IMPROVEMENT OF COMPLEMENTARY FOODS FOR INFANTS AND YOUNG CHILDREN SIX TO 23 MONTHS IN SEAWEED FARMING LIVELIHOOD ZONE, MICHEWENI DISTRICT, PEMBA

SULEIMAN, SULEIMAN ATIK

DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN HUMAN NUTRITION OF SOKOINE UNIVERSITY OF AGRICULTURE.

MOROGORO, TANZANIA.

2016

ABSTRACT

Appropriate child feeding is the basis for a good nutritional status and healthy development, and a key factor for health in later life. In Tanzania, more than a third of children under-five years are affected by chronic malnutrition. In Zanzibar, 12% of children under-five are suffering from acute malnutrition. 4.5% are severely malnourished. The aim of the study was to improve the complementary foods for infants and young children aged six to 23 months in seaweed farming livelihood zone. This study was conducted in Micheweni district which covers about 407 km^2 and comprises 28 local administrative authority (shehia/village). A longitudinal (Panel survey) analytical design was used to establish baseline on nutritional situation, dietary assessment from three 24 hour recalls to identify nutrient gap and intervention to rectify the dietary inappropriateness escorted with monitoring for three consecutive months using panel data. Data collection tool was developed using ProPAN guideline. Data were analyzed using ProPAN-2 software with Epi-info version 3.5.4 (descriptive statistics) and SAS-8, 2004 (inferential statistics) using Duncan Multiple Range Test. Majority of children, expressed mild to moderate underweight (29.57%), (14.07%); wasting (20%) (11.38%); stunting (23.61%), (5.37%) and MUACZ (28.32%), (16.07%) respectively. Occupation was only socio-demographic factor that had shown significant association with nutritional indicator (WHZ). After intervention significant difference was found on weight and MUAC of children aged 12-23 months who were still breastfed. Meanwhile, 33.3% were able to meet minimum dietary diversity and 91.7% able to minimum meet meal frequency. Specific nutrients were below recommendation in pre-intervention but had shown significant difference in post intervention except for iron and zinc. The predominance of under-nutrition was intensified by inadequate knowledge and misconceptions about appropriate complementary foods. Monitoring at community level was fundamental in

promoting recommended Infants and Young Child Feeding practices, along with adaptation of key messaging to address common misconceptions. District authority need synergic approach to advocate child care practices within communities by increasing demand in utilization of health services, promote optimal complementary feeding and dietary diversity through nutrition sensitive agriculture, specific nutrition counselling and cooking demonstration to enhance bioavailability.

DECLARATION

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

Suleiman, Suleiman Atik,
(MSc. Candidate)

03/10/2016
Date

The declaration above is confirmed by

Prof. Nyaruhucha, C. N.
(Supervisor)

03/10/2016
Date

DEDICATION

This dissertation is dedicated to my family and parents and my colleagues who facilitated the entire study process.

AKNOWLEDGEMENTS

First, my deepest acknowledgement goes to my Sponsor (Irish Aid Training Program) for the financial support which has facilitated the study to be conducted timely. Special appreciation should go to my supervisor Prof; Nyaruhucha, C. N. for his guidance and commitment throughout the study process, next to my assistance supervisor Ms. Kereth, G for her commendable comments. Also I am indebted to Dr. Mamiro and his ProPAN team for his invaluable contribution and guidance in the ProPAN software that was principally used for data analysis, parallel to Dr. Lymo, C. M. for his assist to make data more meaningful by inferential analysis. Furthermore, I am grateful to Administration of two departments; Food security and Nutrition and Nutrition Unit from key ministries (MANRLF) and MoH) of Zanzibar for their valuable input of both data collection tools/equipment and man power, with insightful to Fatma A. S. (Mrs) for her support and affinity founding to the mothers during recipe creation exercise.

My profound thanks go to the mothers and caregivers of children who generously shared their knowledge and experiences and actively participated in preparing and tasting the preparations (foods). Meanwhile, other gratitude go to the local authorities of four villages in seaweed farming livelihood zones who established a rapport and supporting the field work, parallel to my enumerators (CORPs and CHWs) who ensured both qualitative and quantitative data were collected amidst all the challenges in the rural community set-up.

