FACTORS THAT PREDICT CAREGIVERS INTENTION TO FEED PEARL MILLET TO RURAL SCHOOL AGED CHILDREN IN KONGWA DISTRICT, TANZANIA

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ABSTRACT

Iron and zinc deficiencies are among the public health concern in school children in developing countries. This study investigated factors that predict the intention of caregivers to feed pearl millet to school children in Kongwa district. A cross-sectional study was carried whereas 128 caregivers of school children aged 5 – 12 years were interviewed on the construct based on the combined model of Theory of Planned Behaviour (TPB) and Health Behaviour (HBM). Correlations and multiple linear regressions were performed to measure association between constructs and to identify predictive constructs. Mann-Whitney were used for score comparison. Knowledge about pearl millet and it's relation to health (β = 0.536, P = 0.000) was strong predictor of health behaviour identity. Health behaviour identity (β= 0.336, P = 0.000) was significantly predicted intention. Cues to action as an external factors seemed to be the best predictor for intention to feed pearl millet standardized (β = 0.231, P = 0.023). Finally, intention was significantly predicted behaviour (β = 0.774, p = 0.044). We found that caregivers had the intention to feed pearl millet to their children and which can be increased by; increasing knowledge on iron, zinc and pearl millet to caregivers by providing various community trainings in order to increase influence on the decision of caregivers pearl millet to their school going children.

DECLARATION

I, MONICA ALEX CHANDE, do hereby declare to the Senate of the Sokoine University of Agriculture that this dissertation is my original work, done within the period of registration and that it has neither been submitted nor being concurrently submitted for a higher degree award in any other Institution.

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DEDICATION

This work is dedicated to my beloved parents Mr. and Mrs. Chande and my brothers for their love, encouragement and support; to my beautiful young sisters Leah and Sarah and my future children to showing them that everything is possible if you are determined to pursue it.

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LIST OF ABBREVIATIONS

HBM	Health Behaviour Model
ICRISAT	International Crops Research for the Semi-Arid Tropic
SPSS	Statistical Package for the Social Sciences
SUA	Sokoine University of Agriculture
TPB	Theory of Planned Behaviour
URT	United Republic Tanzania

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Iron and zinc deficiencies are of public health concern among school children in developing countries (Abizari *et al.*, 2013; Gowele *et al.*, 2018). Iron and zinc deficiency are likely to occur together because zinc is a co-factor of several enzymes and plays a role in iron metabolism (Bodiga, and Krishnapillai, 2007; Kelkitli *et al.*, 2016; Soliman *et al.*, 2019). In Tanzania, iron deficiency anaemia is common among children and women of child-bearing age (Rubyogo and Kasuga, 2018). A study done in Dodoma and Morogoro regions in Tanzania reported that Recommended Daily Intake of iron and zinc was inadequate for 26% and 95% of school children respectively (Gowele *et al.*, 2018).

Iron deficiency in children is associated with poor physical growth, poor cognitive development and poor immune function (Liu *et al.*, 2018; Albaroudi *et al.*, 2018). Zinc deficiency in children leads to reduced growth and development, impaired immunity, increased morbidity and mortality from infectious diseases (Mitchikpe, 2007). Furthermore, zinc deficiency also impairs taste perception and appetite, gonad development, skin integrity, and leads to delays in cognitive development (Mitchikpe, 2007). These consequences from iron and zinc deficiencies lead to decreased physical work capacity and health productivity of a child (Stevens *et al*., 2013).

Inadequate dietary intake of iron and zinc lead to their deficiencies. Numerous food based strategies have been recommended in order to improve iron and zinc status of school children (Gibson, 2011; Shetty, 2011). These include strategies such as increasing

household food and nutrition security, adding nutrients to foods, dietary diversification, increasing mineral and vitamin bioavailability from foods by increasing consumption of nutrient-dense cereals such as pearl millet (Shetty, 2011; Nubé and Voortman, 2011; Mayer *et al.*, 2011; Thompson, 2011).

Pearl millet has been cultivated and consumed mostly in Kongwa due to its suitability in arid and semi-arid agro ecologies and it diversified people's diet as it is nutrient dense crop (ICRISAT, 2018). Pearl millet has potential to grow in harsh environment with significantly low rainfall, lower soil quality, hence lower farm inputs such as fertilizers where other major staple cereal crops fail to grow (ICRISAT, 2016; Wang *et al.*, 2018). Pearl millet tolerates temperatures of up to 42°C, whereas other cereals, like maize (40°C), rice (32°C) and wheat (30°C) cannot handle that heat (ICRISAT, 2016). This is due to the fact that, pearl millet has potential climate-smart vegetative, reproductive, and physiological features which make it well-suited for growth in harsh conditions (Varshney *et al.*, 2017; Liang *et al.*, 2018). Pearl millet has contribution to food security and dietary nutrients for people in semi-arid areas due to its ability to withstand harsh climatic environment (Abdallah, 2013; Finkelstein *et al.*, 2015).

Nutritionally, pearl millet (*Pennisetum glaucum*) is reported to be superior to major cereals like maize because of its high nutrient content with 14.5 g/ 100 g proteins, fat 5.1 g/100g, energy 1720 kcal/100 g, high fiber (8.5 g/100g), and higher minerals concentrations of iron 10.8 mg/100 g dry matter and zinc 2.4 mg/100 g (Varshney *et al.*, 2017; Agrawal *et al*., 2016). A study done by Nambiar *et al.* (2011) showed comparison of iron and zinc contents in pearl millet and other mostly consumed cereals. Therefore,

pearl millet proved the potential to contribute to iron and zinc status of population in semi-arid areas.

1.2 Problem Statement and Justification

Kongwa is a semi-arid district and is likely to face food insecurity due to drought (Mkonda and He, 2017). A study done by Rowhani *et al.* (2011) revealed that, change in seasonal temperature and precipitations in semi-arid areas affect crop production. It is reported that production loss can be as high as 50% due to drought related stress (Otunge *et al*., 2010). Furthermore, a survey done by Rowhani *et al.* (2011) as cited by Kahimba *et al.*, 2015 projected that seasonal temperature increase of 2°C by 2050 will reduce average maize, sorghum, and rice harvests in semi-arid areas by 13, 8.8, and 7.6% respectively (Rowhani *et al.*, 2011; Kahimba *et al.*, 2015).

Decreased food production affects not only food security but also threatens micro-nutrient status of school children. A study done in Dodoma and Morogoro regions reported that the prevalence of iron and zinc deficiency among school aged children was 27.8% and 32.8% respectively (Gowele *et al.*, 2018). Food-based approach is needed for reduction of iron and zinc deficiencies.

Pearl millet is a staple food for people living in Kongwa district, which is an important dietary source of iron and zinc. It is more stable in semi-arid regions compared to other cereals. Pearl millet is also locally available in the area and appropriate traditional food; because it is grow well, income generating and culturally acceptable. Even though pearl

millet is already part of the food culture of Kongwa district, it is not known what factors influence caregivers to feed pearl millet to their school aged children (Laswai *et al.*, 2008; Abdallah, 2013; Charles, 2013). It is important to know factors influence caregivers to feed their children pearl millet in order to promote its consumption. Therefore, the aim of this study is to investigate the factors that predict the intention of caregivers to feed pearl millet to school children aged 5–12 years in Kongwa district, Dodoma. The combined of Theory of Planned Behaviour (TPB) and Health Belief Model (HBM) were used to examine factors influencing pearl millet consumption behaviour.

This study will help in understanding drivers of pearl millet consumption and provide important insight for the development of effective interventions leading to increased pearl millet consumption not only to school aged children but also to the households**.**

1.3 Study Objectives

1.3.1 General objective

To investigate the factors that predict the intention of caregivers to feed pearl millet to school children aged 5 – 12 years in Kongwa district.

1.3.2 Specific objectives

i. To assess the association between background and perception of caregivers with the intention to feed their children aged (5 – 12 years) with pearl millet.

ii. To assess the association between beliefs and attitudes of caregivers with the intention to feed their children aged (5-12years) with pearl millet.

iii. To assess the association between intention of caregivers to feed pearl millet to children of 5-12 years and pearl millet consumption patterns.

1.4 Hypothesis

$H_{0.}$ Caregivers' behavioural intention to feed pearl millet to school aged children is no significant predictor to caregivers feeding pearl millet to their children.

$H_{1.}$ Caregivers' behavioural intention to feed pearl millet to school aged children is significant predictor to caregivers feeding pearl millet to their children.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Pearl Millet Consumption

Pearl millet is one of the main nutri-cereal foods in the arid and semi-arid regions of Asia and Africa (Jukanti *et al.*, 2016; Kargwal *et al.*, 2019). Pearl millet is said to be the staple crop for farm households in the world's poorest countries and especially among the poorest people (Basavaraj *et al.*, 2010; Mehta *et al.*, 2017). Pearl millet can be consumed in different forms depending on the country, and even between different parts of a country. In East and West African countries, pearl millets food products are consumed as thick and thin porridges while pearl millet is boiled like rice products and flat bread or unfermented in mostly Asia but it is fermented in Eritrea and Sudan (Abdallah, 2013).

In many countries, consumption of pearl millet has dropped due to high availability of cereals maize, rice, wheat and sorghum (Reddy *et al.*, 2018). In India, for example, pearl millet is consumed mainly by the low and middle income people (Basavaraj *et al.*, 2010). Less than 10% of total pearl millet consumed by higher income people as food in rural areas and less than 5% in urban areas and about 46% of pearl millet in urban is consumed by low income consumers (Basavaraj *et al*., 2010). Furthermore, bitter taste of pearl millet grain, difficult in digestion and cooking, poor storing quality of flour are among of the factors that cause the failure in demand for pearl millet grain for food purpose (Reddy *et al.*, 2018). On the other hand, cereals comprising sorghum, pearl millet and maize are known to receive higher shares in the household budgets of the poor especially in the dry regions (Reddy *et al.*, 2013).

In Tanzania, more than 95% pearl millet produced is consumed within the production area commonly in the form of thin porridge and stiff porridge whereas; small quantity is used for poultry (Rohrbach and Kiriwaggulu, 2007). A study done by Abdallah (2013) on determinants for local pearl millet consumption in Singida rural and Kishapu districts reported that education level of the household head, pearl millet price, age of the household head occupation and family food priority/food preferences are the major factors that influence pearl millet consumption in the study area (Abdallah, 2013).

2.2 Nutrient Content of Pearl Millet

Pearl millet grain is among the most nutritious food of the major cereal. Pearl millet has high nutritional value in terms of high levels of energy, dietary fibre, and proteins with a

balanced amino acid profile, many essential minerals, some vitamins, and antioxidants (Jukanti *et al.*, 2016). Pearl millet is a rich source of energy 361 Kcal/100g, carbohydrate is 67.5 g/100g, protein is 11.6, and rich in fat content 5 mg/100g, as 75% of the fatty acids are unsaturated (Nambiar *et al.*, 2011). Moreover, it is rich in B-vitamins, potassium, phosphorous, magnesium, iron, zinc, copper and manganese and high amount of antioxidants (Nambiar *et al.*, 2011; Sarita and Singh, 2016; Krishnan and Meera, 2018). These nutrients and antioxidants may be beneficial for the overall physical and nutritional wellbeing (Nambiar *et al.*, 2011; Malik, 2015).

