed at investigating the extent to which floods exacerbates ~~on~~ poor nutrition of children in Chikhwawa district by (i) examining the nutrition status of children in both flood-prone areas and non-flood-prone areas; (ii) determine the household food security in the flood areas and non-flood prone areas in the communities of Chikhwawa district and (iii) identifying the nutrition practices used in flood-prone areas in Chikhwawa district. The findings of this study will provide information on the status of poor nutrition of children in flood-prone areas which will inform and guide decision-makers.

1.2. Problem statement

In recent years, Malawi has put more effort into child survival and maternal health, which has decreased the number of underweight children, but almost no improvement in chronic malnutrition or stunting(Fatima, 2018). According to a

nutrition audit report for Malawi, the average rate of stunting in the Sub Saharan Africa is 40%, which means that Malawi has one of the highest rates of stunting on the continent (Mqsun, 2012). Chikhwawa being one of the districts in Malawi that experiences severe flooding almost yearly, flooded households are affected by an excess of adverse conditions including food insecurity due to crop failure, or food affordability due to sudden price changes and may lead to undernutrition. Daily care of children and breastfeeding practices is importantly challenged also during floods as in worst scenarios all basic services become disrupted, including water and sanitation conditions, or the provision of community basic health and social services. Besides, diarrhea or respiratory diseases, which occur at increased rates during or after flooding have the potential to worsen the child's nutritional status. Therefore, the study aimed to investigate the extent to which floods exacerbates poor nutrition of children in Chikhwawa district.

According to Rodriguez-Llanes et al., (2016), Increasing flooding decreases food production, and consequently, children may bear the greatest burden of hunger and lack of sufficient nutrients for body growth; hence possibility of suffering from malnutrition. Additionally, as more extreme weather events expand the number of emergencies and humanitarian crises, children will pay the highest price as the world experiences a steady rise in climate-driven migration, thereby interfering with the lives and future well-being of the children (Rodriguez-Llanes et al., 2016).

1.3. Research objectives

1.3.1. Main objective

- ✓ To investigate to what extent floods exacerbates poor nutritional status of children in Chikhwawa district

1.3.2. Specific objectives

- ✓ To determine the household food security in flood-prone areas and non-flood-prone areas in the communities of Chikhwawa district.
- ✓ To compare the nutritional status of children in flood-prone areas and in non-flood-prone areas in Chikhwawa district.

- ✓ To identify the nutritional practices used by communities in Chikhwawa district.

1.4. Research questions

- ✓ Do both flood-prone and non-flood prone area have food insecurities?
- ✓ Is there any difference between flood prone area and non-flood prone areas on the nutritional status of children?
- ✓ Do the communities in flood-prone areas in the Chikhwawa district have nutrition practices in relation to the occurrence of floods?

1.5. Significance of the study

According to Rodriguez-llanes et al., (2011), flooded households are affected by an excess of adverse conditions including food insecurity due to crop failure, or food affordability due to sudden price changes and may lead to undernutrition. Chikhwawa being one of the districts that faces floods also encounter the same problem. Therefore, the study will identify feasible solutions that will help to ensure poor nutrition is eradicated and millennium development goals are attained. Knowledge on the impacts of floods in poor nutrition and good practices of nutrition in Chikhwawa district is important and will benefit the government through the Departments of Disaster Management Affairs (DoDMA) which will get informed of the status of poor nutrition in Chikhwawa district and incorporate mitigation and diversification strategies for the flooded areas in Chikhwawa to cope up with effective interventions for the good nutrition practices to ensure good health in children.

2. CHAPTER 2: THE LITERATURE REVIEW

2.1 The food security and vulnerability

The concept of food security originated some 45 years ago, at a time of global food crises. Initially it focused on ensuring food supply with regard to availability and the global and local price stability of basic foods (Berry et al., 2015).

According to Pauw et al., (2010) vulnerability may be seen as a combination of the degree to which a person or household is exposed to a hazard, and the extent to which they can cope with the effects of the hazard. The combination of vulnerability and hazard produces the risk of a particular outcome, such as food insecurity.

Although Malawi has not experienced widespread famine since 2005 (FAO, 2020), the household survey results indicate that a substantial proportion of the population experiences extreme forms of food insecurity, and that about 33 percent of the population live in a state of very low food security , such that at some time during the year they experienced multiple indications of reduced food intake and disrupted eating patterns or hunger owing to lack of resources. Another 8 percent showed low food security that caused a reduction in the quality and variety of food intake. FAO, 2020, also states that the proportion of food insecurity is significantly higher in rural areas relative to urban areas (34 to 23 percent) and is more prevalent in female-headed households compared to male-headed households (38 to 31 percent)(FAO, 2020).

The world food problem is one of the greatest challenges for mankind. According to Food and Agricultural Organisation of the united Nations, the world Food program (WFP), the International Fund for Agriculture Development (IFAD), and the global hunger index around 850 million people were under nourished globally in 2013 (Engler & Kretzer, 2014).

Even though the number show a slightly declining trend since 2010, Engler and Kretzer, (2014) suggested that almost quarter of the global population still faces hunger. They further suggested that in developing countries the problem is still severe with 14.9% of the population being undernourished.

most small farm agriculture in Malawi is rain fed, this makes the domestic food availability and the economy as a whole highly vulnerable to climatic variation (Cromwell & Kyegombe, 2005). According to Aberman et al., (2018) food security is defined as when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

According to Engler and Kretzer, there are four pillars of food security which are; availability, access, utilization and stability, and the nutrition dimension is vital to the concept of food security.

Msiska, (2017), agreed with Engler and Kretzer's idea where he added that food availability relates to the supply of food through production distribution and exchange.(Msiska & Resources, 2017). He further defined food access as the affordability and allocation of food as well as the preferences of individuals and households.

The UN committee on Economic, social and cultural rights 2018, noted that the causes of hunger and mulnutrion are often not a scarcity of food but inability to access available food, usually due to poverty. Floods as a disaster will contribute to one way or another to poverty hence.

Malawi is amongst the poorest countries in the world. It is also having very high levels of inequality. Consequently, poverty is both widespread and deep, making many Malawians highly vulnerable and often leaving them unable to cope with even a moderate production shock(Cromwell & Kyegombe, 2005).

Msiska, (2017) added that it is poverty that can limit access to food and can also increase how vulnerable an individual or household is to food price spikes. Access depend on whether the household has enough income to purchase food at prevailing prices or has sufficient land and other resources to grow its own food.

According to Malawi Government, (2006), there are two distinct types of access to food; direct access in which a house hold produces food using human and material resources and economic access in which a household purchases food produced elsewhere.

Apparently, food security has traditionally been defined in terms of people's access to maize and as a result, the policies toward the small holder sector in agriculture

have largely been driven by the desire to achieve maize self-sufficiency (Madise & Mpoma, 1997). However, Msiska, (2017), argued that describing maize as life is not true because there are other equally important crops which provide important nutrients such as beans, rice and cassava just to mention a few.

Verduzco-gallo and Ecker shows evidence that Malawian households have historical been unable to provide a sufficient sur-plus of staple food during good rainfall years to cover for food shortages during flood years and this is important contributing factor to vulnerability and food insecurity in Malawi (Verduzco-gallo & Ecker, 2014).

2.2 Nutrition indicators in Malawi

The attainment of good nutrition depends on and encompasses the entire food supply. Plant and animal foods and their various components are the primary vehicles that provide nourishment to human beings.

According to Ohlhorst et al., (2013), nutrition is vital, not only in the growth and development of humans and animals but also in the prevention and treatment of disease.

Nutrition is also fundamental to the maintenance of good health and functionality. Basic and applied research on the interrelations between nutrition and no communicable diseases, nutrient composition, and nutrition monitoring represents the underpinnings for healthy populations and robust economies.

Cromwell and Kyegombe 2005, shows evidence that that the prevalence of stunting amongst children under five in Malawi indicative of long-term malnutrition appears to have declined over the last two decades, but still remains at very high levels, particularly amongst rural children. Levels of wasting indicative of short-term malnutrition appear to have increased and, for rural children, are now at the +5% internationally recognized warning level. Although the reduction in prevalence of stunting is positive (and may be related to reductions in disease arising from improved access to water and sanitation), the increase in wasting, which is closely associated with inadequate consumption of food, is alarming. Taken overall, Malawi's child nutrition indicators give cause for concern (Cromwell & Kyegombe, 2005).

2.3. Impacts of natural disaster in children

Carolyn Kousky 2016, considers three ways that natural disasters may harm children disproportionately, often with long-lasting effects.

First, disasters can damage children's physical health. Children may be injured or killed, but they may also suffer from such things as malnutrition caused by disruptions in food supply or diarrheal illness caused by contaminated water. Moreover, disasters can cut off access to medical care, even for non-disaster-related illnesses.

Second, disasters can cause mental health problems. Not only are disasters themselves stressful and frightening, but children can suffer psychological harm from the damage to their homes and possessions; from migration; from the grief of losing loved ones; from seeing parents or caregivers undergo stress; from neglect and abuse; and from breakdowns in social networks, neighbourhoods, and local economies.

Third, disasters can interrupt children's education by displacing families, destroying schools, and pushing children into the labor force to help their families make ends meet in straitened times(Kousky, 2016).

Diwakar et al., added that disasters can have a direct impact on a household's poverty status and dynamics, through physical and material damage to their lives and assets. For instance, homes may be partially or totally destroyed, resulting in a lack of safe shelter. This can inhibit a child's ability to recover, while threatening their physical security(Diwakar et al., 2019).

He further explained the indirect impacts on households and children where by the damaged infrastructure and poor housing conditions can increase exposure to future climate or disaster risks, or can disrupt households' water, electricity/energy supplies and communications, hindering recovery (Lovell and Mitchell, 2015). Households may reduce spending on education, healthcare and food, which can affect nutrition and longer-term development outcomes.