Finally, my appreciation goes to my family for the firm honest support. Your sympathy throughout the study period is appreciable.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

CHWs	Community Health Workers
CI	Confidence Interval
CL	Confidence Limit
CORPS	Community Owned Resources Personnel
DHMS	District Health Management System
DRIs	Dietary Reference Intakes
EAR	Estimated Average Recommendation
FAO	Food and Agriculture Organization
FGDs	Focus Group Discussion
IYCF	Infants and Young Child Feeding
MANR	Ministry of Agriculture and Natural Resources (Zanzibar)
MoH	Ministry of Health (Zanzibar)
MUAC	Mid upper arm circumference
NRC	National Research Council
PAHO	Pan America Health Organization
PEM	Protein Energy Malnutrition
PHNBs	Public Health Nurse (class B)
ProPAN	Process for Promoting Child Feeding
REPOA	Research on Poverty Alleviation
S D	Standard Deviation
UNICEF	United Nations Children's Fund
WASH	Water Sanitation and Hygiene
WHO	World Health Organization
ZAMREC	Zanzibar Medical and Research Committee

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Appropriate child feeding is the basis for a good nutritional status and healthy development, and a key factor for health in later life (WHO/ USAID/ AED/ FANTA/ IFPRI/ and UNICEF, 2008). To ensure sound foundation and secure future of any society, health and nutrition of their children need protection (WHO, 2005). However, consumption of inadequate proteins, calories and micronutrients retard growth and development, often irreversibly (FAO, 2005).

Infants and young children who are deprived of essential nutrients are often trapped in a cycle of malnutrition, disease and impaired development that causes irreversible damage. The most harm occurs during pregnancy and in the first two years of a child's life; (within 1,000 days from conception to 2 years of a child life); therefore, action must focus on this highly vulnerable period of life (UNICEF, 2012). This is due to the fact that nutrition improvements are inherently sustaining over time. Investment in the first 1,000 days of a child's life yield benefits throughout that person's life cycle and across generations (Bhutta, 2008).

Inappropriate complementary feeding practices namely: untimely introduction, improper feeding frequency and low dietary diversity of complementary foods result to inadequate dietary intake (WHO, 2007). This in turn is exacerbated by poor care practices and as a result, a large proportion of infants and young children suffer from growth failure and deficiencies in micronutrients notably iron, vitamin A and zinc (Black *et al.*, 2008). The consequences of infants and young children under-nutrition at formative stages of life

place a great burden on affected individuals as well as society as a whole (Victora *et al.*, 2008).

It has also been established by WHO/UNICEF that inappropriate feeding practices and their consequences are major obstacles to sustainable socioeconomic development and poverty reduction. Hence efforts to accelerate economic development in any significant long-term sense will be unsuccessful until optimal child growth and development, especially through appropriate feeding practices, are ensured (WHO/UNICEF, 2003).

In Tanzania, under-nutrition is still highly prevalent. More than a third of children under-five years are affected by chronic malnutrition (stunting) (NBS and ICF Macro, 2010). It has been estimated that 1.3 per cent of children under five are severely malnourished. In 2014 it was expected that there will be more than 220,000 children with severe acute malnutrition and 380,000 children with moderate malnutrition in the country. In Zanzibar, 12 per cent of children under five are suffering from acute malnutrition and 4.5 per cent are severely malnourished. In 2014, it is estimated that 40,000 children under five will be affected by acute malnutrition, of which 21,000 will be affected by severe acute malnutrition (Brandenburg and Kamugisha, 2014). This shows that malnutrition is still a public health problem.

Prevalence of high levels of under nutrition is related to multiple factors including maternal under nutrition, inadequate infant and young child feeding practices, repeated infectious diseases, poor sanitation and hygiene, as well as low capacity of health staff and community health workers to deliver nutrition information and services, and low investment on nutrition at community level (Brandenburg and Kamugisha, 2014).

1.2 Problem Statement

The study on Working Conditions in Zanzibar Seaweed Farming Industry done by Msuya (2006) revealed that the impact on women's household duties seem to affect the care and feeding practices of those seaweed farming livelihood zones. Likewise Moshy *et al.* (2013) noted that underweight problems in Jibondo village was intensified by improper feeding practices because mothers resumed seaweed farming and octopus fishing soon after delivery. This suggests that although their occupation aimed to generate income and improve their standard of living but conversely the activities interfere with the child care and feeding practices ultimately affecting children's welfare.

It is clearly indicated by all anthropometric indicators that the nutritional status of the under-fives has worsened, for instance, in 2005, in Zanzibar, stunting was estimated at 23.1% but in 2010 it was 30.2%; acute malnutrition was at 6.1% and it deteriorated to 12%. The magnitude of stunting of under five years children in Pemba Island is higher (35.5%) compared to that of Unguja island (26.7%) (NBS and ICF Macro, 2010).

Regional information recorded from NBS and ICF Macro (2005) and NBS and ICF Macro (2010) show that stunting is 39.3 and 31.3%, wasting are 12.7 and, 8.4%; underweight is 23.9 and 18.6% for North and South Pemba respectively (NBS and ICF Macro, 2010). Most victims are from Northern Pemba in which Micheweni district is located whereas seaweed farming livelihood zone seems to contribute high prevalence of malnutrition (DHMS, 2012).