Pearl millet is important to school going children especially in semi-arid regions as it provides food security in the household (Satyavathi *et al*., 2015). Pearl millet is source of iron and zinc; it can be a low-cost solution for combating micronutrient deficiencies in millet consuming regions and could be exploited for the preparation of nutrient-dense foods (Krishnan and Meera, 2018).

2.3 Importance of Iron and Zinc to Nutrition status of Children

Iron and zinc are essential minerals that play a critical role in biological processes in human body (Rerksuppaphol and Rerksuppaphol, 2017). Cellular zinc homeostasis enables proper release and action of insulin hormone, controlling oxidative stress and various age-related disorders (Sarma *et al*., 2018). Iron is found in the haemoglobin present in circulating erythrocytes and it is involved in the oxidative metabolism and many other cell functions (Sarma *et al*., 2018).

In school children, dietary iron and zinc ensures optimal physical growth as well as neuro-behavioural and brain development (Vakili *et al.*, 2009; Fretham *et al*., 2011; Choi *et al.*, 2011). As a result their deficiencies may lead to poor cognitive development in children through change in neuropsychological functions (Samuel *et al.*, 2010; Jáuregui-Lobera, 2014). Furthermore, Zinc deficiency has contributed much in stunted growth among children, loss of appetite as well as morbidity from diarrhoea, pneumonia and malaria (Khalil *et al.*, 2015; Rerksuppaphol and Rerksuppaphol, 2017).

2.4 Zinc and Iron Deficiency among School Children

In the developing countries of Africa and Asia, 12–58% of School Aged Children were suffering from anaemia (Getaneh *et al*., 2017) and 5-30% of these children have zinc deficiency (Abah *et al*., 2015; Pramono *et al*., 2017). A Study done in India reported that 18.7 % children were deficient in Iron while Zinc deficiency was seen in 12.8 % cases and combined deficiency was 3.9% (Jora *et al*., 2015). School aged children are susceptible to anaemia and zinc deficiency due to inadequate consumption of nutrient-rich foods, dietary taboos, and inefficient utilization of available micronutrients by cause of infections and infestations (Herrador *et al*., 2014).

A study conducted by Samwel *et al.* (2010) to know the prevalence of zinc deficiency among primary school children in a poor peri-urban informal settlement in South Africa. Results reported that high risk of zinc deficiency and suboptimal zinc status for the majority of this study population of children. On the other hand, Napel *et al.* (2014) studied plasma zinc levels, anthropometric and socio-demographic characteristics of school children in eastern Nepal. The study also showed higher prevalence of zinc

deficiency among school children where by average of 85.6% of children suffers from zinc deficiency.

Nik Shanita *et al.* (2018) conducted a study on prevalence of anaemia and iron deficiency among primary schoolchildren in Malaysia. The study reported that prevalence of anaemia and iron deficiency among children was 4.0% and 5.2%. On the other hand, Getaneh *et al.* (2017) also determined prevalence of anaemia and associated factors among school children in Gondar town public primary schools, northwest Ethiopia. The study reported that about 15.5% of school children were anaemic: 69.1% and 38.9% of them were mildly and moderately anaemic (Getaneh *et al.*, 2017).

2.5 Strategies to Fight Iron and Zinc Deficiencies

The existence of iron and zinc deficiencies has been associated with the low bioavailability, poor dietary intake, monotonous and cereal-based diets of the affected populations (Singh *et al*., 2017). Several interventions include diet diversification, supplementation, fortification and bio-fortification have being utilized to improve iron and zinc status in these populations (Sarma *et al*., 2018; Akhtar *et al*., 2013). The selection of intervention depends on the cause, severity, and scope of the micronutrient deficiencies of the area (Bailey *et al*., 2015). The intervention always tries to eliminate the root cause and must be considered within the cultural preferences, most feasible, sustainable and economical (Sarma *et al*., 2018).

Nutrient-dense cereals and legumes are important dietary sources of iron and zinc especially for households that consuming a largely plant-based diet (Shahzad *et al*., 2014). Aslam *et al*. (2018) showed that cereals can contribute more than 50% of total dietary iron intake in children and adolescence. An intervention using cowpea flour to control iron deficiency showed that the use of cowpea flour may be a good approach in the control of this deficiency (Abizari *et al*., 2013). Nutrient-dense crops can be used in order to enhance iron and zinc for fighting deficiencies.

2.6 Conceptual Models

2.6.1 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) was developed by Ajzen (1991) and is one of the most frequently models for predicting human social and nutrition behaviour. The TPB has validated solid efficacy for predicting nutrition behaviours e.g., healthy eating, breakfast consumption among population and dairy intake (Psouni *et al.*, 2016; Wenhold and White, 2017; Wong and Mullan, 2009). The behavioural intention is the chief construct in the TPB and is assumed to be made by the constructs as follows; *Attitude towards behaviour* symbolizes a person's evaluation of performing behaviour (Montano *et al.*, 2015). The attitude towards behaviour is determined by beliefs about the positive or negative consequences of performing behaviour and their importance (Sheeran *et al.*, 2016). *Subjective norm* reveals a person's perceived social pressure to perform, or not to perform, behaviour (Conner *et al.*, 2018). *External control belief* shows a person's perceived ability to perform a specific behaviour (Sheeran *et al.*, 2016). *Behavioural intention* is a sign of how hard a person is willing to try, or how much effort a person is planning to make, in order to perform behaviour (Montano *et al.*, 2015).

2.6.2 Health Belief Model (HBM)

The HBM is one of the most widely recognised theoretical frameworks for explaining and changing health behaviours (Tarkang and Zotor, 2015). Major features of this model holds that the person have choices and are able to make suitable decisions regarding their health. It consists of the constructs; *Perceived susceptibility* states to the degree to which a person feels vulnerable to a health problem (Fanou-Fogny *et al.*, 2011; Abizari *et al.*, 2013. The *perceived severity* states to the degree to which a person feels that a health problem has serious medical or social consequences (Fanou-Fogny *et al.*, 2011; Abizari *et al.*, 2013). *Health behaviour identity* denotes a person's evaluation of the effectiveness of health behaviour in reducing the perceived threat (Fanou-Fogny *et al.*, 2011; Abizari *et al.*, 2013). The *perceived barriers* denote a persons' evaluation of psychological, or financial obstacles involved in a health behaviour (Fanou-Fogny *et al.*, 2011; Abizari *et al.*, 2013). *Cues to action* trigger a person to change his or her health behaviour (Fanou-Fogny *et al.*, 2011; Abizari *et al.*, 2013).

2.6.3 Combined model of TPB and HBM

Theory of Planned Behaviour (TPB) and Health Belief Model (HBM) are two psychosocial theories that are used in explaining nutrition-related behaviours (Sun *et al*., 2006). A combination of these two theories has been greatly shown to improve the ability to enlighten nutrition behaviour (Talsma *et al*., 2013). Sun *et al* (2006) noted that, combine of TPB and HBM illustrates that; first, person's nutrition-related behaviour is influenced by both internal and external factors. Second, Behavioural intention is an important dependent variable to predict behaviour. Thus, the combined model of this

research is centred on behavioural intention of caregivers and behaviour of caregivers in feeding pearl millet to their children perspective. Fig. 2 shows the relationships of variables under study. The two pertinent variables (internal and external factors) influence behavioural intention and behaviour to feed pearl millet. The external factors contain *Subjective norms*, *Control beliefs* and *Cues to action*. The internal factors are divided into three levels: 'Background and perception' comprises the constructs *Perceived susceptibility* and *Perceived severity* of a disease, *Knowledge*, and *Health value*. 'Belief and attitude' consists of the constructs *Perceived barriers*, *Attitudes towards behaviour*, and *Health behaviour identity.* Therefore, through using the combined model of TPB and HBM can have good predictive value of nutrition behaviour, since TPB can predict social and nutrition behaviour and HBM can explain and change nutrition behaviour.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of Study Area

The study was conducted in Laikala village in Kongwa district, Dodoma region (Fig. 1). Laikala village borders Gairo village in the East, Dodoma district in the West, Kibaigwa village in the North and Sagara village in the South. Generally, Laikala village lies on the leeward side of Ukaguru Mountains (URT, 2016). The village is characterized by its semi-arid conditions, with a rainfall of 450-700 mm/year. The annual temperature varies from mean minimum of 18ºC to a maximum of 34ºC. The main activities by people are agriculture and livestock keeping include cattle, goats, sheep, pigs, chickens and ducks. The crops which are grown include maize, sorghum, pearl millet, groundnuts, sunflower and pigeon peas. Livestock which are kept include cattle, goats, sheep and pigs (URT, 2016).

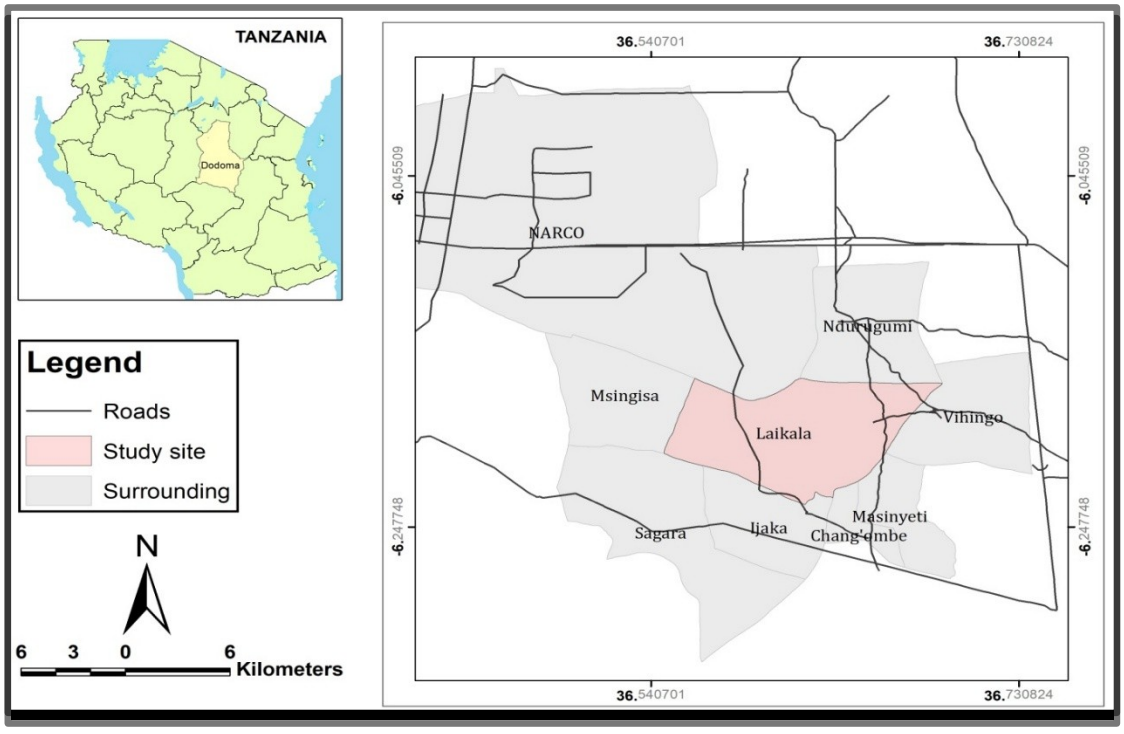

Figure 1: Map showing the study site

3.2 Study Design

Cross sectional design was used in this study. According to Kothari (2004), a cross-sectional design is considered favourable because it is inexpensive in term of time, flexibilities, minimizes bias, and maximizes reliability. The design is useful for descriptive purposes and data collected to be used to determine relationships between different variables focused in the study (Setia, 2016).