3. CHAPTER 3: MATERIALS AND METHODS

3.1. Research design

A descriptive cross-sectional study design was conducted, using both quantitative and qualitative methods.

3.2. Study Area

The study took place in Chikwawa district, Traditional Authority Katunga, at Kapasula and William villages. And the area has been chosen because almost every year, there is occurrence of floods that causes devastating problems in the communities.

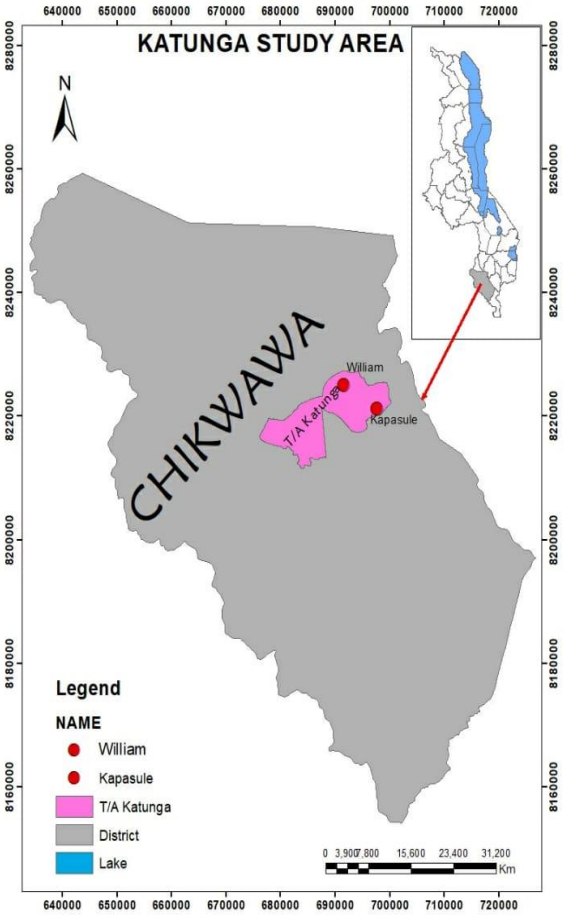


Figure 1: Map of TA Katunga showing study area

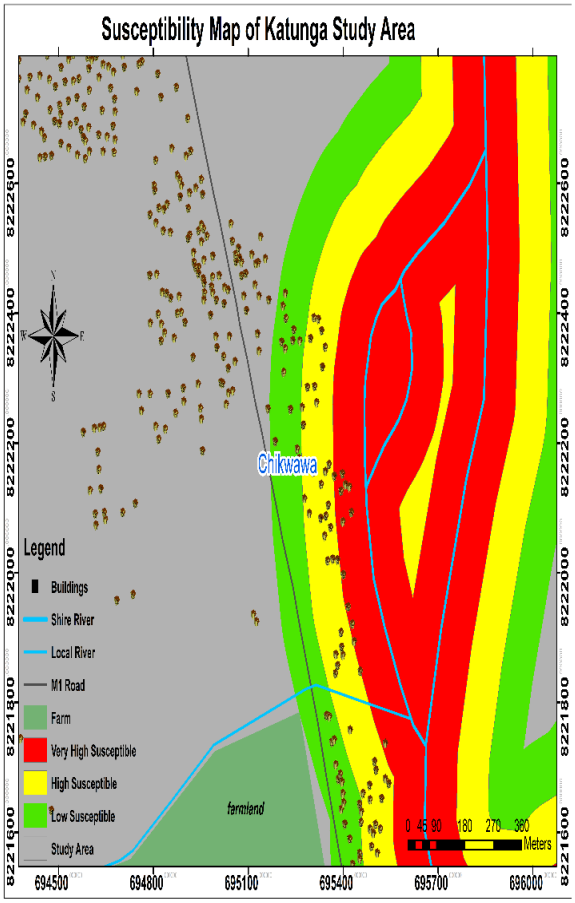


Figure 2: Susceptibility map of study area

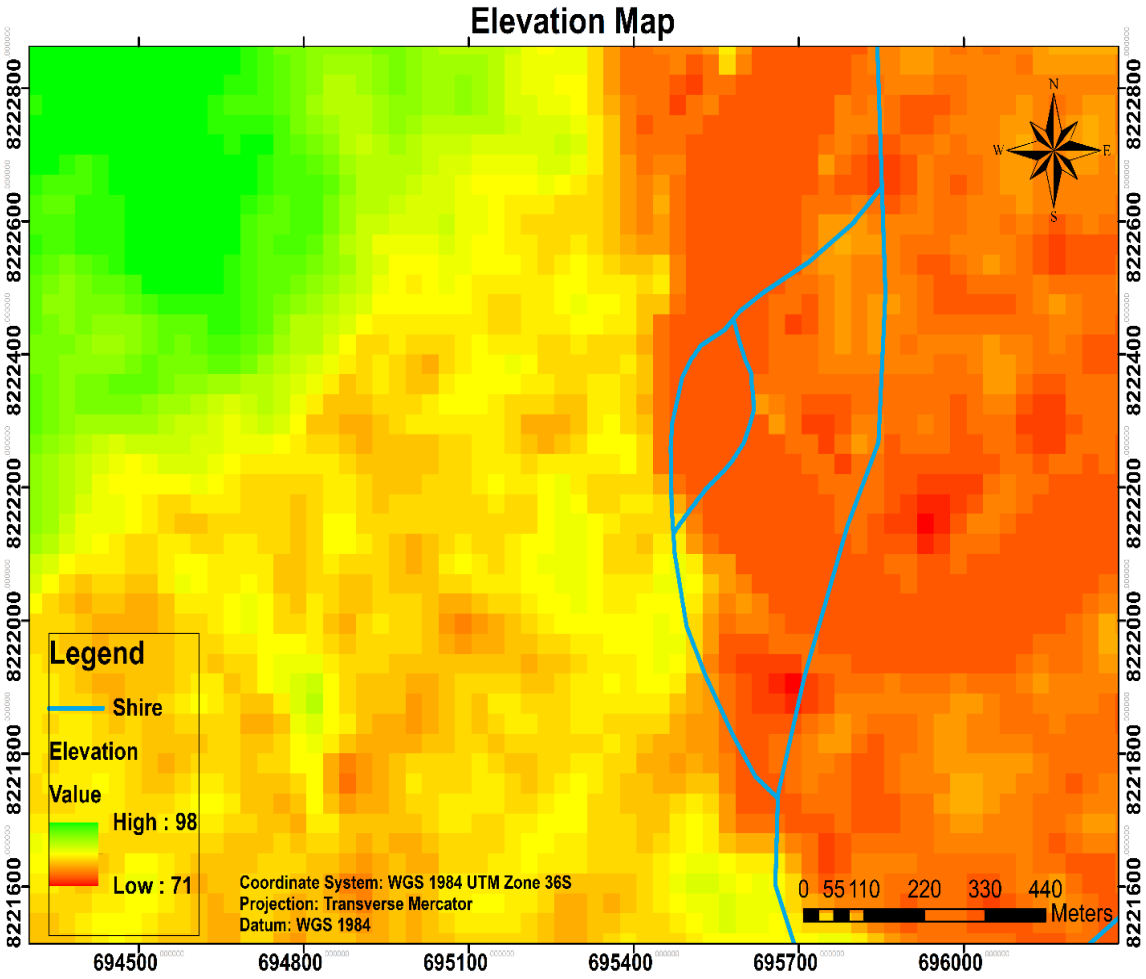


Figure 3: Map showing digital elevation model of the study area in TA Katunga

3.2.1. Study population

The study population constituted primary care givers of and the under 5 children, residing in flood prone and non-flood prone areas at Kapasula and William villages respectively.

3.3. Inclusion criteria

The participants with the following attributes were included in this study;

1. Primary care giver of an under 5 children
2. Residing in the William and Kapasula villages, located in T/A Katunga in Chikwawa
3. Present at that particular time of the study

4. Those who consented to participate in the study

3.4. Exclusion criteria

1. Primary care giver of children less than or equal to 5 months
2. Primary care givers of under 5 children who were not present at that particular time of the study
3. Those who did not consent to participate in the study

3.5. Study period

The data was collected from 26th of March to 30th of March, 2021. Data management and analysis took place from 1st of April to 4th of April, 2021.

3.6. Sample size

A sample size of 80 participants; 20 primary givers of the under 5 children (parents) and 20 children from the flood prone area and 20 primary givers of the under 5 children (parents) and 20 children from non-flood area was enrolled into the study. The study used a cluster sampling technique where the whole population was divided into groups, (flood-prone areas and non-flood-prone areas). Subsequently, a random sample was taken from these groups, all of which was used in the final sample(Taherdoost et al., 2017). The size of the sample was calculated using $n = Z^2(P)\ (1 - P)/e^2$ where **n** represents sample size, **Z** is the value of a normally distributed standard variate which for a 95% confidence interval takes on the value of 1.96. since the value of **P** is not known 0.5 will be used; **e** is the allowable error or the desired level of accuracy (*Malawi University of Science and Technology Ndata School of Climate and Earth Sciences Research Project I*, 2020).

$$n = Z^2(P)\ (1 - P)/e^2$$

n= $[(0.95)^2(0.5)\ (1\text{-}0.5)]/\ (0.05)^2$

n=90.25

n=90 (to the nearest whole number)

So, 90 subjects were recruited in the study through random sampling and interviews. The sample size was then reduced to 80 because of limited resources and time.

3.7. Data collection

The data was collected from 26thof March to 30th of March, 2021. The investigator, led by the districts' disaster management team lead, informed the T/A and the village headman about the project and issued out the permission letters from district council and MUST to them a day prior to commencing data collection. The village headmen announced the issue and alerted their people about the data collection activity that was to take place in their homes. On 27th March, after explaining the study and its rationale to each participant and finding out if the participant was eligible for participation, informed consent was sought and then data collection started with the interview phase using the questionnaire. After the interview, the Mid Upper Arm Circumference (MUAC) of an under 5 child was measured using a MUAC tape and the result was recorded on a checklist. A code number was used in place of participant name for both checklist and questionnaire; both the primary care giver of the under 5 children and the child were assigned a similar identification code. The questionnaire was largely close ended, with three questions open ended.