The study on Management of Severe Acute malnutrition in Zanzibar done by deRenzi *et al.* (2008) noted that relapses were common among children discharged from hospital, probably because there is no continuation of proper feeding practices in the community.

Even though there are various intervention measures that address issues of malnutrition at Micheweni District such as immunization, deworming, provision of Ready to Use Therapeutic Food (RUTF) but dietary adequacy of complementary food for under two years children in Pemba has not been much addressed. Suboptimal complementary feeding practices by using different approaches have been addressed by many studies in Pemba including Pelto and Thairu (2008) and Katarzyna *et al.* (2009). Basing on this information Paul *et al.* (2008) recommend that traditional meal structures for infants such as tea and bread for dinner in Pemba Island, may need adjustment. The same scenario has been observed in Unguja by Kinabo *et al.* (2013). They reported that, foods which were frequently consumed by the children (six to 59 months) include black tea, white bread, African doughnut with a varied range of energy density. They also commented that, early initiation of complementary foods, inadequate micronutrients notably iron, zinc and vitamin A, inadequate knowledge of mothers and or caregivers in preparation of complementary foods could probably be a contributing factor to higher rates of malnutrition.

1.3 Justification of the Study

Programmes to support breastfeeding and complementary feeding are among the most effective interventions to promote healthy growth and development in infants and young children (Bhutta, 2008). The need of using community approach in addressing infants and children under-nutrition in Pemba is crucial as it has been illustrated from the above studies.

Therefore, it was worth to conduct this study in order to equip mothers with conspicuous skills and appropriate knowledge on food attributes which are available on their locality,

indeed household monitoring will encourage behaviour changes practices and to identify dietary recommendations which will consider diversifications.

The expected outcomes of this study will address the gap in nutrient inadequacy of complementary food alongside advocate a comprehensive infant and young child-feeding strategy with prioritized interventions. Moreover, the outcomes will assist in developing a subnational action plans through integration approaches, strengthening monitoring and evaluation system on feeding practices and overcoming both Medium and Severe Acute Malnutrition in Zanzibar.

1.4 Objectives

1.4.1 General objective

The general objective of the study was to modify complementary foods of infants and young children six to 23 months in a sea weed farming livelihood zones with the aim of improving their nutritional status.

1.4.2 Specific objectives

(i) To determine the nutritional status of children aged six to 23 months in seaweed farming livelihood zone.

(ii) To identify feeding practices of children aged six to 23 months in a seaweed farming livelihood zones.

(iii) To determine the nutrient gap in complementary foods in a seaweed farming livelihood zones

(iv) To develop nutritious dishes that may address dietary inadequacies among infants and young children aged six to 23 months in a sea weed farming livelihood zones.

(v) To assess the acceptability and feasibility of the potential recommendation of modified recipes to caregivers.

1.4.3 Study questions

i) What was the nutritional status of under-two years in a seaweed farming livelihood zone?

ii) What was the nutrients gap for six to 23 months from the recommended?

iii) What were the feeding practices of infants and young children in sea weed farming livelihood zone?

iv) Will the modified recipes using local available food improve complementary food in seaweed farming livelihood zone?

v) To what extent acceptability of recommendations will improve the feeding practices?

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Adequate nutrition during infancy and early childhood is crucial to the development of each child. The period from birth to two years of age is a critical window for the promotion of optimal growth, health and behavioral development (UNICEF, 2013). Understanding the immediate and underlying causes of under-nutrition in a given context is critical to delivering appropriate, effective and sustainable solutions and adequately meeting the needs of the most vulnerable people (UNICEF, 2008).

2.1.1 Causes of under-nutrition

The UNICEF conceptual framework defines nutrition and captures the multifactorial causality of under-nutrition. Children become malnourished if they suffer from diseases that cause under-nutrition or if they are unable to eat sufficient nutritious food. These fall are immediate causes. These two causes, i.e diseases and inadequate dietary intake often occur together and are caused by multiple underlying factors including inadequate physical or economic access to food, poor health services, an unhealthy environment and inadequate caring practices for children and women. More basic causes include poverty, ecological, illiteracy, and low status of women, culture and belief (social norms and behaviour) as well as political aspects (UNICEF, 2008).