3.3 Sampling Frame

Participants were selected from rural households with at least one caregiver of school child aged (5-12 years) who was a woman of reproductive age (20-49). Caregivers were pearl millet farmers who had consumed pearl millet before because they understand pearl millet and they can relate with their school children's daily performance.

3.4 Sampling Procedures

Participants were selected using multistage sampling through purposive and random sampling techniques. Kongwa district was purposively selected from Dodoma Region because of its semi-arid environment, cultivation of pearl millet as well as their participation in Africa RISING Project site Hillbur (2013). Laikala village was purposively selected based on the same criteria (Hoeschle-Zeledon, 2019). Simple random sampling technique was done to obtain households as per required inclusion criteria mentioned in section 3.3.

3.5 Sample Size Determination

Sample size of this study was estimated based on the TPB model (Francis *et al.*, 2004) under purposive sampling, whereby a sample of 128 caregivers were involved in the study from different households. Required sample size was determined by statistical power analysis; this requires the specification of the study design and the expected effect size (Francis *et al.*, 2004). Francis *et al.* (2004) revealed that it is reasonable to assume at least a moderate effect size for TPB studies using a multiple regression approach and sample size of 80 - 160 is acceptable.

3.6 Tools

3.6.1 Questionnaire

The questionnaire consisted of questions as identified through literature review and questions on socio-economic and demographic characteristics. The sentences were categorized into 12 constructs according to the model by Sun *et al*. (2006). The constructs were further grouped into background and perception, beliefs and attitudes, external factors, intention and behaviour based on a combined model of TPB and HBM. Each sentence was translated into a statement, either positively or negatively stated depending on the construct, and the respondents were asked to indicate their level of agreement or disagreement on a Likert scale. Sentences of most constructs were scored from 1 to 5 as shown in Appendix 1 (**Section B - M**).

However, for the constructs Attitude towards behaviour and Subjective norms, sentences were consisted of pair statements with answer categories ranging from1 to 5 and −2 to 2.

The scores of the pair statements were then multiplied to derive one score for each item ranging from −10 to 10. Caregivers' intention was considered high if it was higher than the median intention score of the group and low if it was equal to or lower than the median scores. The questionnaire was translated into the local language (Swahili) and correctness checked with back translation into English. Questionnaire was pre-tested in a site similar to the study site so that questionnaire can be optimized. Pre-testing was done with caregivers who were not part of the final study group. Changes in the questionnaire were done after the pre-test.

3.6.2 Food Frequency Questionnaire

The Food Frequency Questionnaire (FFQ) was used to establish the common types of pearl millet based dishes consumed by the household members and the frequency of consumption (Appendix 2).

3.7 Statistical Analyses

Descriptive statistics were performed to describe the socio-demographic and socio-economic characteristics of the caregivers and children. Multiple sentence constructs were tested for reliability of the questionnaire and internal consistency using Cronbach alpha and sentence-total correlation. The items within a construct were regarded as consistent when Cronbach alpha was approximately 0.75 or higher and the corrected sentence-total correlation of all sentences in a construct which were higher than 0.30 (Sharma, 2016; Hisham *et al*., 2018).

A Mann-Whitney test was used to examine whether the caregivers with a high intention and those with a low intention to consume pearl millet were significantly different but the means presented on tables was geometric means obtained by computing the natural log transformation and back transforming the data. Spearman's correlation (rho) was used to test the bivariate association within the combined model of TPB and HBM.

Four multiple linear regression models were performed to examine the contribution of the constructs to intention to feed pearl millet. Models used to determine the relative importance of the predicting constructs for the following outcomes: Health behaviour identity, Behavioural intention and Behaviour.

Model 1: Health behaviour identity = f (Knowledge, Perceived susceptibility, Perceived severity and Health value)

Model 2: Intention = f (Perceived barrier, Health behaviour identity, and Attitudes towards behaviour)

Model 3: Intention = f (Subjective norms, Control beliefs, and Cues to action)

Model 4: Behaviour = f (Perceived barrier, behavioural intention and Perceived barrier * behavioural intention)

All models were adjusted for interviewer effect, education of caregivers and age of a child. Overall, statistical tests were 2-tailed, and p-value < 0.05 was considered statistically significant. Statistical analyses were performed IBM SPSS Statistics for Windows (Version 20.0. IBM Corp, 2011, Armonk, NY).

3.8 Ethical Consideration

Permission to conduct the research was obtained from Sokoine University of agriculture as well as Dodoma region and Kongwa district authorities. Respondents were consent informed of the aim of the study and the kind of information that would be sought from them before commencing the interviews. They signed the informed consent form, and participation was voluntary. The questionnaires were administered to the respondents while ensuring confidentiality of the information they gave. To ensure privacy, names and other means of identity were concealed by assigning numbers during data collection. The researcher ensured that all information obtained were kept confidential and was only used for the purpose of the study.

CHAPTER FOUR

4.0 RESULTS

4.1 Characteristics of the Study Participants

4.1.1 Demographic factors

A total of 128 caregivers with a similar number of children participated in the study (Table 1). Less than half of the school aged children included in this study were male (40.6 %). Overall, mean age of all children was 7.52 years (7.16, 7.83 years) with male children mean age as 7.60 years (7.16, 7.83 years) and female children as 7.47 years (7.06, 8.14 years). The majority of the respondents were married (82.0%), with others as single (5.5%) or divorced (12.5%). Only 40.7% of the caregivers had primary or

secondary school education. Respondents interviewed were mostly composed of the ethnic tribe of Kaguru (96.9%).

Table 1: Background characteristicts of schoolchidren and their caregivers in Kongwa (n = 128)

Variable	n, (%)	Mean (95% CI)
Schoolchild characteristics		
Age of children	128 (100)	7.52 (7.16, 7.83)
Male	52 (40.63)	7.60 (7.06, 8.14)
Female	76 (59.37)	7.47 (7.05, 7.90)
Sex of children		
Male	52 (40.63)	
Female	76 (59.37)	
Caregiver Characteristics		
Education		
None	76 (59.4)	-
Primary school*	50 (39.1)	-
Secondary school*	2 (1.6)	-
Ethnic group		
Kaguru	124 (96.9)	-
Other tribes (Gogo, Hehe, Nyamwezi)	4 (3.1)	-
Marital status		
Married	105, (82.0)	-
Divorced	16, (12.5)	-
Single	7, (5.5)	-
Relationship with a child		
Mother	121, (94.5)	-
Guardian	7, (5.4)	-

*Some of caregivers did not complete school

4.1.2 Income generating activities and asset ownership

Agriculture was the major income generating activity for most of the caregivers in which when pearl millet is cultivated can not only bring food in the household but also can help to boost household economy (Table 2). Caregivers possessed information and communication devices thus nutrition education intervention should be delivered using phone and radio communication to reach many caregivers. Most of them had land for cultivation, it is easy for them to cultivate crops they want without restriction and they lived in their own houses. Majority of the houses had mud walls, no floor and aluminium roofing sheets.

Table 2: Income generating activities and asset ownership

Income Activities	n	%
Caregivers occupation		
Agriculture	114	88.3
Civil servant	7	5.5
Artisans	7	5.5
Asset ownership		
Radio	37	28.9
Mobile phone ownership	60	46.9
Television	6	4.7
Radio	37	28.9
Land for cultivation	122	95.3
Own cultivation land	100	78.1
Refrigerator	1	0.8
Own house	120	93.8
House rented	8	6.3
Type of floor material		
Terrazzo	17	13.3
Cemented	13	10.2
Mud	98	76.6
Type of roofing sheet		
Aluminium roofing sheet	123	96.1
Other sheets like Bamboo, Leaves and Wood	5	4
Type of wall material		
Cement	16	12.5
Mud	112	87.5
Toilet		
Pit latrine	111	86.7
Public toilet	17	13.3

4.1.3 Household and living arrangement

Mostly 84.4% male headed household and were observed household sizes ranged from three to six members (Table 3). They were using firewood as a source of energy for cooking. Drinking water was mostly fetched from village tape water.

Table 3: Household and living arrangement

Household arrangement	n	%
Living arrangements		
Caregivers, husbands and children	47	36.7
Caregivers, Husbands, children and relatives	61	47.7
Caregivers and children only	17	13.3
Caregivers, children and relatives	3	2.3
Household size		
3 – 6	74	57.8
7-10	49	38.3
≥ 11	5	4.0
Source of energy for cooking in the household		
Charcoal, Firewood	4	3.1
Firewood	120	93.8
Firewood, maize cobs	2	1.6
Sunflower and maize stalks	1	0.8
Sunflower stalks	1	0.8
Main source of drinking water		
Tape water	121	94.5
Protected dug out well	1	0.8
Bore-hole water	6	4.7

4.1.4 Pearl millet consumption behaviour

Pearl millet is consumed by all household members mostly cooked as thin or stiff porridge without mixing with other cereals (Table 4).

Table 4: Pearl millet consumption behaviour

Pearl millet	n	%
Main consumers of pearl millet		
All household members	124	96.9
Father and children	1	0.8
Mother and children	3	2.3

4.2 Reliability and Summary Values of Construct

Cronbach's alpha coefficients revealed high reliability of the multiple items constructs with values ranging from 0.75 to 0.87. The obtained Cronbach's alpha suggests very good

internal consistency reliability for the scale with the sample (Christmann and Van Aelst., 2006). Median scores of the constructs were ranging from 3 to 40.5 (Table 5).

Table 5: Internal consistency and median scores of the constructs (n = 128)

Construct	Cronbach α	Items	Median	25th and 75th	Range values*
Knowledge	.87	10	30	30, 34	10 – 50
Perceived susceptibility	.78	8	19	17 , 24	8 – 40
Perceived severity	.82	12	40.5	36 , 44	12 – 60
Health value	.83	6	25	24 , 28	6 – 30
Health behaviour identity	.76	7	26.5	25 , 26	7 – 35
Perceived barriers	.75	9	30	25, 34	9 – 45
Attitude towards behaviour	.86	8	16	12 , 19	-6 – 30
Cues to action	.84	15	34	31 , 43	15 – 75
Control belief	-	1	4	4, 5	1-5
Subjective norms	.83	11	10	1, 10.75	-8 – 28
Behavioural intention	-	1	5	3, 5	1-5
Behaviour	-	1	3	1, 5	1-5

*****Range refers to the possible scores for each variable.

4.3 Bivariate Correlations of Constructs

In the combined model, most bivariate correlations between constructs were statistically significant (Fig. 2). Constructs from “background and perception” were found significantly positive correlated with health behaviour identity in Knowledge construct. In this study it means that, knowledge of caregivers about pearl millet have positive health

behaviour identity (r_s =0.581, P < 0.000). Within "Beliefs and attitudes" constructs, health behaviour identity was positive significant correlated with Attitude towards behaviour of caregivers (r_s = 0.463, P < 0.000). Health behaviour identity correlated (r_s = 0.310, P < 0.000) significantly with intention. "External factors" were positively correlated with intention to consume pearl millet in the construct of subjective norms (r_s = 0.272, P < 0.002) and cues to action (r_s = 0.296, P < 0.001). Final, there was a statistically significant correlation between intention and consumption of pearl millet among school going children (r_s 0.440, P < .000).