The investigator collected data for all participants in both villages, starting with the flood prone area (Kapasula) then the non-flood prone area thereafter. Therefore, 20 interviews of primary care givers each Kapasula and William villages (totaling to 40) and 20 MUAC measurements on under 5 children each from both villages (totaling to 40) were conducted.

The questionnaire was in Chichewa for easy communication. Because it was anticipated that some people in the rural areas of Chikwawa may not be able to read and write, the questionnaire was administered by the investigator using an interview approach. This approach also helped participants to speedily seek for clarification where they did not understand any question.

3.8. Ethical consideration

The ethical clearance was sought and granted from the MUST research and ethics committee. Permission to conduct the study was sought from Chikwawa district council. Participants were well informed and consented to participate prior to data collection. Participation in the study was voluntary and no harm was expected during

participation. A code number was used instead of a participant's name for confidentiality.

3.9. Data management and analysis

The IBM SPSS 19 statistical program was used to analyse the data. Descriptive statistics were used to interpret the demographic data: age, sex, number of family members in each household, head of each household and highest level of education for the primary caregivers.

Frequencies, percentages, proportions, means and standard deviations were also used to present outcomes from other sections of the questionnaire and the checklist that sought for food security, knowledge on groups of food and food consumption practices, and the anthropometric parameter of the children respectively. Pearson chi square and fisher's Exact test were used to show the level of relationship in the outcomes between the flood prone and non-flood prone areas, with the significance level (p value) set at 0.05. Frequency distribution tables, pie chart and graphs were used to provide an overall and coherent presentation and description of data.

The food security

Similarly, Food Consumption Score (FCS) were assessed and grade to understand the food security of the areas. Participants listed the food items they consumed in the past 7 days, and the food items they consumed in 7 days during the most recent flood event. The food diversity was then captured by simply measuring the number of food groups (out of seven) that a household consumed over a reference period of seven days. The household that consumed four food groups were considered to have low diversity (Engler & Kretzer, 2014). To calculate the FCS, the food diversity was combined with the number of days each food group were consumed and the relative nutritional importance of different food groups. The standardized threshold of FCS that were used are divided into three groups; poor food consumption; borderline food consumption and acceptable food consumption. and an aggregate score of all food items were then weighted and interpreted using the scoring method in table 2.

Table 1. The level of food consumption practices in TA Katunga in the Chikhwawa district.

SCORES OF FOOD GROUPS CONSUMED	Quality level of food consumption practice
>4	Acceptable food consumption
Equal to 4	Bordering food consumption
< 4	Poor food consumption

The nutrition status of the children

The nutrition status of children was measured using a MUAC tape, and the classification was based on the color of the measurement of the tape. In general, the green, yellow and red colors represent healthy nutritional, borderline nutritional and malnutrition statuses respectively. table 3 below is the summary of the classifications of the color measurement of the tape.

Table 2. The classifications of the color measurement of the MUAC tape

Color of the measurement of the tape	Presentations of the colors
Green	Healthy nutrition
Yellow	Borderline nutritional
Red	Malnutrition

The nutrition practice

This was being regarding to the level of knowledge, applicable choices (as outlined by the participant) were ticked by the investigator on the questionnaire. Participants mentioned the groups of food using the local terminologies used in Malawi e.g. zanyama, zamafuta, zamasamba, zanyemba, zipatso, zopasa mphamvu ndi Madzi. Depending on the number of items listed, their levels of knowledge were graded; each correct item listed by the participant scored 1 point. Table 1 shows how the level of knowledge was graded using the number of scores given to each individual.

Table 3. The level of knowledge classification on the groups of food

SCORES	LEVEL
Greater than or equal to 4	High
3	Moderate
Less than or equal to 2	Low

4. CHAPTER 4: RESULTS AND DISCUSSIONS

4.1. Results

4.1.1. General characteristics of the study population

40 primary care givers of under 5 children and their respective 40 under 5 children were recruited and completed the study, making a 0 % drop out rate. The mean age of primary care givers from both study areas was 32.7±8 years. The mean of the total number of household members in the two study areas was 4.7±2. Table 3 shows proportions of the primary care givers, from both flood prone and non-flood prone areas, according to their demographic features.

Table 4. The demographic characteristics of primary care givers in flood prone and non-flood prone areas in Kapasula and William villages.

Parameters	Percentages of primary care givers (%)
GENDER	
Women	100
EDUCATION LEVEL	
Never schooled	17.5
Primary	67.5
Secondary	15
HOUSEHOLD HEAD	
Father	75
Mother	22.5
Grandparent	2.5

4.1.2 Determination of household food insecurity in flood-prone and non-flood-prone area in TA Katunga

(a) Sources of income for primary care givers of under 5 children

The majority of participants from flood prone areas (55%) and non-flood prone areas (95%) reported farming as their main source of farming, while the remainder (45% and 5%, respectively) reported employment as source of income. The Fisher's Exact test showed that there is a significant difference between the sources of income between the participants from flood prone and non-flood prone areas (p=0.008). Figure below illustrates the differences in the sources of income between the two areas, using the proportions of participants.

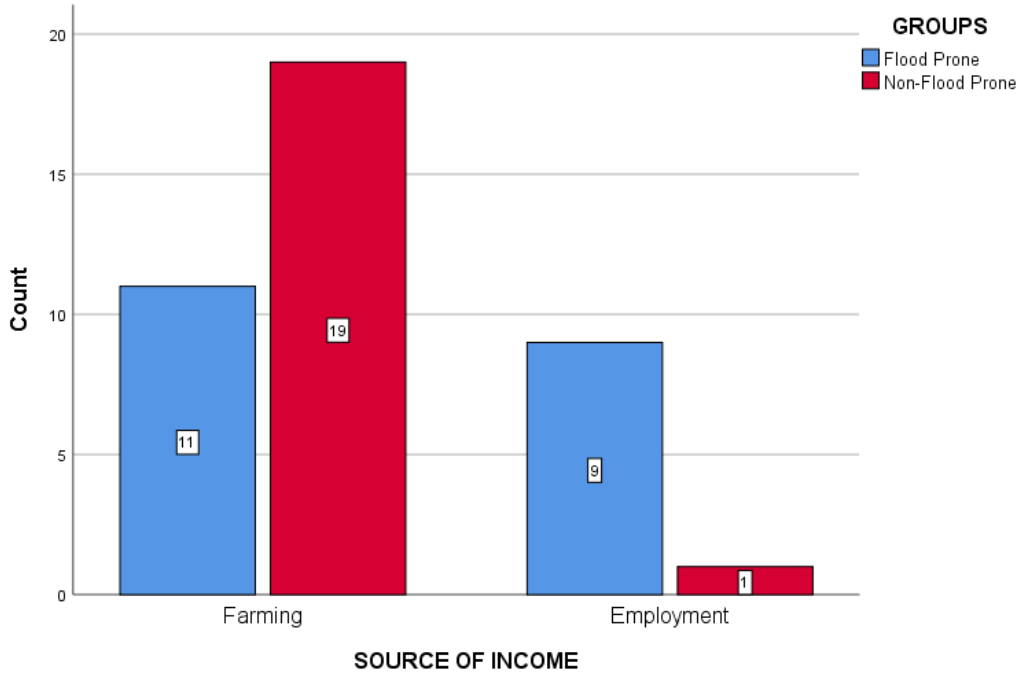


Figure 4. Illustrates the differences in the sources of income between the two areas, using the proportions of participants.

(a) Monthly net income for primary care givers of under 5 children

A large percentage 60%(n=12) of primary care givers of the under 5 children from the flood prone areas had over MK25,000 as their monthly income, while a large percentage 85% (n=17) of primary care givers from the non-flood areas had less than MK25,000 as their monthly income. The Pearson Chi-Square test showed that the monthly net income was significantly different between the participants from the two areas (p=o. o24). The differences, using the count of participants, in the monthly net income is shown in figure 5.

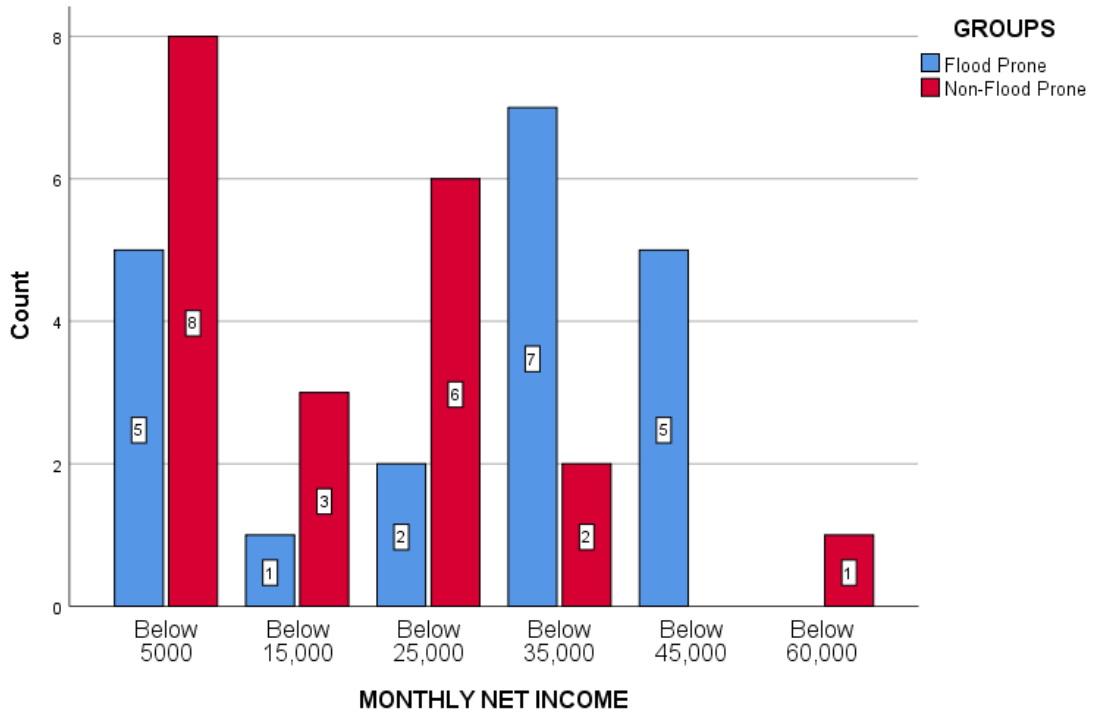


Figure 5. illustrates the differences in the monthly net income in William (non-flood prone) and Kapasule villages (flood-prone)