2.1.2 Breast feeding

Recommendations for optimal infant and young child feeding insist that infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health, and thereafter, they should receive nutritionally adequate and safe

complementary foods while breastfeeding continues up to two years. Breast milk is not only an important source of energy and nutrients in children aged six to 23 months but also a critical source of energy and nutrients during illness, and reduces mortality among children who are malnourished. It can provide half or more of a child's energy needs between the ages of six and 12 months, and one third of energy needs between 12 and 24 months (WHO/UNICEF, 2008). However, global progress on this intervention is both uneven and suboptimum (Cai and Brown, 2012). The duration of exclusively breastfeeding is on average only two and half months in mainland Tanzania and two weeks in Zanzibar. At two to three months, only 51 percent of infants are exclusively breastfed, and this falls to 23 percent by the age of 4-5 months (UNCEF, 2012).

In a study conducted in Simanjiro District, breast feeding practices were far from the recommended since they were affected by weaning practices at the tender age. On average 54 and 34% respondents weaned their babies at two and half months and five months respectively (Nyaruhucha *et al.*, 2006).

2.1.3 Complementary feeding

Complementary feeding refers to the timely introduction of safe and nutritionally rich foods in addition to breast-feeding typically provided from six to 23 months of age (UNICEF, 2012). It is a significant factor that determines the nutritional status of children because although, exclusive breastfeeding provides the best start, after six months and as long as breastfeeding continues, the child needs more vitamins, minerals, proteins and carbohydrates than are generally available from breast milk alone (Dyson *et al.*, 2005). The problem of poor quality of complementary food has been under emphasized in nutrition programming for quite some time (Dewey, 2005; UNICEF, 2012).

Complementary foods given to children are often carbohydrate-based and lack sufficient protein, minerals and vitamins. Many mothers lack the knowledge and support from other family members to exclusively breastfeed and feed their young children in the best way possible (UNICEF, 2012).

The study conducted in six districts of Unguja island using ProPAN guidelines, discovered the inadequacy of most important micronutrients due to poor dietary diversity and meal frequency in the preparation of complementary feeding though the energy and protein were reported to be adequate (Kinabo *et al.*, 2013). Nyaruhucha *et al.* (2006) from their study in Simanjiro District revealed that, porridge (gruel) mixed with milk or milk alone were the major complementary foods, while few mothers added protein rich ingredients such as legumes, sardines, and eggs. Half of the children were fed three times per day while few got four times a day.

2.1.4 Caregivers Knowledge, skills and counseling

Optimal complementary feeding depends not only on what is fed, but also on how, when, where, and by whom the child is fed. One key strategy is skilled, timely, and targeted counseling on recommended feeding practices. Quality counseling often requires improving the capacity of health care providers and community health workers to counsel, demonstrate, coach, and address specific concerns of mothers and others in the household (UNICEF, 2005). Evidence shows that mothers are willing to prepare enriched complementary foods if they are culturally acceptable, and that improving maternal knowledge and feeding practices can lead to increased dietary intake and growth of infants. Good counseling and negotiation with the mother in health system and community health care settings is crucial to ensuring optimal complementary feeding practices (Shazia *et al.*, 2014). They also conclude that, malnutrition among young

children can be greatly reduced by educating parents regarding the preparation of safe and adequate local weaning foods.

2.1.5 Safe and clean water accessibility

Access to sufficient quality and quantity of water is essential to nutritional security. Households require water for chores like cooking, cleaning clothes and drinking (FAO, 2005). A lack of access to adequately clean water and improved sanitation facilities leaves communities and individuals vulnerable to infections and disease which are closely linked to increased levels of under-nutrition (UNICEF, 2012).

2.1.6 Hygiene and infestation

Sanitation issues like disposal of human excreta, disposal of garbage and cleanliness of the household environment affect the health of a population (FAO/WHO, 2005). Engle and Bentley (2002) and Salah (2004) observed that there are a number of opportunities for improving children feeding practices through home visits by community health workers, insisting standard of hygiene, immediate visits to physicians for a sick child and immunization. Moreover, inadequate sanitation and hygiene also increase the risk of intestinal worm infestation such as hookworm infestation, an infections (WHO/UNICEF, 2012).

Similarly, Nyaruhucha *et al.* (2005) commented that the high prevalence of intestinal worms could be attributed to poor hygiene especially with regard to minimal use of toilet facilities. Likewise, Paul *et al.* (2011) concluded that illness caused by inappropriate hygiene practices (e.g. lack of hand washing) may depress appetite and lead to inadequate intake.

2.1.7 Child care practices and impact on nutrition

The key care practices that could impact on child nutrition include care of pregnant and lactating mothers, breast feeding and feeding young children, care of children during illness, psychosocial care of children, food preparation and storage, and hygiene (Arimond and Ruel, 2002). However, these practices are to a large extent dependent or modified by availability of resources to the caregiver for its implementation. These include knowledge and beliefs about child rearing, the health and nutritional status of the care provider, control of resources and/or autonomy for child care (these include decision making role and employment of caregiver), workload and time constraints for providing child care and social support (these include availability of alternate caregivers, sharing of workload, father's role in child care and community support) (UNICEF, 2009).