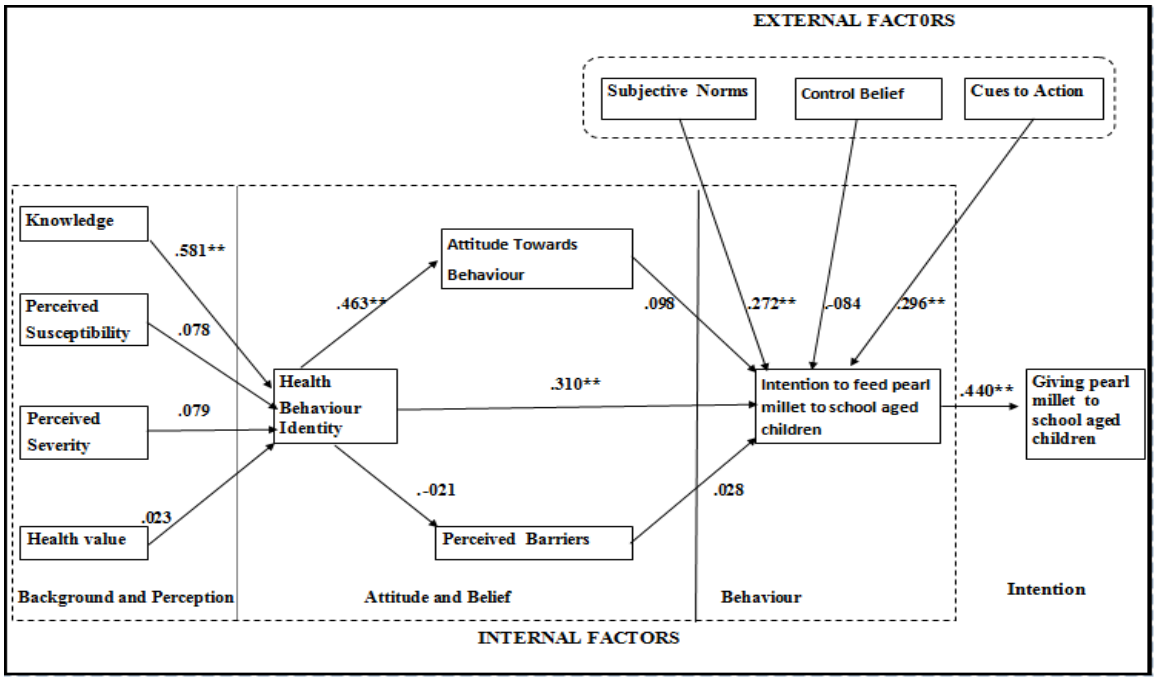

Figure 2: A combined model of the Theory of Planned Behaviour and Health Belief Model with Spearman correlation coefficients between related constructs **P < 0.05 (2-tailed).

Source: Adapted from Sun *et al.*, (2006).

4.4 Association between Background and Perception of Caregivers with the Intention to Feed their School Aged Children

4.4.1 Prediction of health behaviour identity to feed pearl millet to schoolchildren

In model 1, “background and perception” contained *Knowledge, Perceived susceptibility, Perceived severity and Health value constructs* which were used to predict *Health behaviour identity.* These constructs accounted for 27.5% of the variance in Health behaviour identity. Knowledge construct was only significant predictor of Health behaviour identity (Model 1; standardized $\beta = 0.536$, $P < 0.000$; Table 6).

Table 6: Constructs predicting health behaviour identity to feed pearl millet to schoolchildren

Model Description[1]	Standardized β	P	R2	Adjusted R
Model 1: Y = Identity			0.306	0.275
Predictors				
Knowledge	0.536	0.000		
Perceived Susceptibility	0.057	0.467		
Perceived Severity	-0.071	0.394		
Health Value	0.089	0.274		

[1]Model was adjusted for interviewer effect, education of caregivers and age of a child.

4.4.2 Background and perception constructs with intention

The geometric means between high and low intenders within individual items in the construct were investigated (Table 7). In the *Knowledge construct*, statements of "Pearl millet contain iron", "zinc-important growth", "zinc – prevent diarrhoea", "zinc – prevent pneumonia" were significantly higher in the high intenders than in low intenders. This showed that caregivers were knowledgeable that pearl millet contained iron and zinc which are advantageous for child growth; also their deficiencies can influence other diseases.

Results in *Perceived Susceptibility construct* showed that, "disinterested with environment" was significantly higher in the high intenders than low intenders. This indicates that caregivers have observed some of their school going children not interacting with others fully. However, the results of this study showed there is no significant difference between high intenders and low intenders in all statements in the *Perceived Severity construct*. Caregivers did not believe on consequences of iron and zinc deficiency in their school going children daily activities.

Furthermore, the results revealed no significant difference between two intentions groups in the *Health value construct*. This means that caregivers did not believe that iron and zinc were important for cognitive development and activeness in their school children.

Table 7: Differences in mean scores between low and high intenders to feed pearl millet per items of background and perception constructs (n = 128)

Items	Geometric Mean		P-value
	[1]Low Intention	[2]High Intention	
Knowledge			
Pearl millet contain zinc	3.11	3.17	0.564
Pearl millet contain iron	3.10	3.30	0.048
Zinc is important for the growth	3.20	3.26	0.004
Iron is important for the growth	3.20	3.23	0.293
Iron is important for the health	3.16	3.27	0.081
Zinc is important for the health	3.16	3.18	0.064
Iron can prevent shortage of blood	3.22	3.27	0.123
Zinc can prevent diarrhoea	3.13	3.06	0.033
Zinc can prevent pneumonia	3.15	3.12	0.027
Zinc can prevent malaria	3.16	3.27	0.668
Susceptibility			
My child suffers easily from malaria	2.82	2.65	0.504
My child suffers easily from pneumonia	2.53	3.32	0.173
My child suffers easily from diarrhoea	2.39	2.08	0.121
My child is disinterested with the environment easily	2.63	2.08	0.037
My child has poor appetite	2.30	2.11	0.392
My child suffers easily from shortage of blood	1.86	1.88	0.959
My child becomes weak and tied	2.14	2.17	0.89
My child has irritable moods	2.68	2.42	0.21
Severity			
Zinc deficiency can lead to pneumonia	2.81	2.90	0.737
Zinc deficiency can lead to diarrhoea	2.80	2.78	0.478
Zinc deficiency influence malaria	2.80	2.78	0.749
Iron deficiency leads to shortage of blood	2.88	2.92	1
Iron deficiency leads to disinterested with the environment	2.84	2.76	0.778
Shortage of blood affects growth	3.33	3.39	0.703
Shortage of blood affects shortness of breath	3.10	3.00	0.967
Shortage of blood makes child weak and tied	3.28	3.22	0.935
Malaria Increases the chance of death of child	3.56	3.33	0.47
Pneumonia increases the chance of death of child	3.47	3.55	0.19
Diarrhoea increases the chance of death of my schoolchild	3.61	3.97	0.102
Shortage of blood can increase chance of death to child	3.75	3.85	0.268
Health value			
The health of my child is very important to me	4.23	4.43	0.383
The growth of my child is important to me	4.20	4.38	0.606
The intelligence of my child is important to me	4.04	4.30	0.17
The performance of my child is important to me	4.01	4.13	0.4
It is important that my child is important to me	4.07	4.23	0.661
The survival of my child is important to me	4.16	4.20	0.838

[1]Low intention (n = 53) = intention to consume pearl millet less than once a week. [2]High intention (n = 75) = intention to consume pearl millet once a week or more.

4.5 Association between Beliefs and Attitudes of Caregivers with the Intention to Feed their School Aged Children

4.5.1 Predicting of intention

Model 2 contained constructs from "attitude and belief" which were *Health behaviour identity, Perceived barriers and Attitude towards behaviour*. Model 2 explained 9.8% of the variance of the "attitude and belief" influenced the behavioural intention of the caregivers to give pearl millet to their school aged children. Health behaviour identity (β= 0.336, P < 0.000) was significant predictor of behavioural intention (Table 8).

Table 8: Intention to feed children pearl millet

[1]Model Description	Standardized β	P	R^2	Adjusted R
Model 2: Y = Intention			0.136	0.098
Predictors				
Health behaviour identity	0.336	0.000		
Perceived barriers	0.056	0.516		
Attitude towards behaviour	-0.095	0.313		

[1]Model was adjusted for interviewer effect, education of caregivers and age of a child.

4.5.2 Belief and attitude constructs with intention

Then geometric mean between high and low intenders within individual items in the construct were investigated (Table 9). In *Health behaviour identity* construct, test that agreement with the announcements "*Giving pearl millet is one of the best thing I can do for my schoolchild*", "*Giving pearl millet is one of the best thing I can do for my schoolchild to improve her/his intelligence*", "*Giving pearl millet is one of the best thing I can do for my schoolchild to improve her/his health*" and "*Giving pearl millet is one of the best thing I can do for my schoolchild for her/his survival*" were significantly higher in the high intenders than in low intenders group. With these responses it gives an impression that caregivers understand the importance of pearl millet in their children's life. Since *Attitudes towards behaviour* correlated significantly with intention, we checked

and found that scores were higher for the high intenders but there were not significant different between intenders groups.

Perceived barriers constructs was not correlated significantly with intention, we checked and found that mean scores were higher for the high intenders and were significantly different with mean scores of low intenders (Table 9). Mean scores of items of *"worry of price of pearl millet in the market" and "Pearl millet is expensive in the rainy season compared to dry season"* were higher for high intenders and there was significantly different with mean scores of low intenders. This implies that households which out of pearl millet stock may find it expensive to buy especially in the rain season.