(b) Participants consumption of all groups of food in both study sites

Large percentages of participants from flood prone (55%, n=11) and non-flood prone (65%, n=13) areas consumed 4 groups of food in the past 7 days, which was classified as a borderline food consumption. Table 6 shows the classification of consumption levels between the groups. The Pearson Chi-Square indicated that the two groups did not significantly differ in the food groups' consumption levels (p=0.413). Figure 7 shows the non-significant differences in a one week's consumption levels between the groups.

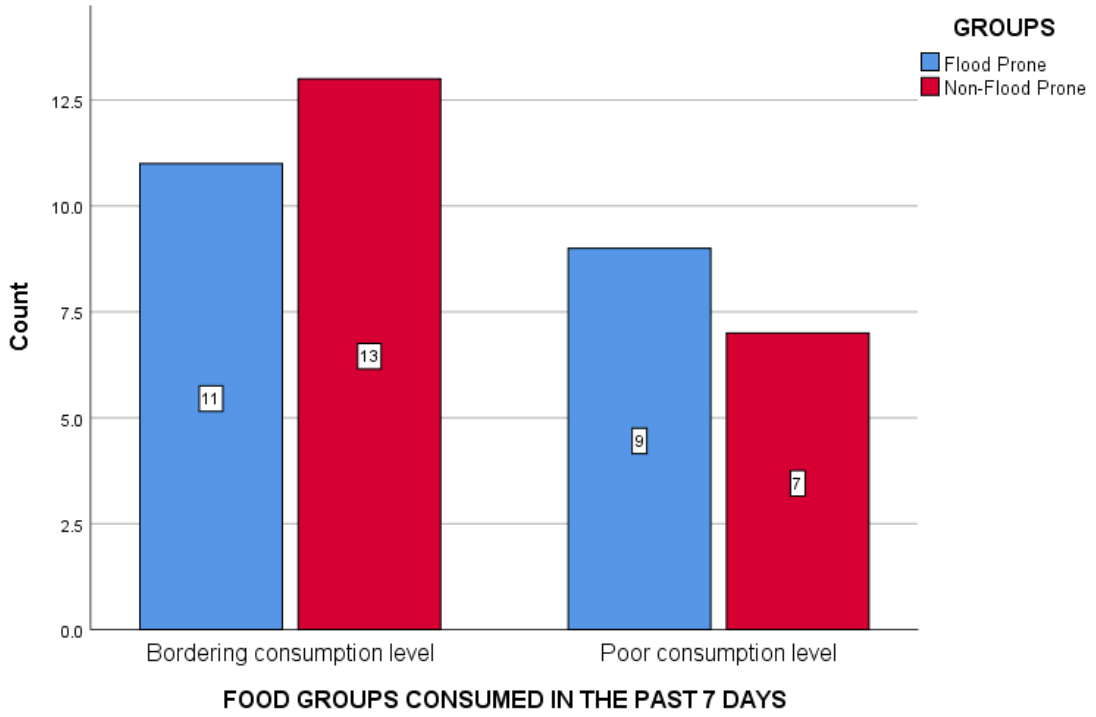


Figure 6. illustrates a non-significant difference in the participants' level of food consumption between study sites

(c) Participants recall of consumption of all groups of food during the most recent flood event

The majority of participants from the flood prone area (90%, n=18) had poor food consumption level during 7 days of the most recent flood event. Figure 8 illustrates the distribution of consumption levels among the participants from the flood prone area. There was significant differences in the consumption levels between the groups (p=0.001).

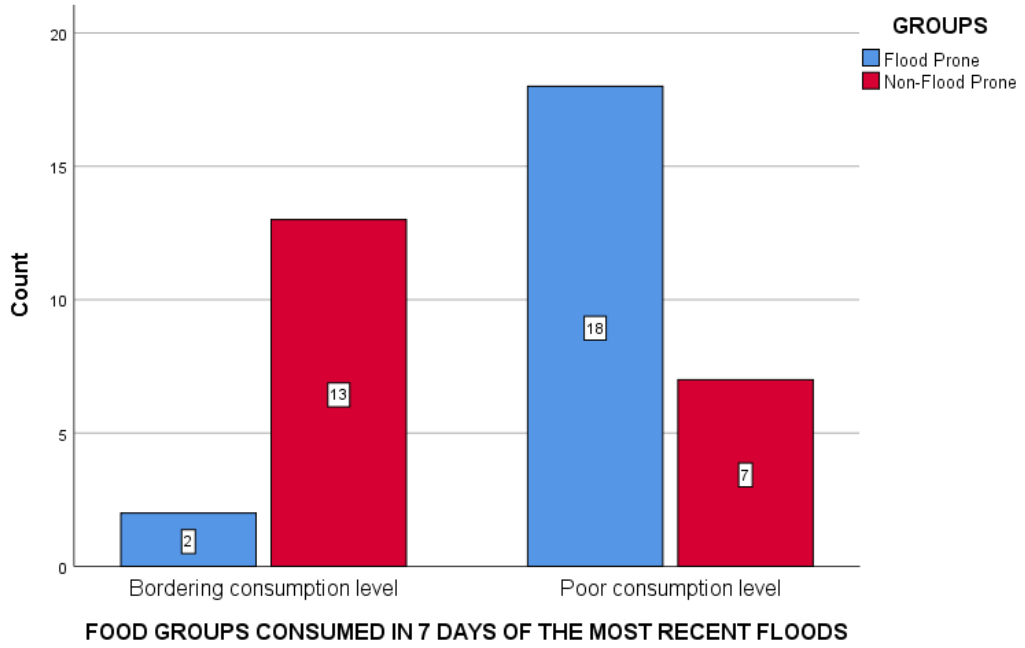


Figure 7. Illustrates the distribution of food consumption levels during the most recent flood event

4.1.3 Comparison of nutrition status of children in both study areas

i. Anthropometric measurement of the under 5 children

A total of 40 under 5 children were enrolled and completed the study. The ages varied across the children from both sides. The Pearson Chi-Square indicated no significant differences in the ages of the under 5 children between the flood prone and non-flood prone areas (p=0.569). Figure 9 shows the comparison of the age ranges of the children from flood prone and non-flood prone areas.

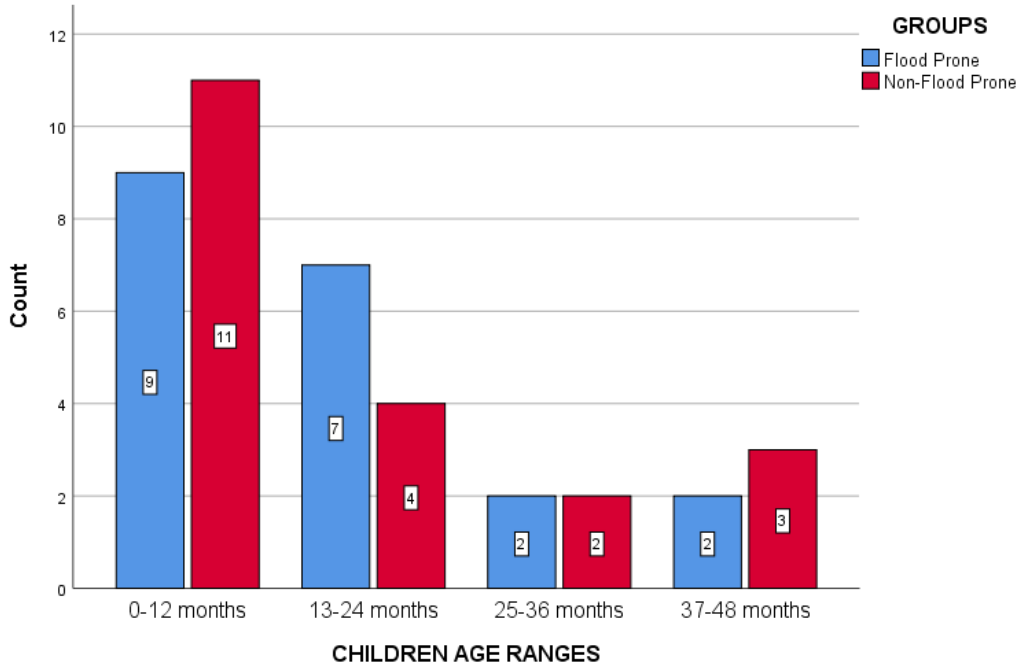


Figure 12. Illustrates the non-significant comparison of Age ranges of the under 5 children from both study sites

The mean MUAC value for all children from flood prone and non-flood prone areas was 13.9±2.3. Majority of children from the flood prone area (50%, n=10) had a borderline nutritional status, while the majority of children from non-flood prone area (90%, n=18) had healthy nutritional status. The Pearson Chi-Square indicated that the nutritional status of the under 5 children differed significantly between the under 5 children from flood prone and non-flood areas (p=0.001). Figure 10 compares the significant variation in the nutritional status of the under 5 children from flood prone and non-flood prone areas.