2.1.8 Seaweed farming and impact on child care.

Commercially viable seaweed was first introduced to Zanzibar in the late 1980s from the Philippines and became the third largest exporter of seaweed in the world, after the Philippines and Indonesia (FAO, 1990). According to the government, the sector used to employ 23 000 people - 90% of whom were women (Msuya, 2011). Seaweeds generate direct income to farmers and it has changed the livelihoods of thousands of people especially women living along the coastlines (Msuya, 2011; Seif, 2013).

Seaweed has a lot of uses, but commonly it is used as a base for toothpaste, lotions, cosmetics, medicine, and some species used as food (Anir and Veikila, 2010). Seaweeds farms are generally located in shallow, calm and constantly warm waters, but only where the bottom part of water is sandy. The temperature should be between 25 and 30 degrees centigrade. The seaweed grows for six weeks and is harvested and re-planted in the same

tidal cycle (Seif, 2013). More time seems to be spent in seaweeds farms which ultimately affect women who have under-two years children.

Child care becomes a problem for women who have to work long hours. Sometimes women farmers are unable to work on their farms because they are unable to find someone to take care of their children (Msuya, 2006). Some women feel guilty that they are not caring for their children properly. One woman noted, "*You feel bad because your children are waiting to eat.*" quoted by Msuya (2006). In some cases older children are given a responsibility of taking care of their young ones who are tender aged (Msuya, 2012).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Area

This study was conducted in Micheweni District which covers about 407 km^2. Micheweni is among the four districts of Pemba island forming the 28 local administrative authority (shehia/village) half of them lying along the coastal region with a population of 146 438 people (NBS/OCGS, 2012). Based on population distribution by age and sex, under five years account for 12.7% (18,664) of total population where as male and female ratio are closely related. Correspondingly, 24.28% (35,565) fall under reproductive age, 11.52%; 12.75% represents men and women respectively. Average household size is 5.3 with 96 sex ratio which is a bit high compare to other districts in Pemba (NBS/OCGS, 2013).

Short rains (usually unreliable in certain eastern parts of this district) starting from October to December and long rains that begin in March and end in May support some agricultural activities in most areas. Domestic production of food is still very much dependent on weather conditions and is limited by geographical factors, part of it is semi-arid and land is limited to mechanization since is occupied by coral rag. There are also a number of constraints in the agricultural sector, such as shortage of inputs, lack of effective extension services (NBS/OCGS, 2012a).

The people of Micheweni also engage in other economic activities including livestock keeping (chiefly goat keeping) excavating stones and cutting into blocks, handicraft and small business. The rich marine environment supports fishing activities for both men and women, although women mainly engage on seaweed farming and collecting other marine products along the sea shoe. Fishing zones comprising seaweed farming livelihood zone,

are mostly on marginal land and are highly vulnerable to acute, chronic and transitory food insecurity and malnutrition (NBS/OCGS, 2012b). Self-reported food insecurity is higher in district by 25% (REPOA, 2006). The percentage of people living below the basic needs poverty line in Micheweni is 74.2%, with 25% of basic need poverty gap, remarkably high figure compared to the national average. Micheweni has also the highest incidence of extreme poverty, with 33.5% of people living below the food poverty line with 6.9% food poverty gap (OCGS, 2010).

Figure 1 shows Micheweni district map.

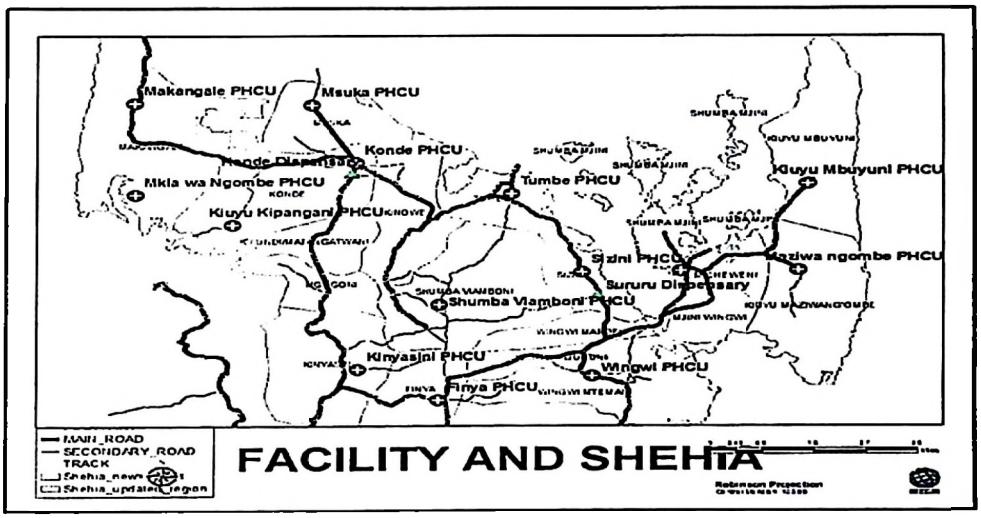

Figure 1: Micheweni distict map;displaying the main road, secondary roads and the location of health facilities in shehia (DHMS, 2012)