Table 9: Differences in mean scores between low and high intention to consume pearl millet per items of beliefs and attitudes constructs (n = 128)

Variables	Geometric mean		P-Value
	[1]Low Intention	[2]High Intention	
Health behaviour identity			
Giving pearl millet is one of the best thing I can do for my schoolchild	3.64	4.05	0.001
Giving pearl millet is one of the best thing I can do for my family members	3.82	4.02	0.147
Food that contain iron is one of the best thing I can give to my schoolchild to improve his/her cognitive development	3.37	3.56	0.076
Food that contain zinc is one of the best thing I can give to my schoolchild to improve his/her cognitive development	3.23	3.43	0.128
Giving pearl millet is one of the best thing I can do for my schoolchild to improve her/his intelligence	3.13	3.63	0.041
Giving pearl millet is one of the best thing I can do for my schoolchild to the improve her/his health	3.30	3.98	0.005
Giving pearl millet is one of the best thing I can do for my schoolchild for her/his survival	3.33	3.84	0.015
Perceived barrier			
I worry about the price of pearl millet on the market	2.48	3.05	0.021
I worry about the time require to process pearl millet	2.69	2.79	0.822
I worry about pearl millet being contaminated by stones	3.16	3.05	0.686
Pearl millet is easily prone to insect attack such as rice moth	2.75	2.58	0.379
Pearl millet is expensive in the rainy season compared to dry season.	3.01	3.71	0.043
I worry about the availability of fuel required to cook pearl millet	2.89	3.06	0.947
I worry about the quantity of fuel required to cook pearl millet	2.32	2.07	0.721
Pearl millet flour has a short shelf life	3.25	3.23	0.203
Attitude towards behaviour			
Feeding my school child with pearl millet helps to prevent malaria	1.10	1.02	0.106
It is important to feed my school child with food that prevent malaria	3.26	3.30	0.355
Feeding my school child with pearl millet helps to prevent pneumonia	1.00	1.03	0.332
It is important to feed my school child with food that prevent pneumonia	3.23	3.43	0.267
Giving pearl millet to my child helps to prevent blood shortage	1.07	1.02	0.785
It is important to feed my child with foods that prevent blood shortage	3.55	3.51	0.592
Feeding my school child with pearl millet helps to prevent diarrhoea	1.10	1.08	0.88
It is important to feed my child with foods that prevent diarrhoea	3.51	3.51	0.791

[1]Low intention (n = 53) = intention to consume pearl millet less than once a week.
[2]High intention (n = 75) = intention to consume pearl millet once a week or more.

4.6 Association between Intention of Caregivers in Kongwa District to Feed Pearl Millet to Children

4.6.1 Intention and Behaviour

Model 4 contained age of a child, education, Perceived barriers, Behavioural intention and Barriers*intention. Model 4 showed that 20.3% of the variance in pearl millet consumption could be explained where only the construct intention could significantly predict behaviour ($\beta = 0.774$, $p = 0.044$; Table 10).

Table 10: Intention and Behaviour to feed pearl millet to school going children

Variables	Standardized β	P	R^2	Adjusted R
Model 4: Y = Behaviour			0.220	0.203
Predictors				
Age of a child	0.043	0.597		
Education	0.025	0.761		
Perceived barriers	0.105	0.646		
Intention	0.774	0.044		
Barriers*intention	-0.375	0.404		

Model was adjusted for interviewer effect, education of caregivers and age of a child.

4.6.2 Pearl millet consumption and intention to consume pearl millet

Proportion of Intention of caregivers to feed pearl millet to their school going children in the coming month was high but the actual consumption behaviour of pearl millet in the last month is low. Also there were caregivers who did not feed their school going children pearl millet in the previous month is high and some of them are not intending to feed them in the next month (Fig. 3).

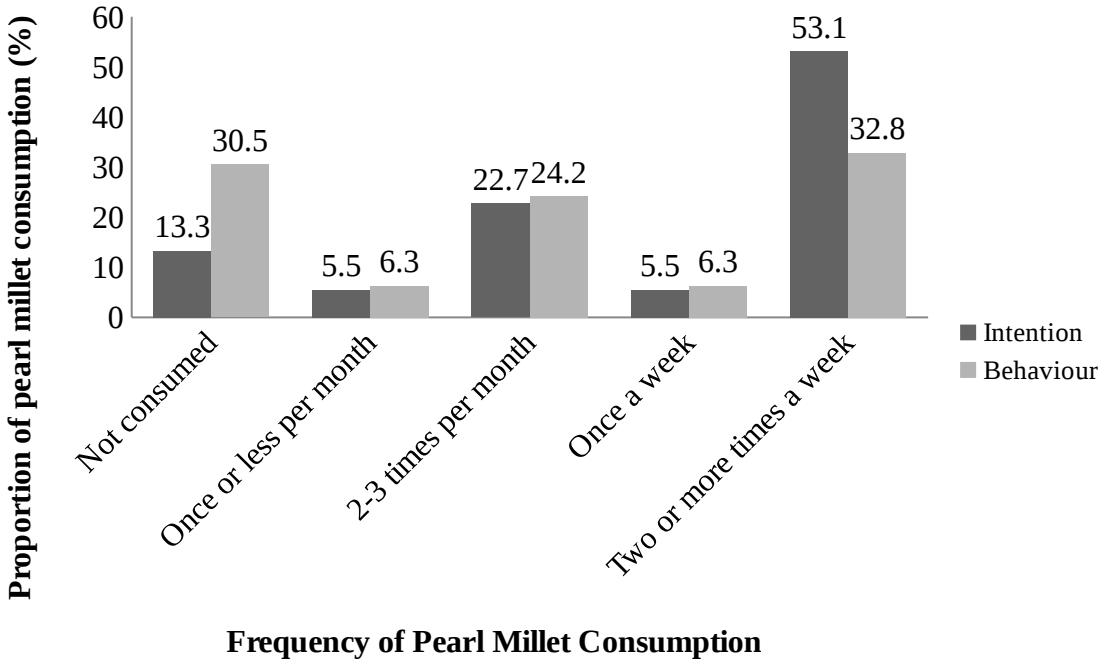

Figure 3: Intention to consume pearl millet in the coming month and behaviour (pearl millet consumption) of the last month (n = 128).

4.7 Drivers of Food Choice among Caregivers to Feed Pearl Millet to their School Going Children

4.7.1 Consumption of various pearl millet based foods

Pearl millet can be consumed in different forms (Fig. 4-7). Results of this study revealed that caregivers tend to feed their school going children either stiff porridge or thin porridge made of pearl millet only. Caregivers with high intention gave their children pearl millet porridge two or more times in a week compared to those caregivers with low intention (Fig. 4, 6).