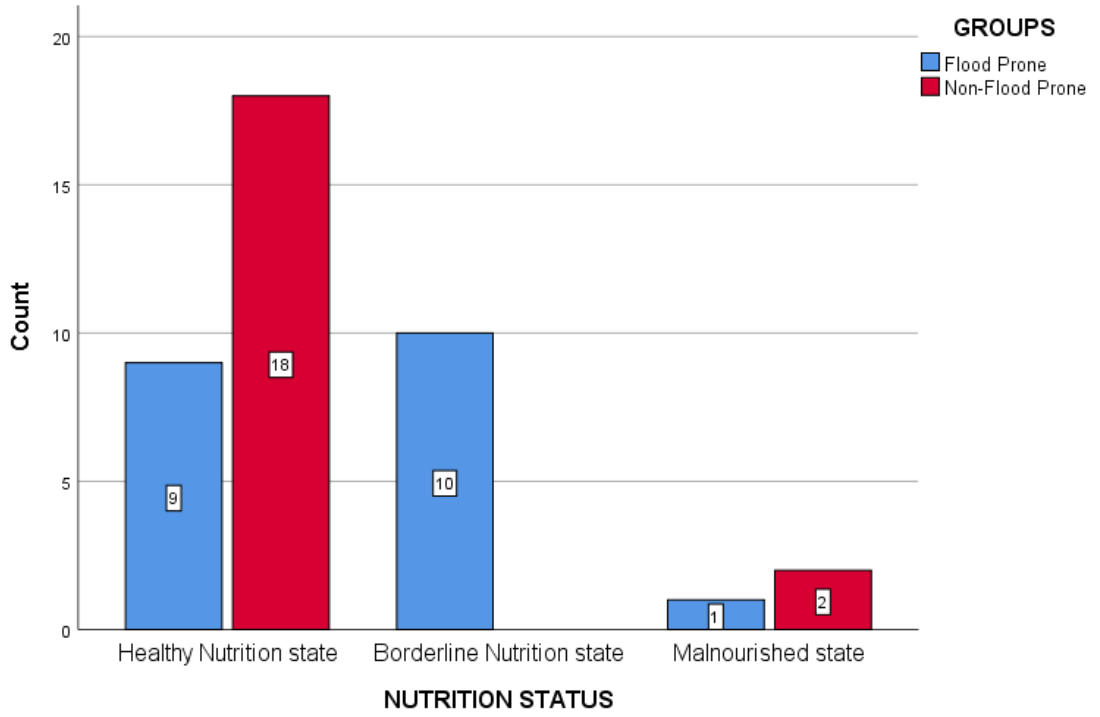


Figure 13. Illustrates the comparison of significant classes of nutrition status of the under 5 children from both study sites.

4.1.4 The nutrition practices and knowledge

(a) Number of meals consumed on daily basis in the participants households

Large percentages of participants from the flood prone area 65%(n=13) and non-flood prone area 75%(n=15) reported that they consumed 2 meals per day. The Pearson Chi-Square test showed that there was no significant differences between the number of meals consumed on daily basis among the participants from flood prone and non-flood prone areas (p=0.565). Figure 3 illustrates the non-significant differences.

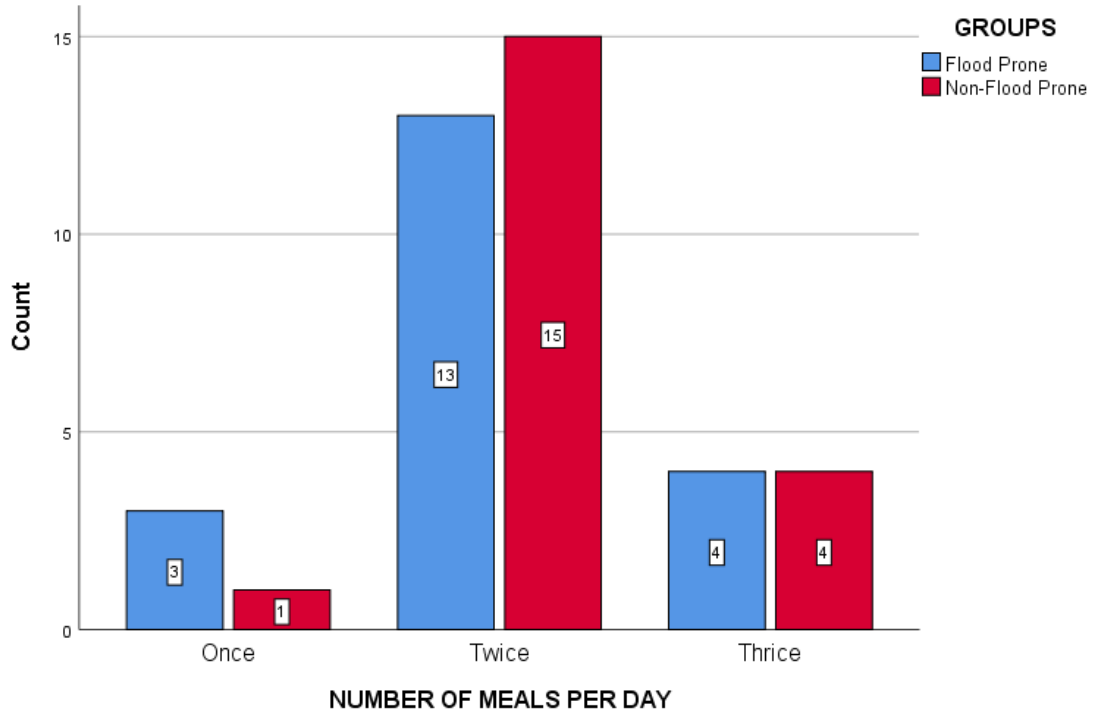


Figure 8. Illustrates the non-significant differences in the number of meals between study sites

(b) Staple food reported by participants from both study sites

All participants from both flood prone and non-flood prone areas reported Nsima as their staple food.

(c) Level of knowledge about the 6 groups of food among the study participants

The majority of the participants from flood prone area 95%(n=19) and non-flood prone area 95%(n=19) reported that they were knowledgeable about the groups of food. The Pearson Chi-Square test showed that there was no difference in the level of knowledge among the participants from floor prone and non-flood prone areas (p=0.887). Figure 4 shows the non-significant differences in the assessed level of knowledge of the participants between the groups.

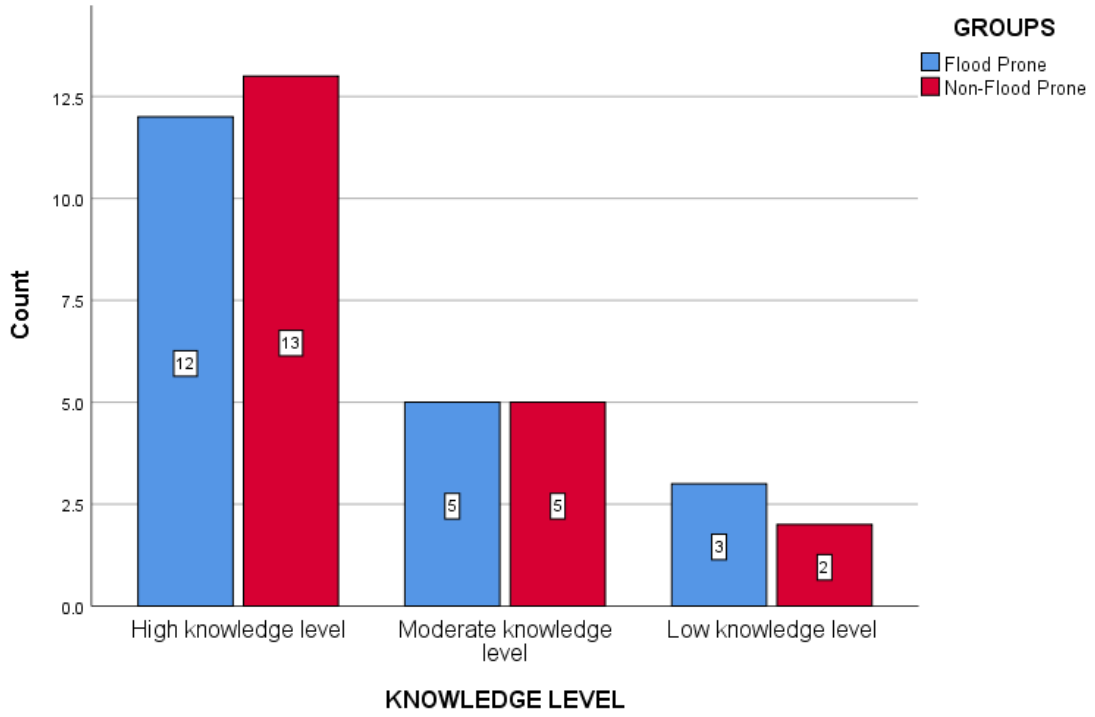


Figure 9. Illustrates the non-significant differences in the level of knowledge

(e) Daily consumption of all groups of food by under 5 children

The majority of primary care givers from flood prone area (60%, n=12) and non-flood prone area (80%, n=16) reported that they do not give their under 5 children all 6 groups of food. The Fisher's Exact test showed that there were no significant differences in the provision of all groups of food to the under 5 children between the flood prone and non-flood prone areas (p=0.30). Figure 5 illustrates the non-significant differences between the groups. All of the 28 participants who reported that they do not manage to give all groups of food to their under 5 children, reported lack of money as the contributing factor.