3.2 Study Design

A longitudinal study design was employed to collect both qualitative and quantitative data. Nutritional survey was conducted in 360 house-holds with children aged six to 23 months from four villages. A focus group discussion was done after a baseline, and information generated was used as a guide for formulating recipes. Moreover, market survey was also conducted to identify the locally available foods in each particular community.

Malnourished children were identified using anthropometric indices (Weight, Height, and MUAC) in relation to their ages; fifteen children were selected from each village/shehia. These children were then stratified according to age group and breast feeding status. Dietary assessment was then conducted on 60 mothers of children from each village using 24 hours recall to identify the most consumed food and meal pattern.

3.3 Study Population

The study population comprised of children between six to 23 months old and their mothers or caregivers from the seaweed farming livelihood zone being the main respondents. Other participants who facilitated the process of data collection included Community Owned Resource Personnels, health professions, and community leaders (Shehas) from the respective selected shehias namely, Mtemani, Tumbe Mashariki, Maziwa Ng'ombe and Kiuyu Mbuyuni.

3.4 Sample Size

The sample size was computed using the general equation adopted from SMART (2012) to obtain 60 respondents to participate in monitoring phase.

Sample size was computed from the general percentage of stunting children less than 5years in Pemba (35%) (NBS and ICF Macro, 2010).

$$N = \frac{Z^2 \, p \, q}{d^2}$$

Where: N = sample size

Z = the standard normal deviate at 95% confidence level (1.96).

P = estimated prevalence of malnutrition to children 0-59 months (35.5% for Pemba).

q = (1- p)

d^2 = margin of error at 5% (standard value of 0.05).

$1.96^2 \times 0.35 (1 - 0.35) / 0.05^2 = 349.58 \sim 350.$

12/100 x 350 = 42 respondents.

Besides, a proportion of 5% (18 respondents) were added as a precaution of those who decided to drop to continue participating in the study. Therefore the reasonable sample size recruited for monitoring were 60 respondents.

3.4 Data Collection

Data were collected based on ProPAN guideline field manual (Process for the Promotion of Child Feeding). This refers to a set of research tools designed for institutions working to improve the diets and feeding practices of children under 24 months old to prevent early childhood malnutrition. It guides users through a step-by-step process for identifying problems related to young child nutrition, breastfeeding, and complementary feeding within a specific target population (PAHO/WHO, 2013). Both qualitative and quantitative data were collected using different tools and techniques. Qualitative data collection focused on exploring indigenous perceptions and possible descriptions with regard to nutritional status of children under two years. FGDs, face-to-face interviews during home visiting including observation were employed. Quantitative data such as anthropometric and dietary habits were obtained through measurements of children and interviews of mothers using 24 hours dietary recall.

3.4.1 Socio-economic data

Age of parents, education level, occupation, housing, family size were recorded based on a combination of maternal health cards and the parent's indigenous knowledge though semi-structured interview.

3.4.2 Nutritional status

Nutritional status refers to the current body status of an individual or a population group related to their state of nourishment (the consumption and utilization of nutrients).

Assessment was done using anthropometric parameters such as weight, height/length, and MUAC. Anthropometric data were recorded during Reproductive and Child Health (RCH) clinic services and by home visits for Wingwi Mtemani, Tumbe East, Maziwa Ng'ombe, and Kiuyu Mbuyuni during baseline survey.

The age of the child was recorded based on a child birth date form health cards. Weights of children were taken to the nearest 0.1 grams with minimal or light clothing on, using Salter Scales. Length was measured to the nearest 0.1 centimeters (cm) in bare feet with children lying straight against a length board.

Mid Upper Arm Circumference (MUAC) of children was taken at the midpoint of the upper left arm using a MUAC tape and recorded to the nearest 1mm. The nutrition status indices used in this study were: Weight-for-Age z- scores: under-weight (WAZ), weight for height z-score: wasting (WHZ), height for age z-score: stunting (HAZ), and MUAC-for-Age z- scores (MUACZ). Table 1 shows the cut-off points for categorization of degree of malnutrition.