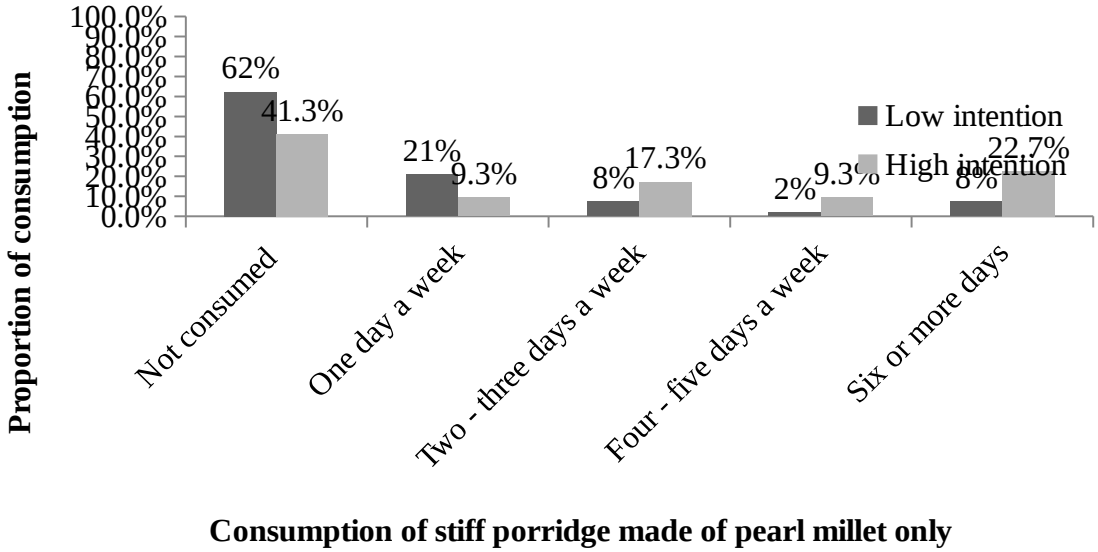

Figure 4: Stiff porridge made of pearl millet only

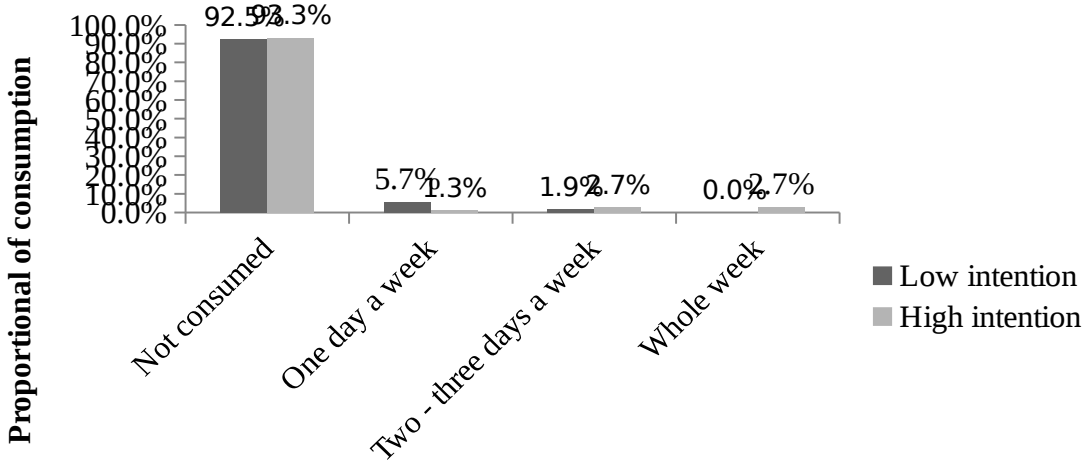

Figure 5: Stiff porridge made of pearl millet with other cereals

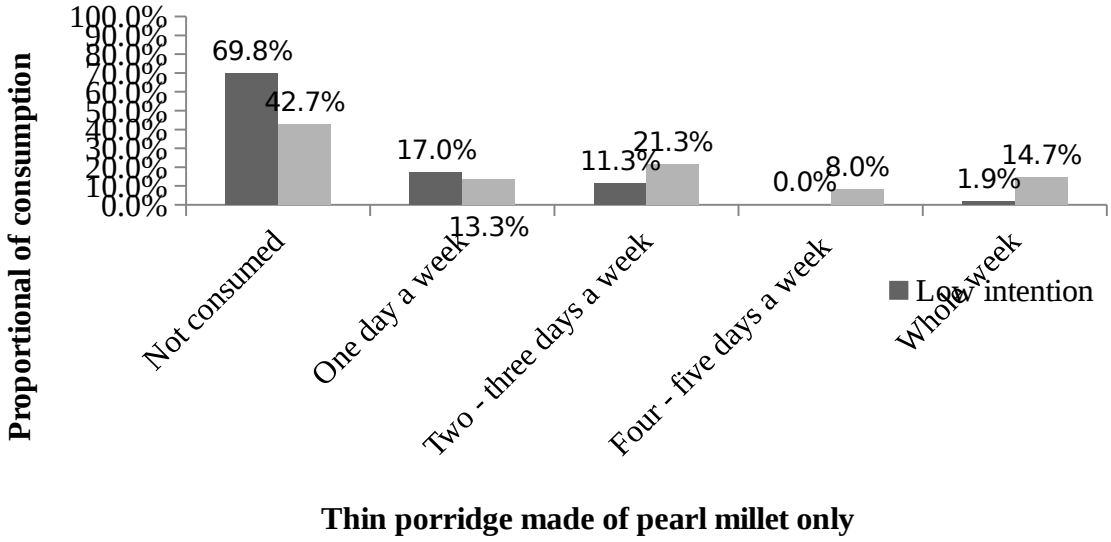

Figure 6: Thin porridge made of pearl millet only

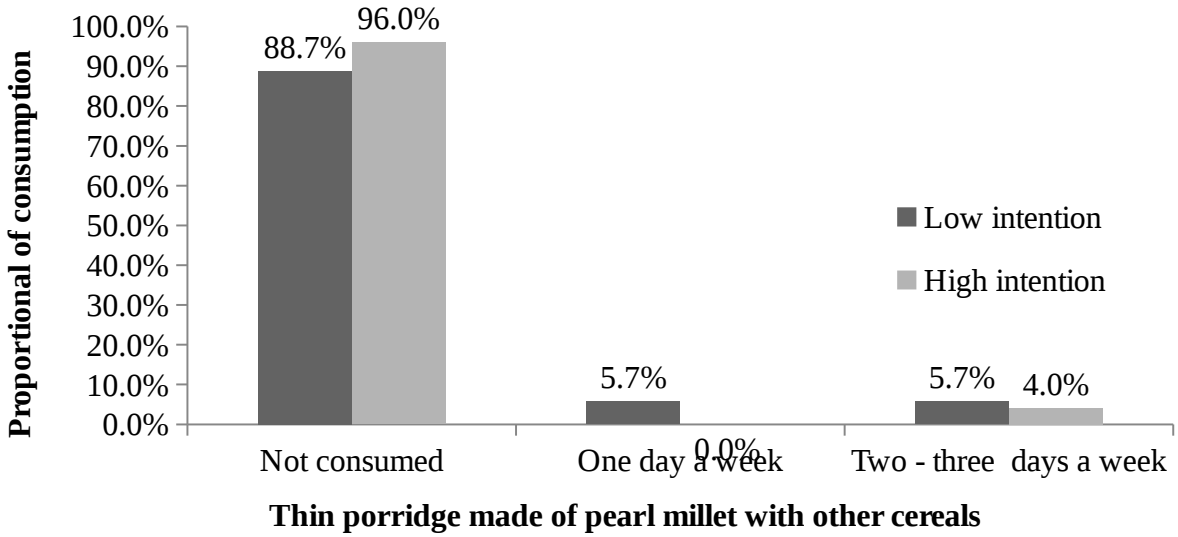

Figure 7: Thin porridge made of pearl millet with other cereals

4.7.2 External factors

4.7.2.1 Bilayer Correlation and multiple linear regressions

Model 3 contained predictors from external factors such as Subjective norms, Control belief and Cues to action. Model 3 explained 10.9% of the variance of the external factors influenced the behavioural intention of the caregivers to give pearl millet to their school aged children. Cues to action from the external factors seemed to be the best predictor for intention to feed pearl millet (β = 0.231, P = 0.023, Table 11).

Table 11: Multiple linear regression

Variable	Standardized β	P	R^2	Adjusted R
Model 3: Y = Intention			0.115	0.109
Predictors				
Subjective norms	0.158	0.123		
Control belief	-0.089	0.303		
Cues to action	0.231	0.023		

Model was adjusted for interviewer effect, education of caregivers and age of a child.

4.7.2.2 External factors with intention

Differences between high and low intenders within individual items in the construct were investigated (Table 12). Comparing several statements on Subjective norms; “husband”, “mother in law”, “child’s teacher” and “doctors” were statistically significant difference between high and low intention groups. These are the people who usually give advice and caregivers listen to them. Thus, nutrition education can be useful in promoting nutrition dense food like pearl millet.

Results in the *cues to action* construct also showed that “trainings” conducted in the community showed statistically significant difference between high intenders and low intenders. Community training meetings can be used to promote pearl millet consumption.

Table 12: Differences in mean scores between Low and High intention to consume pearl millet per item of External factors (n = 128)

Variables	Geometric mean		P-value
	[1]Low intention	[2]High intention	
Subjective norms			
My husband gives me the advice to feed pearl millet to my child.	1.04	1.14	0.007
My mother-in-law advices me to feed pearl millet to my child	1.08	1.10	0.019
My mother advises me to feed pearl millet to my child	1.07	1.08	0.059
Advice from my mother is important to me	3.81	3.92	0.214
My friend(s) advise me to feed pearl millet to my child	1.04	1.10	0.351
My Childs' teacher(s) gives me the advice to feed my child with pearl millet	1.07	1.00	0.022
The advice of my child's teacher(s) is important to me	3.33	3.70	0.068
My nurse advices me to feed pearl millet to my child	1.10	1.03	0.15
Doctors give me the advice to feed my child with pearl millet	1.09	1.05	0.009
Community leaders give me the advice to feed my child with pearl millet	1.00	1.00	0.675
Religious leaders give me the advice to feed my child with pearl millet	1.00	1.06	0.21
Cues to action			
Important ceremonies like traditional wedding and funeral make my school child want to eat pearl millet	2.19	2.38	0.283
Special guest(s) at home make my school child want to eat pearl millet	2.18	2.60	0.051
Festivals, Ramadan, harvest time or women meetings make makes my school child want to eat pearl millet	1.83	2.11	0.113
My school child likes to eat pearl millet when we go out to a restaurant	1.90	1.86	0.849
I comply with the doctors, clinicians or health workers advice to give pearl millet to my school child	2.53	2.87	0.139
Illness of my school child makes me want to use pearl millet.	2.09	2.38	0.15
My school child suffering from shortage of blood makes me want to use pearl millet	2.08	2.19	0.47
My child suffering from diarrhoea makes me want to use pearl millet	2.12	2.35	0.18
My child suffering from pneumonia makes me want to use pearl millet	2.02	2.33	0.068
My child suffering from malaria makes me want to use pearl millet	2.01	2.25	0.229
A shortage of food makes me want to feed my school child with pearl millet	2.56	2.47	0.655
People around me buying pearl millet makes me want to feed pearl millet to my school child	1.99	2.24	0.162
Pearl millet sellers and marketers make me want to buy pearl millet	2.13	2.27	0.428
The media makes me want to use pearl millet	2.06	2.38	0.08
Trainings in the community makes me want to feed pearl millet to my school child	2.02	2.49	0.014
External control belief			
I am the one who decides my school child should consume pearl millet.	3.91	3.96	0.434

[1]Low intention (n = 53) = intention to consume pearl millet less than once a week. [2]High intention (n = 75) = intention to consume pearl millet once a week or mo

CHAPTER FIVE

5.0 DISCUSSION

5.1 Background and Perception of Caregivers with the Intention to Feed Their School Aged Children

This study revealed that general knowledge of caregivers to feed pearl millet was a significant predictor of health behaviour identity among caregivers. In the *Knowledge* construct, caregivers were aware that *"Pearl millet contains iron", "zinc-important growth", "zinc – prevent diarrhoea" and "zinc – prevent pneumonia"*. Knowledge of caregivers was essential in evaluating the effectiveness of Health behaviour identity. Knowledge can be used to highlight caregivers' awareness about the relationship between pearl millet and health and specifically iron and zinc deficiencies (Abizari *et al*., 2013). Caregivers are the role models to their children on eating behaviours thus their nutritional knowledge level could affect the eating behaviours of their children (Yabancı *et al*., 2014).

Other studies using the combined models of TPB and HBM also showed the strong relationship between *Knowledge* and *Health behaviour identity*. For example, studies on bio-fortified cassava and amaranth grain in Kenya reported that *Knowledge* was a strong predictor of *Health behaviour identity* (Talsma *et al*., 2013; Macharia-Mutie *et al*., 2011). The results of this study advocated that giving pearl millet to children is basically mothers/caregivers motivation. Thus, when caregivers think that pearl millet is good for their school children were mostly of firmed by general knowledge that pearl millet prevents diseases (Krishnan and Meera, 2018). Even though caregivers were aware of the contribution of iron and zinc nutrients to their children's health, growth and diseases prevention, they didn't know their deficiencies could affect their children's daily lives.

Pearl millet is an important staple food for farm households and among low economic status people (Basavaraj *et al*., 2010). Providing them with knowledge about the relation between iron and zinc and pearl millet may bring caregivers to the next stage of preparation to feed pearl millet to their school aged children. In our study, we can conclude that specific knowledge on health and crop are more likely to positively influence caregivers' behaviour to feed pearl millet to their school going children.

Likewise, previous studies reported a significant positive relationship between *Knowledge* and nutritional behaviour (Fathi *et al*., 2017; Hooper *et al*., 2012; Choi *et al*., 2008). Caregivers' nutritional knowledge level was strongly associated with children's dietary behaviour. Caregiver with a low level of nutritional knowledge was a risk factor for a child's unhealthy dietary behaviours and poor nutrition status (Zeng *et al*., 2012). The current study revealed that caregivers' knowledge is significantly associated with pearl millet consumption, which is in agreement with the findings from studies by Chege and Kuria (2017) and Agbozo *et al*. (2016). Since caregivers have low Knowledge on pearl millet, even its consumption was affected. Therefore, nutrition education is necessary to increase caregiver's knowledge in not only pearl millet but also consumption of other foods and improve nutritional status of school children.

The importance of iron and zinc to cognitive performance of children is well documented (Chaudhary *et al*., 2015). Iron-deficient children are less involved and interested to their surroundings (Aboud, 2011). Additionally, studies had stated that iron and zinc deficiencies can affect both health and threaten the life of school children (Howie *et al*., 2018; Al Mamun and Ghani, 2017; Rahmati *et al*., 2017). Furthermore, iron and zinc deficiencies can lead to short memory hence it affect child's school performance and ability to perform physical activities (Chaudhary *et al*., 2013; Palacios *et al*., 2020;

Fiorentino *et al*., 2013). Caregiver's thinking of pearl millet being good for their school going children, seems to be determined mainly by general knowledge, rather than specific aspects on iron and zinc deficiencies (like *Susceptibility, Severity or Health value*).

5.2 Belief and Attitude Constructs with Intention to Feed Pearl Millet to School Aged Children

The current study revealed that *Health behaviour identity* significantly predicted Behavioural intention to feed pearl millet to school aged children. The intention to feed pearl millet is highly dependent on caregivers' health behaviour identity. Caregivers in this study seem to evaluate the effectiveness of pearl millet consumption in improving child general health. Therefore strengthening their health behaviour through positive knowledge can lead to positive intention to feed their children pearl millet.

Once more, *Health behaviour identity* was positively associated with *Behavioural intention* and with *Attitudes towards behaviour*. *Health behaviour identity* seemed to be an influencing construct for stimulating *Attitude* toward pearl millet consumption. These results shows that caregivers will weigh the consequences of pearl millet consumption more positively, when they agree that *"pearl millet is good for their school aged children, iron and zinc can improve cognitive development, and pearl millet can improve child health and survival"*.

Likewise, Sun *et al*. (2006) reported positive correlation between *health behaviour identity* and the *attitude towards iron-fortified soy sauce*. Regarding the *attitudes towards behaviour*, the positive correlation indicates that women will evaluate the consequences of pearl millet consumption more positively, when they agree that pearl millet is good for them and their household members. Relative similar results on positive correlation

between *Health behaviour identity* and the *Attitude towards iron-fortified soy sauce* were reported elsewhere (Sun *et al*., 2006).