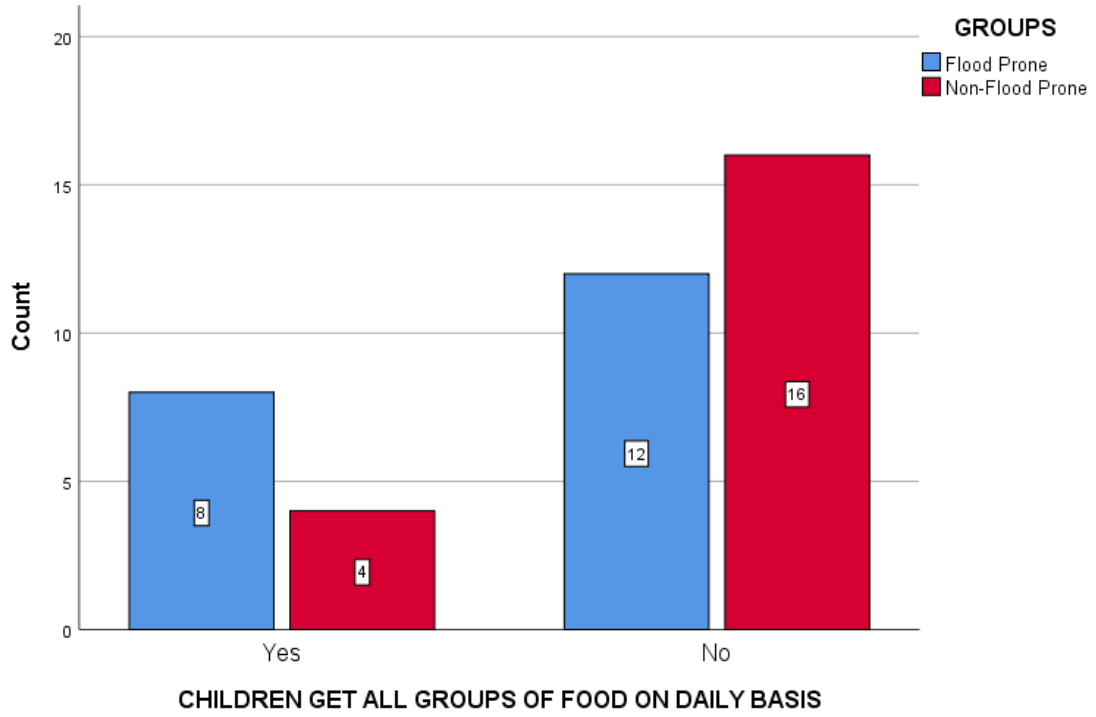


Figure 10. Illustrates the non-significant differences in the provision of food between study sites.

The minority of participants from flood prone (40%, n=8) and non-flood prone area (20%, n=4) both study sites reported that provision of all 6 groups of food assists the children to grow well, while the remainder from both sites did not know the benefits of consuming all groups of food. Fishers's Exact test indicated no significant difference in the knowledge of benefits of providing all groups of food to children among the participants from both flood prone and non-flood prone areas (p=0.176). Figure 6 shows the non-significant differences in the knowledge between the two locations.

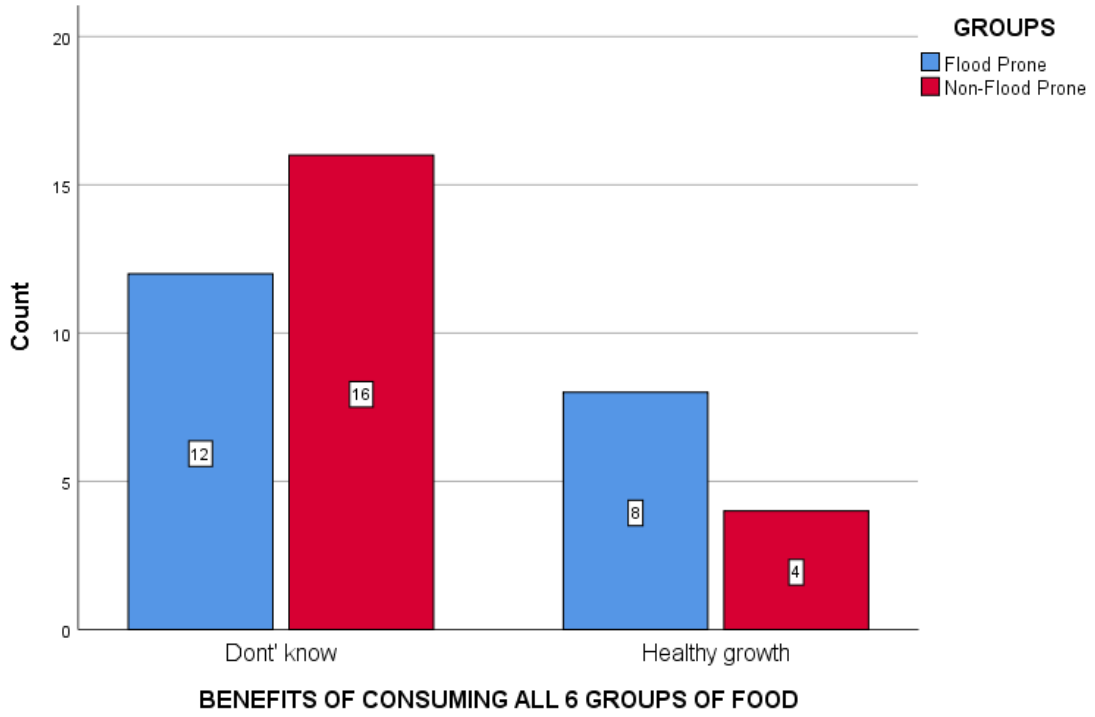


Figure 11. Illustrates the non-significant differences in the knowledge on benefits of consuming all groups of food.

The majority of participants from flood prone (75%, n=15) and non-flood prone (95%, n=19) areas reported that they find it difficult to provide all groups of food to the under 5 children. The Fisher's Exact test indicated no significant difference in whether the participants experience difficulty or easiness in the provision of all groups of food to the under 5 children between the flood prone and non-flood prone areas (p=0.182).

4.2 Discussion

4.2.1 introduction

Commonly, floods cause displacement of people and loss of property of the people living in flooded areas. It is also not uncommon that Malawi, a poor country in Sub-Saharan Africa, experiences floods almost yearly in some parts of the Northern, central, Southern and Eastern regions. Unfortunately, the majority of Malawians living in rural areas rely on farming for food production, and any change in climate that leads to floods affects their capacity to produce food. Consequently, this fosters increasing poverty levels among the people, which makes it difficult for the families to look after their children adequately and appropriately. This descriptive study gives an understanding of the case for Chikhwawa district, that faces floods yearly. In general, the findings from this study show that flooded households are subjected to a slew of problems, including food insecurity as a result of crop failure or food affordability due to lack of money. Furthermore, the results indicate that the under 5 children from flooded households are not well nourished compared to those from non-flooded areas. In this chapter, the findings of this study are being compared to what other scholars have found on related studies.

Determination of household food insecurity

Although most people from flooded areas do farming, the difference with those who do not farm is just 10%. This can be alluded to the fact that during floods, lands that are used for farming are destroyed and crops are damaged; hence not motivated to farm but opting to go into employment. Furthermore, their livelihood is disturbed and this results in acute poverty that then leads to food insecurity. Despite that a large proportion of participants (36%), constituting the flooded households, raise between MK26,000 to MK44,000 in a month, it was noted that none of the household from the flood prone area partook the acceptable level of food consumption; implying that the monthly wages from employment are not enough to promote food security. This is possibly because the money is used to carter for time-to-time shelter renovations, hospital costs as a result of other flood related ailments, children school support and food.

In addition, majority of the flooded households (90%) achieved a poor level of food consumption during a week of the most recent flooding event; suggesting that the flooded households do experience food insecurity throughout the year, and the situation worsens during disaster events such as floods. Furthermore, it is important to appreciate that these primary care givers are also taking care of other children, which may make it difficult to achieve the appropriate consumption levels of each child. According to traditional practices in most parts of rural areas of Malawi such as in Chikhwawa, women prioritizes husbands when it comes to meal intake; therefore, this practice may also contribute to the disparity in the availability of appropriate and adequate amount of food for recommended consumption levels among children. Nevertheless, several reports have also shown that a significant proportion of the population in Malawi suffers from severe food insecurity, with about 33% of the population living in a state of extremely low food security, meaning that they experience many signs of decreased food consumption, interrupted eating habits, or hunger due to lack of resources at some point during the year (Aberman et al., 2018). Therefore, it is reasonable to assume that the situation of food security in Kapasule village has gotten worse as a result of floods.

4.2.2 Nutrition status of children in both study areas in Chikhwawa district

The findings from this study indicated significant differences in nutrition status of children from flood-prone and non-flood prone areas ($p=0.001$). Although a small proportion of children (2.5%) from flood prone area was malnourished compared to the non-flood prone area (5%), the majority from the flood prone area had a borderline nutrition status (25%) while 45% from non-flood prone area had a good healthy with no one at borderline. This suggests that more under 5 children from flood prone area (27.5%) are at a risk of suffering from malnutrition. In addition, this suggests that under 5 children from this area are prone to suffering from opportunistic diseases that can come as a result of nutrition deficiencies, and may not grow well. Similarly, Rodriguez-Llanes et al., (2016) also reported that exposure to floods is associated with long-term malnutrition in rural communities, and children exposed to floods during their first year of life presented higher levels of chronic malnutrition. However, Rodriguez-Llanes et al., (2011) claimed that nutrition status

of under 5 children from flood and non-flood prone areas did not differ. Nevertheless, Rodriguez-Llanes et al., (2011) reported that children from flood prone area were at a more risk of suffering from malnutrition compared to those from non-flood prone area; which corresponds to the findings from this Chikwawa case study. Therefore, it is reasonable to hypothesize that flooding events contribute to poor child growth and high cases of diseased state of children.