Table 1: WHO classification for degree of malnutrition

Degree of malnutrition	Cut-off point (Z-scores-W/A, H/A, W/H)	MUAC (cm)
Normal	-1 SD	> 13.0
Mild	-2 and <-1 SD	< 12.5
Moderate	-3 and <-2 SD	11.5 – <12.5
Severe	<-3 <-3 SD	<11.5

3.4.3 Focus group discussions (FGDs)

Four FGDs were conducted at the end of the household survey in each of the villages to solicit information on the mothers'/ caregivers' knowledge and perceptions regarding complementary feeding in the area of study. The main purpose of Focus Groups was to

have views of other members of the population (caregivers, family members, health workers, traditional birth attendants, etc). Data on the topics pertaining to children's upbringing, feeding practices specifically complementary feeding as well as meal pattern and duration before mothers resumed their income generating activities, (particularly seaweed farming) were collected. Likewise local foods availability and seasonality were identified using (ProPAN form II-3.1) and matrix II-3.2 for analysis.

To enhance homogeneity, each FGD comprising health attendants, CORPS and mothers/caregivers with 10-12 participants, six to eight were females with children below two years and four were males). Members of the FGDs were recruited with the help of Community Owned Resources Personnel (CORPS), Community Health Workers (CHWs). Mothers with children were first separated from traditional birth attendant and community health workers then gathered to verify their answers. Discussions were typically held in a local health center lasting approximately one hour, supervised and moderated using a standardized discussion guide (ProPAN form II-3.1).

The following topics were covered during discussion.

i. Major foods used for preparation of complementary foods
ii. The seasonality and availability of the identified foods
iii. Meal pattern and feeding practices
iv. Reasons for the selected and neglected other food types

After survey and FGDs completion, respondents were recruited and invited to participate in interview of dietary assessment of their children using 24 hours recall.

3.4.4 Intervention measure

Mothers with malnourished children were invited and assembled to receive nutritional knowledge which included food groups and proper feeding practice as well as

recommendations that would improve complementary feeding. Nutrition messages, recommendations and recipes were developed through various teaching materials including sample of food groups and audiovisual (video) display. From this demonstration mothers were able to identify their deficit in formulating complementary food based on recommendations.

3.4.5 Market survey

The information about food availability, seasonality and market place where most food stuffs were purchased during FGDs was used as a guideline in doing market survey. Food's name, retail unit, net weight, price, and seasonality (the months in which the food usually available) were important data collected using ProPAN form (1-5.I) (PAHO/WHO, 2003).

3.4.6 Dietary intake

Dietary intake was captured with three non-consecutive 24-hour recalls based on information provided by mothers/caregivers on behalf of their child. Interviewers collected ordinary domestic utensils (e.g. serving, table and tea spoons), plastic bowls and cups used by the children and weighed the child's typical portion size three times to estimate the mean weight of food eaten.

Based on recall, the same mothers (60) who were involved in the dietary assessment, and had children aged six to 23 months provided information on child food intake. Portion size of recipes taken was measured using sensitive food scales and analyzed using ProPAN software complemented by the Tanzania Food Composition Table (Lukmanji *et al.*, 2008). To determine the nutrient adequacy both macronutrient and micronutrient intakes notably

iron, zinc, calcium, vitamin A and C were compared with the Dietary Reference Intakes (DRIs) (IOM, 2000; PAHO/ WHO, 2003).

To obtain a reliable assessment of dietary intake, visual aids such as food samples like fruits (ripe banana, mango) were used to help mothers and researchers to precisely measure, report and record reasonable portion sizes which provide a reasonably accurate estimate of usual intake for studies at the population level. The collection of dietary data was simplified by the limited variety of food available and the use of consistent preparation methods in the community.

3.4.7 Recipe creation exercise

The major aim was to obtain nutritious recipes that might contribute to overcoming the dietary inadequacies that has been found in the target population, as guided by ProPAN (Form II-1.1). Meanwhile the improved recipes considered the varieties of foods that are more nutritious than the prevailing ones.

3.4.8 Selection of potential foods

Based on the results from FGDs, Market Survey (Module I) and information collected in the 24-hour recall specific foods and food combinations were selected for the recipe creation sessions. Some criteria for the selection of these foods are listed below (PAHO/WHO, 2013).

i. Availability: Refers to foods usually available in the home or sold in the local community.
ii. Nutritional value: Refers to the selection of foods that are high in the nutrients found to be lacking in the diet.

iii. Cost per nutritional benefit: Refers to foods that are accessible to the target population and that have good nutritional value in relation to their cost.

iv. Actual use: Refers to foods commonly used by families and their method of cooking and preparation.

v. Acceptability: Refers to the cultural acceptability of feeding these foods to small children.