Findings from this study indicated that "*Attitude towards behaviour"* measures were not significant associated of *Behavioural intention*. The geometric mean scores and the correlation of the construct with intention to feed pearl millet suggested that these qualities should not be emphasized to stimulate pearl millet consumption in Kongwa district.

On the contrary, other studies reported that *Attitude towards behaviour* was significantly associated with intention. For example, intention to consume halal food in Klang Valley, Malaysia was reported to be predominantly influenced by young Muslims' positive attitudes towards halal food (Khalek *et al*., 2017). Likewise, Attitude towards healthy food choices was the best predictor of behavioural intentions to engage in such choices in Inner Mongolian students Shimazaki *et al*. (2017).

Although *Perceived barriers* were not predictor and correlated with *intention* but caregivers mentioned that price of pearl millet on the market and seasonality were barriers to pearl millet consumption. Other researchers showed that, major portion of seasonal analysis of pearl millet received in market during peak period and prices were highest during the lean period (Singh *et al*., 2018). Despite that the cost of pearl millet is low compared to other cereals, it is difficult to afford large amounts to feed the entire household (Rohrbach and Kiriwaggulu, 2001; Reddy *et al*., 2013). The implication is that rural households who have run out of pearl millet stock may find it expensive to buy.

5.3 Intention to Feed Pearl Millet to School Aged Children

Intention of caregivers to feed pearl millet to school aged children was a good predictor of pearl millet consumption among respondents. Again, the Intention to consume pearl millet was directly influenced by health behaviour identity. The latter was positively correlated with Knowledge that leads to pearl millet consumption.

Studies that measured behaviour and intention such as fonio consumption in Mali, cowpeas in Ghana and consumption of grain amaranth in Kenya have also shown that intention is predictive of behaviour (Abizari *et al.,* 2013; Fanou-Fogny *et al.,* 2011; Macharia-Mutie *et al*., 2011). This means that feeding pearl millet to school aged children in Kongwa Tanzania mostly depends on caregivers' intention to feed that food to their children. Definitely, *intention* was significantly correlated and predicted with *behaviour* in this study. Previous studies that used the combined models of TPB and HBM showed significant association between intention and predicted behaviour (Abizari *et al.,* 2013; Fanou-Fogny *et al.,* 2011; Macharia-Mutie *et al*., 2011). The percentage of caregivers who intended to feed pearl millet their school children at least once a week was higher than those who fed their children pearl millet once a week in the past month, showing the role of a nutrition education intervention for promoting the consumption of pearl millet in Kongwa district. A study done by Dhauvadel *et al.* (2019) showed the effectiveness of nutrition education program for changing the intention to consume healthy food and attitude, perceived behavioural control and intention towards healthy eating behaviour.

This study revealed that proportion of caregivers who intended to feed pearl millet once a week was higher than those who gave their school going children pearl millet once a week in the past month. Fanou-Fogny *et al*. (2011) and Nguyen *et al*. (2019) reported that intention was higher than the actual consumption of food. Result of this study indicates

that nutrition education program is needed in order to promote the consumption of pearl millet in Kongwa district. Increasing pearl millet consumption in Kongwa areas may strengthen livelihoods of the caregivers and contribute to food for households especially during food shortage season.

5.4 Drivers of Food Choice among Caregivers to Feed Pearl Millet to School Aged Children

This study showed that stiff porridge and thin porridge made from pearl millet alone were the most pearl millet based food consumed in many households. Studies done in Tanzania also supported that pearl millet grain is pounded or milled into flour and consumed mostly in a form of stiff and thin porridge compared to other pearl millet food forms (Abdallah., 2013; Mafuru *et al.,* 2012). Thus, in order to improve iron and zinc status among school aged children, caregivers should be encouraged to feed their school aged children iron and zinc rich dishes.

Additionally, external factors were investigated in order to identify surrounding pressure that can affect the decision making of caregivers in feeding their school children pearl millet. The study found that *Subjective norm* and *Control belief* was not a predictor of intention to feed pearl millet to children. Similarly, in the study on cultural acceptability of cassava in Kenya, *Subjective norm* is not predictor of intention (Talsma *et al*., 2013).

The study identified caregivers received general advice from husbands, and mother in laws, child's teachers and doctors on feeding children. Bilal (2015) and Kansiime *et al*. (2017) showed that father's advice in child nutrition has strong influence to caregivers as they are providers in the households. Also older women and health workers play a central role as advisers to younger women and as caregivers of both women and children on

nutrition and health issues (Aubel, 2012; Sunguya *et al*., 2013). Therefore, husband, mother in law, teachers and health workers can be used as potential entry point to improve iron and zinc status among school going children in this community.

Cues to action from external factors were good predictor of caregivers' intention to feed pearl millet to school children. In which caregivers tend to listen to training conducted in the communities. It reflects community trainings, which can be explained as the influence on the decision whether a caregiver will feed pearl millet to their school going children or not. Previous study on consumption of amaranth grains in Kenya (Macharia-Mutie *et al*., 2011) and of iron-fortified soy sauce in China (Sun *et al*., 2006) also found 'Cues to action' to be a predictor of intention. Community trainings have empowered caregivers and nutrition knowledge play a crucial role in establishing linkage between agriculture and nutritional outcomes to the children (Reinbott *et al*., 2016; Kulwa *et al*., 2014; Pandey *et al*., 2016). Thus, community training could be a good platform to train caregivers on nutrient dense foods and improve iron and zinc status of school going children.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study was able to investigate the factors that predict the intention of caregivers to feed pearl millet to school aged children. Overall, we found that intention was predictor of behaviour of caregivers to feed their school aged children pearl millet in our study participants. We found that caregivers had the intention to feed pearl millet to their children and that this intention can be increased by; increasing knowledge on iron and zinc deficiencies and pearl millet; providing various community training in order to increase influence on the decision of caregivers to feed pearl millet to their school aged children. We have also shown that health behaviour identity may mediate and predicted intention of caregivers. These results are encouraging, since they show the potential of nutrient-dense food strategy promotion to become successful.

6.2 Recommendations

i. Nutrition expertise should initiate nutrition education programs to caregivers on benefits of pearl millet and its nutrition benefits. Promotion of pearl millet through demonstrations, trainings, exhibitions, and messages through radio and phones are recommended.

ii. Government should promote urban markets in order to increase pearl millet consumption and improve economic status and household food security.

iii. Development partners and organizations dealing with pearl millet should include new technology, including processing machines, packaging and storage should be supported in order to influence growth of local industries and market.

iv. Food processors should improve shelf life of pearl millet flour as well as processed products reduction of anti-nutritional factors is necessary which could be achieved by using numerous processing techniques for instance fermentation, germination, dehulling, milling, malting, blanching, parboiling, acid and heat treatments

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APPENDICES

Appendix 1: Construct Questionnaire

This questionnaire is designed to identify factors determining the intention to consume pearl millet among school aged children aged 5- 12 years of age in the Kongwa District, Dodoma region.

All information will be treated as confidential and anonymity is assured. Please provide frank/correct answers to the following questions.

A1. Socio-Demographic Questions

a) What is the name of the index child? ……

b) What is your relationship with the child?

a) Mother [ ]

b) Stepmother [ ]

c) Grandmother [ ]

d) Auntie [ ]

e) Other, specify…..……..

c) Is the index child in school? ……

d) Age of index child (primary school child selected for the study).

a) 6 – 7 [ ] b) 8 – 9 c) 10 – 11 [ ] d) 11 and above [ ]

e) Sex of index child (primary school child selected for the study).

a) Male [ ]

b) Female [ ]

f) Marital status of caregiver

a) Married- monogamous b) Married- polygamous c)widow d)Divorced e) Separated

f) Partnered g) Never married

g) Religion of caregiver

a) Christian b) Muslim

h) Number of years of formal education completed by caregiver

……

i) How many household members have been eating the same meals prepared in the past four (4) weeks?

a) 2 – 6 [ ] b) 7 – 10 [ ] c) 11 – 35 [ ] d) Above 35 [ ]

j) Number of children who have to share in meals prepared at home

a) 1 – 3 [ ] b) 4 – 6 [ ] c) 7 – 9 [ ] d) 10 and above [ ]

k) What is your highest income generating activity (Source of livelihood?)

a) Farming [ ]

b) Trading [ ]

c) Civil servant (Government employee) [ ]

d) Artisans (Hairdressers, Seamstress) [ ]

e) Others please specify……..…….

f) Unemployed [ ]

l) Tribe of the caregiver

a) Warangi b) Wagogo c) Wanyambo d) Wasandawe e) Wakaguru

m) Who do you live with in the house?

a) husband and children b) Husband, children and other relatives c) caregiver and children only d) caregiver, children and other reletives

n) Who are the main consumers of pearl millet in the household?

a) spouse b)self c)Infants (children less than one year) d) young children (2-4 years) e) school children (5- 12 years) f) adolescences (13-19 years) g) youth (20-49 years) h) older people

A2. Socio-Economic Status Information

o) Do you have Television

a) Yes [ ] b) No [ ]

p) Do you have a radio

a) Yes [ ] b) No [ ]

q) do you have a land for cultivation

a) Yes [ ] b) No [ ]

r) Do you have refrigerator

a) Yes [ ] b) No [ ]

s) Housing quality (walls, floor, roofing material)

i) Type of floor material

a) Tiled [ ]

b) Terrazzo [ ]

c) Cemented [ ]

d) Bear floor (soil, sand) [ ]

e) Other, specify…….....

ii) Type of roofing material

a) Aluminium roofing sheets [ ]

b) Bamboo [ ]

c) thatched/leaves [ ]

d) Wood [ ]

e) Other, specify…….....

iii) Type of wall material.

a) Cement [ ]

b) Mud [ ]

c) Wood [ ]

d) Thatch [ ]

e) Other, specify…….....

t) Presence of Toilet.

a) Toilet in house [ ]

b) Toilet absent in house [ ]

c) Use of pit latrine [ ]

d) Use of public toilet [ ]

u) Main source of drinking water.

a) Pipe borne water [ ]

b) Protected dug out well [ ]

c) River [ ]

d) Rain – tank storage [ ]

e) Bore – hole water [ ]

v) Availability of electricity. a) Yes [ ] b) No [ ]

w) Main source of drinking water

……

x) What is the source of energy for cooking in the household

……

y) How many people in the house hold have a mobile phone

……

z) Does a caregiver have a mobile phone a) Yes [ ] b) No [ ]

B. Knowledge

	I strongly disagree	I disagree	Neutral	I agree	I strongly agree
B1. Food is important for the health of my schoolchild.					
B2. Food can prevent zinc deficiency to in my schoolchild					
B3. Food can prevent shortage of blood in my schoolchild					
B4. Pearl millet contains zinc.					
B5. Pearl millet contains iron.					
B6. Zinc is important for the growth of my schoolchild.					
B7. Iron is important for the growth of my schoolchild					
B8. Iron is important for the health of schoolchild.					
B9. Zinc is important for the health of my schoolchild					
B10. Iron can prevent shortage of blood in my schoolchild					
B11. Pearl millet can prevent my schoolchild from being infectious disease like pneumonia.					
B12. Pearl millet can prevent my schoolchild from being infectious disease like diarrhea.					
B13. Pearl millet can prevent my schoolchild from being infectious disease like malaria.					
B14. Pearl millet can prevent shortage of blood in my schoolchild					
B15. Intestinal worms can cause loss of blood in my schoolchild.					