4.2.3 Nutrition knowledge and practices

Although the majority of households from flood prone (95%) and non-flood prone (95%) subjectively reported to be knowledgeable about the groups of food, their level of knowledge varied. Interestingly, large proportions of household from flood prone and non-flood prone areas (60% vs 65%) possessed a high level of knowledge, seconded by moderate level of knowledge (25% vs 25%). This entails that most of the primary caregivers of under 5 children from these two areas possess an adequate level of knowledge that may enable them offer a nutritious combination of food ratios to the children. Despite the possession of adequate levels of knowledge, majority of households from flood prone (60%) and non-flood prone (80%) reported that they do not manage to give all groups of food to their under 5 children, and all of them mentioned lack of money as the main contributing factor. Therefore, this implies that possession of adequate level of knowledge does not translate into appropriate practices. Furthermore, this suggests that although the health care workers and other stakeholders in Chikwawa district are doing a good work of imparting knowledge on these primary care givers to encourage them to provide a well-balanced diet to the children, more work needs to be done to promote food security and ensure that the primary care givers have the capacity to provide the appropriate and recommended diet to the under 5 children.

4.2.4 Limitation of the study

The investigator managed to approach each household in their homes and interviewed the primary care givers of the under 5 children. In addition, this study was conducted within 4 months of a recent flooding event; hence making it easier for the participants to remember the challenges encountered during the flooding event. Overall, this is the first study to compare the nutrition status of under 5

children from flood prone and non-flood prone areas in Malawi. However, the study encountered a number of limitations. Firstly, the sample size was small. This was due to lack of funds to support the investigator's stay in Chikwawa or to employ research assistants to do the data collection work in the district. In addition, the study did not assess the nutrition status of other under 5 children in each household; the focus was placed on the youngest under 5 child in each household. This was done to ensure a speedy data collection process due to the same financial constraint. In addition, this study does not establish a causal relationship but an association between floods and childhood malnutrition, and it is only a representative of the children aged 6 and 59 months living in 2 these two rural communities; hence results may not be generalized.

5. CHAPTER 5: COCLUSION AND RECOMMENDATIONS

5.1. Conclusion

The findings reveal the problem of malnutrition and food insecurity in Chikhwawa district, the findings from this study show that flooded households are subjected to a slew of problems, including food insecurity as a result of crop failure or food affordability due to lack of money. Furthermore, the results indicate that the under 5 children from flooded households are not well nourished compared to those from non-flooded areas. Even though there is high knowledge of nutritious food in both flood prone and non-flood prone areas, but people exist in these communities don't practice by giving nutritious food to their children because of inadequate resources that they have hence leading to malnutrition of children.

5.2. Recommendations

People in Chikhwawa are highly vulnerable to prolonged dry spells coupled with flash floods that destroy crops, livelihoods and lead to greater poverty and food insecurity. There is a need to be a shift from a disaster response culture to the integration of disaster risk into sustainable development planning and programming. This includes mainstreaming disaster risk reduction into policies, strategies, programmes and annual planning at all levels as well as creating a multi stakeholder forum for the coordination of different stakeholder. People centered early warning systems need also to exist at national and local levels. Not to mention, Long-term malnutrition prevention programme after floods should be implemented in flood-prone areas.

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7. APPENDENCES

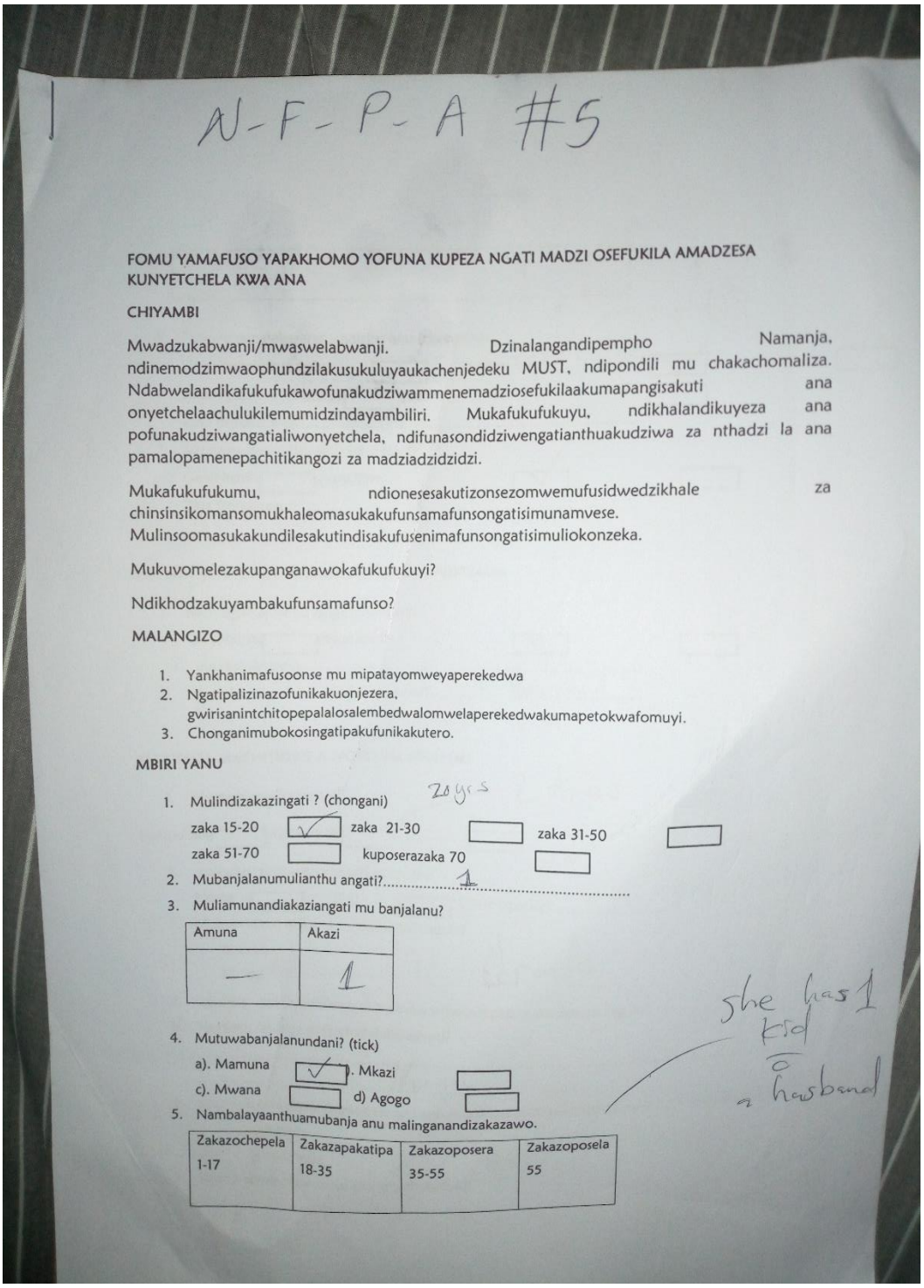
Appendix 1: shows the measurements of children using Middle Upper Arm circumferences



Appendix 2: shows how the Interviwes of care givers of under 5 children in kapasule and William villages



Appendix 3: shows a sample of open-ended questionnaire used in data collection at Kasapula and William villages



N-F-P-A #5

FOMU YAMAFUSO YAPAKHOMO YOFUNA KUPEZA NGATI MADZI OSEFUKILA AMADZESA KUNYETCHELA KWA ANA

CHIYAMBI

Mwadzukabwanji/mwaswelabwanji. Dzinalangandipempho Namanja, ndinemodzimwaophundzilakusukuluyaukachenjedeku MUST, ndipondili mu chakachomaliza. Ndabwelandikafukufukawofunakudziwammenemadziosefukilaakumapangisakuti ana onyetchelaachulukilemumidzindayambiliri. Mukafukufukuyu, ndikhalandikuyeza ana pofunakudziwangatialiwonyetchela, ndifunasondidziwengatianthuakudziwa za nthadzi la ana pamalopamenepachitikangozi za madziadzidzidzi.

Mukafukufukumu, ndionesesakutizonsezomwemufusidwedzikhale za chinsinsikomansomukhaleomasukakufunsamafunsongatisimunamvese. Mulinsoomasukakundilesakutindisakufusenimafunsongatisimuliokonzeka.

Mukuvomelezakupanganawokafukufukuyi?

Ndikhodzakuyambakufunsamafunso?

MALANGIZO

1. Yankhanimafusoonse mu mipatayomweyaperekedwa
2. Ngatipalizinazofunikakuonjezera, gwirisanintchitopepalalosalembedwalomwelaperekedwakumapetokwafomuyi.
3. Chonganimubokosingatipakufunikakutero.