C : Perceived Susceptibility

	I strongly disagree	I disagree	Neutral	I agree	I strongly agree
C1. My schoolchild suffers easily from malaria					
C2. My schoolchild suffers easily from diarrhea					
C3. My schoolchild suffers easily from pneumonia					
C4. My schoolchild has poor appetite					
C5. My schoolchild suffers easily from shortage of blood					
C6. My schoolchild becomes weak and tired easily.					
C7. My schoolchild becomes disinterested with the environment easily					
C8. My schoolchild has irritable moods					

D. Perceived Severity

	I strongly disagree	I disagree	Neutral	I agree	I strongly agree
D1. Zinc deficiency contribute in my schoolchild for being easy infected by malaria					
D2. Zinc deficiency contribute in my schoolchild for being easy infected by pneumonia					
D3. Zinc deficiency contribute in my schoolchild for being easy infected by diarrhoea					
D4. Iron deficiency plays a role in my child' disinterest with the environment					
D5. Iron deficiency plays a role in my school child suffering from shortage of blood					
D6. Shortage of blood plays a role in the growth of my schoolchild.					
D7. Shortage of blood plays a role in the shortness breath of my schoolchild.					

D8. Shortage of blood can make my schoolchild weak and tired all the time					
D9. Malaria can increase the chances of death of my schoolchild					
D10. Pneumonia can increase the chances of death of my schoolchild					
D11. Diarrhea can increase the chances of death of my schoolchild					
D12. Shortage of blood can increase the chances of death of my schoolchild					

E. Heath Value

	I strongly disagree	**I disagree**	**Neutral**	**I agree**	**I strongly agree**
E1. The health of my schoolchild is very important to me.					
E2. The growth of my schoolchild is important to me.					
E3. The breath of my schoolchild is important to me.					
E4. An activeness of my schoolchild is important to me.					
E5. It is important that my schoolchild is strong all the time.					
E6. The survival of my schoolchild is important to me.					
E7. The intelligence of my school child is important to me					
E8. The school performance of my school child is important to me.					
E9. Iron is important for the cognitive development of my child					
E10. Zinc is important for the cognitive development of my child					
E11. Pearl millet is important to prevent my child from diarrhea					
E12. Pearl millet is important to prevent my child from malaria					
E13. Pearl millet is important to prevent my child from pneumonia					

F. Health Behaviour Identity

	I strongly disagree	I disagree	Neutral	I agree	I strongly agree
F1 Giving pearl millet is one of the best things that I can do for my schoolchild					
F2 Giving pearl millet is one of the best things that I can do for my family members					
F3. Food that contain iron is one of the best thing that I can do give to my child to improve his/her cognitive development					
F4. Food that contain zinc is one of the best thing that I can give to my child to improve his/her cognitive development					
F5. Giving pearl millet is one of the best thing I can do for my child to improve her/his intelligence					
F6. Giving pearl millet is one of the best thing I can do for my child to improve her/his health					
F7. Giving pearl millet is one of the best thing I can do for my child for her/his survival					

G. Perceived Barriers

	I strongly disagree	I disagree	Neutral	I agree	I strongly agree
G1. I worry about the availability of pearl millet on the market					
G2. I worry about the price of pearl millet on the market					
G3. I worry about pearl millet being contaminated with stones, gravels etc.					
G4. Pearl millets are easily prone to insect attack such as rice moth.					
G5. I worry about the seasonal supply of pearl millet, not available throughout the year.					
G6. Pearl millet is expensive in the dry season than the					

rainy season.					
G7. I worry about the availability of fuel required to cook pearl millet					
G8. I worry about the quantity of fuel required to cook pearl millet.					
G9. I worried because the variety I prefer is not readily available.					
G10. It is not easy to store/preserve pearl millet					
G11. Pearl millet flour has a short shelf life.					

H: Attitudes towards Behaviour

	I strongly disagree	**I disagree**	**Neutral**	**I agree**	**I strongly agree**
H1. Pearl millet has a good taste.					
H2. My schoolchild prefers foods that taste good					
H3.The shorter cooking time makes me want to feed pearl millet to my schoolchild					
H4. It is important for me to cook the food the take shorter time					
H5. Pearl millet is a nutritious grain.					
H6. It is of great importance to me to feed my schoolchild with foods that are nutritious					
H7. Pearl millet creates variety in my schoolchild's meal					
H8. It is important for me to feed my schoolchild something that creates variety in his/her meal.					
H9. Pearl millet is an example of a traditional staple food.					
H10. It is important for me to feed my schoolchild with traditional staple foods.					
H11. Giving pearl millet to my schoolchild helps to					

prevent blood shortage					
H12. It is important to feed my schoolchild with foods that prevent blood shortage					
H13. Feeding my schoolchild with pearl millet helps stimulate free bowels					
H14. It is important that I give foods that stimulate free bowels to my schoolchild.					
H15. My schoolchild does not enjoy eating pearl millet					
H16. It is important for me to feed my schoolchild with food that he/she enjoys eating					
H17. My schoolchild enjoys eating pearl millet–based added foods such as ugali					
H18. It is important for me to feed my schoolchild with pearl millet based added foods such as ugali					
H19. My schoolchild enjoys eating pearl millet – based added foods such as uji.					
H20. It is important for me to feed my schoolchild with pearl millet based added foods such as uji					
H21. Feeding my schoolchild with pearl millet helps to prevent malaria					
H22. It is important to feed my schoolchild with food that prevent malaria					
H23. Feeding my schoolchild with pearl millet helps to prevent pneumonia					
24. It is important to feed my schoolchild with food that prevent pneumonia					
H25. Feeding my schoolchild with pearl millet helps to prevent diarrhoea					
H26. It is important to					

feed my schoolchild with food that prevent diarrhoea					

I. External Control Belief

	I strongly disagree	**I disagree**	**Neutral**	**I agree**	**I strongly agree**
I am the one who decides my schoolchild should consume pearl millet.					

J. Cues to Action

	I strongly disagree	**I disagree**	**Neutral**	**I agree**	**I strongly agree**
J1. Important ceremonies like weddings or funerals make my schoolchild want to eat pearl millet					
J2. special guest(s) at home make my schoolchild want to eat pearl millet					
J3. Harvest time make my schoolchild want to eat pearl millet					
J4. My schoolchild likes to eat pearl millet when we go out to a restaurant					
J5. I comply with the doctors, clinicians or health workers advice to give pearl millet to my schoolchild.					
J6. Illness/sickness of my schoolchild makes me want to buy pearl millet.					
J7. My schoolchild suffering from anaemia makes me want to buy pearl millet					
J8.A shortage of food makes me want to feed my schoolchild with pearl millet					
J9. People around me buying pearl millet makes me want to feed pearl millet to my schoolchild.					
J10. Pearl millet sellers and marketers make me want to buy pearl millet.					
J11. The media makes me want to use pearl millet					

J12. Trainings in the community makes me want to feed pearl millet to my school child					
J13. My schoolchild suffering from diarrhoea makes me want to use pearl millet					
J14. My schoolchild suffering from pneumonia makes me want to use pearl millet					
J15. My schoolchild suffering from malaria makes me want to use pearl millet					

K. Subjective Norms

	I strongly disagree	**I disagree**	**Neutral**	**I agree**	**I strongly agree**
K1. My husband gives me the advice to feed pearl millet to my schoolchild.					
K2. The opinion of my husband is important to me.					
K3. My mother advises me to feed pearl millet to my child					
K4. Advice from my mother is important to me					
K5. My mother-in-law advices me to feed pearl millet to my schoolchild					
K6. The opinion of my mother in law is important to me.					
K7. My friend(s) advise me to feed pearl millet to my schoolchild.					
K8. The opinion of my friend(s) is important to me.					
K9. My neighbour(s) gives me the advice to feed my schoolchild with pearl millet.					
K10. The opinion of my neighbour (s) is important to me.					
K11. My nurse advices me to feed pearl millet to my schoolchild.					
K12. The advice of my nurse is important to me.					
K13. Doctors give me the advice to feed my child with pearl millet**.**					
K14. The advice of the					

doctors is important to me.					
K15. Community leaders give me the advice to feed my child with pearl millet					
K16. The advice of the community leaders is important to me					
K17. Religious leaders give me the advice to feed my child with pearl millet					
K18. The advice of the religious leaders is important to me					
K19. My child's teacher(s) gives me the advice to feed my child with pearl millet.					
K20. The advice of my child's teacher(s) is important to me.					

L. Behavioural Intention

	Not	**Once or less per month**	**2-3 times per month**	**Once a week**	**Two or more times a week**
L1. How often do you think you will feed pearl millet to your schoolchild in the coming month?					

M. Behaviour

	Not	**Once or less per month**	**2-3 times per month**	**Once a week**	**Two or more times a week**
M1. How often did you feed pearl millet to your schoolchild in the last month?					

Remark Section

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Appendix 2: Food Frequency Questionnaire

Questions About the Child	
Mother: Does you schoolchild take any vitamin/mineral supplements or eat any fortified foods? ☐ Yes *(please answer question below)* ☐ No *If yes, please write below the name of the vitamin/mineral supplement(s) or fortified food(s) consumed:*	
If yes, How often does your school child take the vitamin/mineral supplements or eat the fortified foods? ☐ Daily ☐ Every other day ☐ Twice per week ☐ Once per week ☐ Less than once per week ☐ Only occasionally	
During the last 7 days, how many times did your school child consume the following foods:	
Pumpkin seed	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Sunflower seed	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Fish & sardines	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Ground nuts	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Maize	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Rice	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Sorghum	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Finger millet	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Wheat or foods made from food products made from wheat such as chapatti, mahamri, mandazi, bread	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Pigeon peas	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Cowpea	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Meat (poultry, beef, goat)	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Organs (liver, kidney)	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Cowpea stew	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Mixed cowpea and maize (kande za kunde)	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Traditional non-alcoholic beverage (togwa la uwele)	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
Pearl millet rice	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can't remember
mixed pearl millet and beans	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐

	Can’t remember
Spiced pearl millet rice (pilau)	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can’t remember
Buns made of pearl millet	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can’t remember
Porridge that has groundnut	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can’t remember
Stiff porridge made of maize	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can’t remember
Stiff porridge made of pearl millet only	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can’t remember
Stiff porridge made of pearl millet with other cereal	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can’t remember
Thin porridge made of pearl millet only	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can’t remember
Thin porridge made of maize only	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can’t remember
Thin porridge made of pearl millet with other cereals	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can’t remember
Fruits rich in vitamin C (Oranges, lemon, lime, baobab)	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can’t remember
Green vegetables such as mchicha, mlenda, mnafu, matembele, sukumawiki, spinach	☐ 0 ☐ 1 ☐ 2 - 3 ☐ 4 - 5 ☐ > 6 ☐ Can’t remember