MBIRI YANU

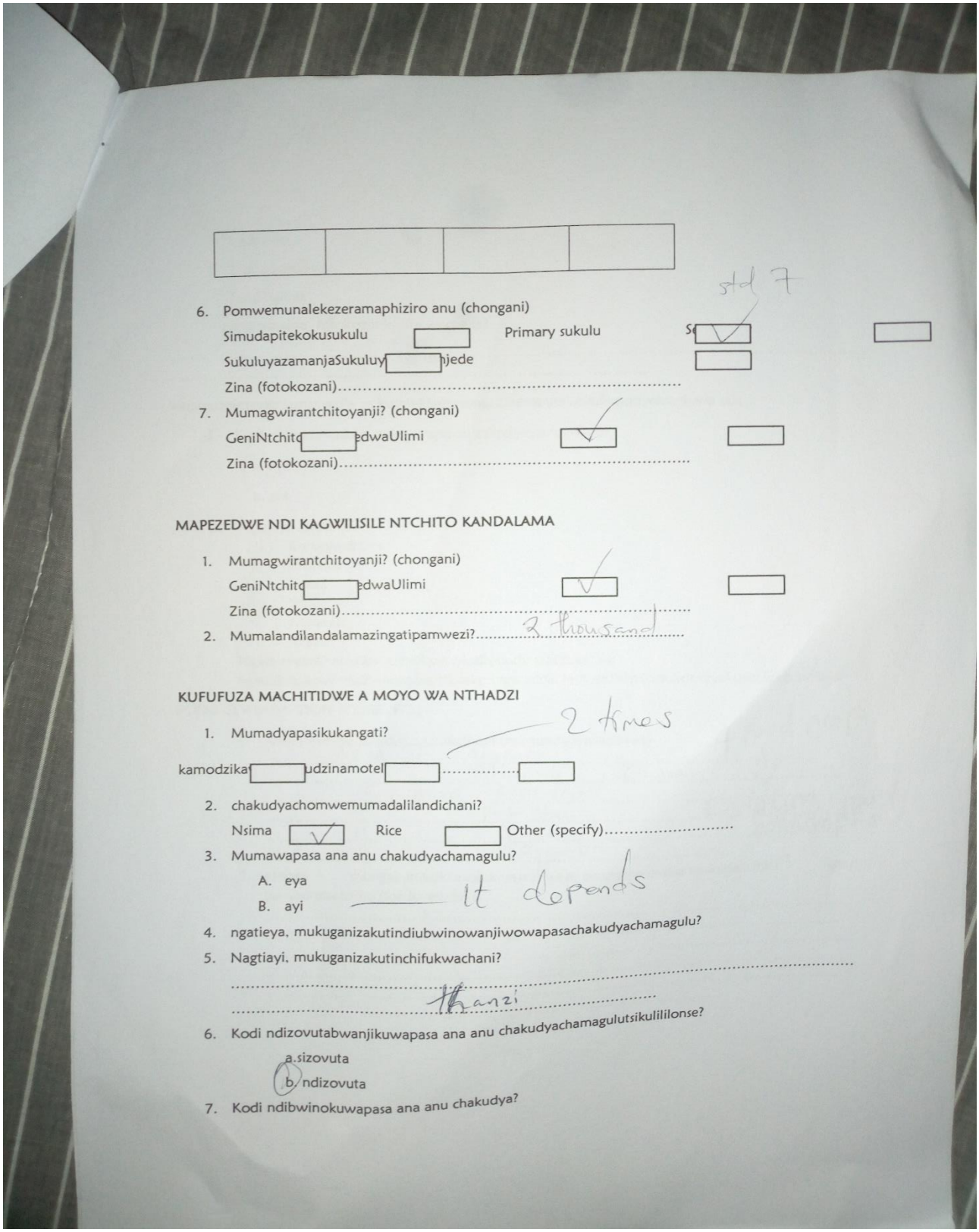
1. Mulindizakazingati ? (chongani) 20 yrs
   zaka 15-20 [✓] zaka 21-30 [ ] zaka 31-50 [ ]
   zaka 51-70 [ ] kuposerazaka 70 [ ]
2. Mubanjalanumulianthu angati? 1
3. Muliamunandiakaziangati mu banjalanu?

Amuna	Akazi
—	1

she has 1 kid
& husband

4. Mutuwabanjalanundani? (tick)
   a). Mamuna [✓] b). Mkazi [ ]
   c). Mwana [ ] d) Agogo [ ]
5. Nambalayaanthuamubanja anu malinganandizakazawo.

Zakazochepela 1-17	Zakazapakatipa 18-35	Zakazoposera 35-55	Zakazoposela 55



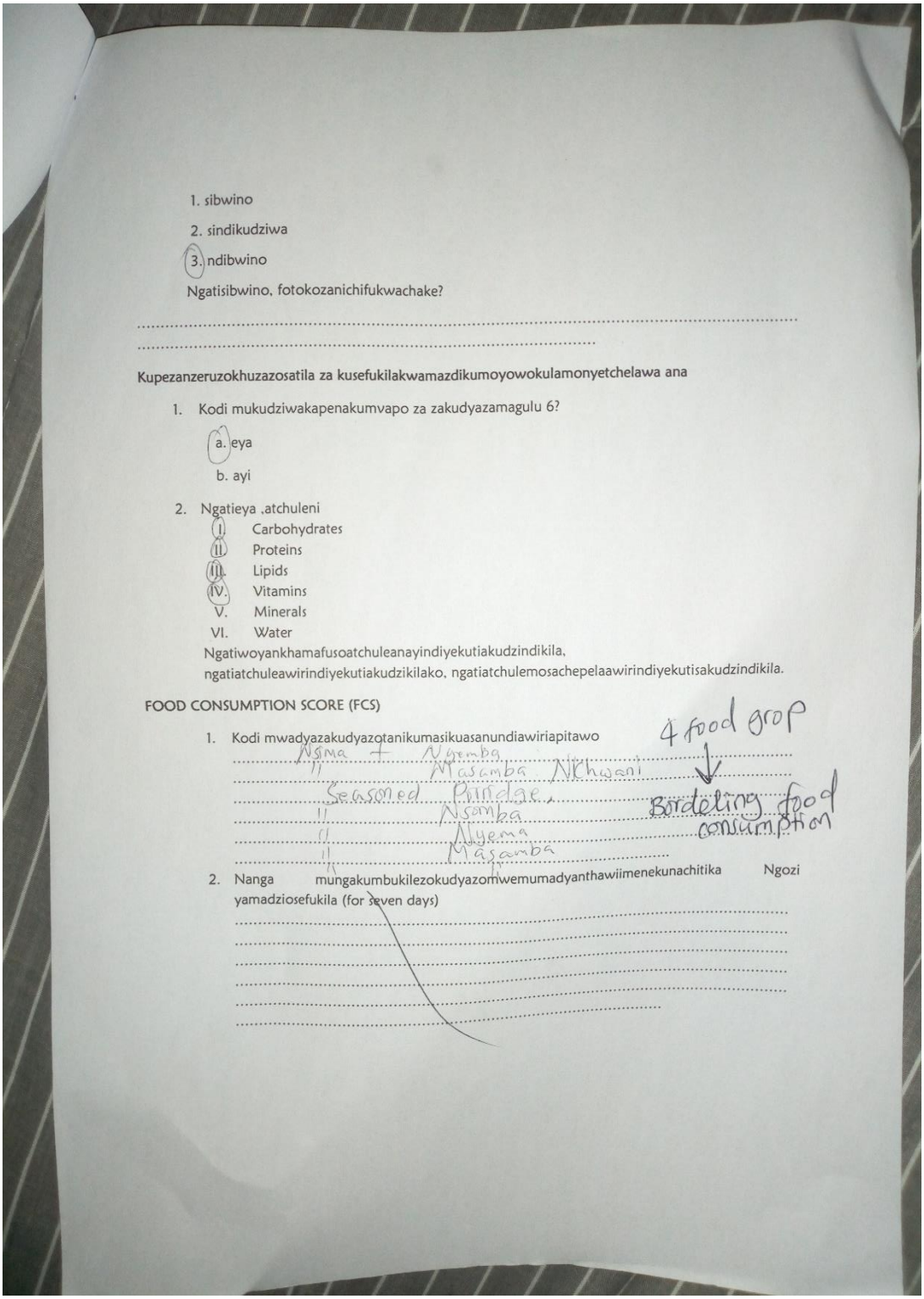
6. Pomwemunalekezeramaphiziro anu (chongani)
   Simudapitekokusukulu ☐ Primary sukulu std 7 ☑ ☐
   SukuluyazamanjaSukuluy ☐ hjede ☐
   Zina (fotokozani).....
7. Mumagwirantchitoyanji? (chongani)
   GeniNtchito ☐ edwaUlimi ☑ ☐
   Zina (fotokozani).....

MAPEZEDWE NDI KAGWILISILE NTCHITO KANDALAMA

1. Mumagwirantchitoyanji? (chongani)
   GeniNtchito ☐ edwaUlimi ☑ ☐
   Zina (fotokozani).....
2. Mumalandilandalamazingatipamwezi? 2 thousand

KUFUFUZA MACHITIDWE A MOYO WA NTHADZI

1. Mumadyapasikukangati? 2 times
   kamodzika ☐ udzinamotel ☐ ..... ☐
2. chakudyachomwemumadalilandichani?
   Nsima ☑ Rice ☐ Other (specify).....
3. Mumawapasa ana anu chakudyachamagulu?
   A. eya
   B. ayi — It depends
4. ngatieya, mukuganizakutindiubwinowanjiwowapasachakudyachamagulu?
5. Nagtiayi, mukuganizakutinchifukwachani?
   .....
   ..... thanzi
6. Kodi ndizovutabwanjikuwapasa ana anu chakudyachamagulutsikulililonse?
   a.sizovuta
   b. ndizovuta
7. Kodi ndibwinokuwapasa ana anu chakudya?



1. sibwino
2. sindikudziwa
3. ndibwino

Ngatisibwino, fotokozanichifukwachake?

.....

.....

Kupezanzeruzokhuzazosatila za kusefukilakwamazdikumoyowokulamonyetchelawa ana

1. Kodi mukudziwakapenakumvapo za zakudyazamagulu 6?

   a. eya

   b. ayi

2. Ngatieya ,atchuleni
   - I. Carbohydrates
   - II. Proteins
   - III. Lipids
   - IV. Vitamins
   - V. Minerals
   - VI. Water

   Ngatiwoyankhamafusoatchuleanayindiyekutiakudzindikila, ngatiatchuleawirindiyekutiakudzikilako, ngatiatchulemosachepelaawirindiyekutisakudzindikila.

FOOD CONSUMPTION SCORE (FCS)

1. Kodi mwadyazakudyazotanikumasikuasanundiawiriapitawo

   4 food grop

   Ngma + Ngemba

   " Masamba Nkhwani

   Seasmed Porridge

   " Nsamba

   " Nyema

   " Masamba

   Bordeling food consumption

   "

2. Nanga mungakumbukilezokudyazomwemumadyanthawiimenekunachitika Ngozi yamadziosefukila (for seven days)

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