3.7.9 Identification of the potential food combinations

Once the potential foods had been selected, the most nutritionally appropriate food combinations were identified keeping in mind the dietary inadequacies found during the nutritional assessment carried out before. These potential food combinations were presented to mothers who were then asked to create new recipes or modify existing ones. The film/movie (www.health phone.org) shown to mothers helped them to modify the existing preparation and creating the suitable recipes for their children.

Consideration was given to age group and stratified into (six to 11) months and (12-20) months; the only difference between the two was viscosity of the preparation.

For each session, 15 mothers with under-nourished children were nominated by CHWs and invited to participate in the recipe creation exercise. Children were stratified into two age groups six to 11 months and 12-20 months during recipes creation exercise. Consent was sought from each mothers/ caregivers on willingness to participate in the study (Participant Consent Letter and Form (ProPAN form I-2.1).

3.4.10 The test of recommendations

The intention of testing the recommendations was to have a potential impact that would promote a behavioral change to respondents. The recommendations were developed after

watching film/movie (www.health phone.org) subsequent to the outcomes of both FGDs and 24 hour dietary recall that disclose the general feeding practices from each respective village. The tested recommendations were the followings: Increase meal frequency, Feed your child a portion of fish whenever available to increase protein density, Feed your child leafy vegetables and fruits, Add snacks between main meals especially fruits whenever available, and Add milk to your child's food/meal.

3.5 Monitoring

Monitoring was done to assist, motivate and identify barriers that hinder participants from abiding with the recommendations. This information was collected using initial visit forms (ProPAN form II-2.1), follow-up and final visit forms (ProPAN form 11-2.2). During this exercise mothers were also able to explore their views, behaviour and attitudes towards complementary feeding that hamper or interferes nutritional status of their children. This made the researchers to suggest suitable advice and nutritional counseling based on their behaviour/attitude.

3.6 Data Analysis

Dietary data from 24 hours recall and anthropometry were analyzed using ProPAN software with Epi-info adopted by PAHO/WHO (2003). Output included energy and nutrient density of foods, nutrient intake, adequacy, and proportion of children with intakes below the recommended values. Child's degree of malnutrition of either normal, mild, moderate or severe was interpreted using (WHO, 2006) growth references standards, after being analyzed into z-score indices (WAZ, HAZ and WHZ), (Table 1). Child's MUAC for age were interpreted using de Onis *et al.* (1997).

Qualitative data from interviews and FGDs were documented in matrix form II-3.1 and the field notes were organized and reviewed which were then categorized into major themes for description, analyzed using matrix form II-3.2 (PAHO/WHO, 2003). Collected information from initial, follow-up and final visits were analyzed using matrix forms reflecting on feasibility of adoption and potential impact criteria or compliance using the mentioned recommendations.

Descriptive statistics (frequency, mean, standard deviation and percentage) were used to describe socio-economic, anthropometric and recommendation of dietary intake of the study population. Inferential analysis was done by SAS version (8-2004). F-test and T- test (Duncan Multiple Range Test) were used to establish statistical difference between the means and Chi-square- test was used to create association between categorical data.

3.7 Ethical Approval

Permission to carry out study was accredited by the Office of the Second Vice President of Government of Zanzibar who's determined to meet the administrative exemption criteria with reference number (OMPR/M.95/C.6/VOL XII/62). This was in accordance with research technical and ethical clearance reviewed by ZAMREC reference number (ST/0001/September/014). Both district and villages/shehia administrative authorities were informed officially about the study in advance. Informed verbal consent from the participants was taken prior to data collection. Similar to recipes creation exercise and monitoring phase, consent was documented by signing a consent form described from the ProPAN guidelines manual.

CHAPTER FOUR

4.0 RESULTS

This part covers results from socio-demographic and economic characteristics of parents, nutritional status of children, dietary and feeding practices and recipe formulations from all four villages Wingwi Mtemani, Tumbe East, Maziwa Ng'ombe and Kiuyu Mbuyuni.

4.1 Household Water Utilization, Sanitation and Hygiene

About 55.25% of the households use tap water for domestic purpose (comprising both home and public installation). Water treatment before drinking was not a common practice in the households for either tap water or wells water consumers, except during a public awareness campaign when there are of reported outbreak of water bone diseases. More than a half of the households (52.5%) had no access to toilet facility (Table 2).

Table 2: Household water utilization, sanitation and hygiene (n=360)

Water accessibility	Frequency	Percentage
Tape water (home installation	10.0	2.77
Tape water (public installation)	190.0	52.77
Wells (uncovered)	144.0	40.00
Wells Pumps (covered)	16.0	4.44
Toilet facilities		
Pit latrine (owned by family)	80.0	22.22
Improved Pit latrines (public/communal	90.0	25.00
Bush/ Field	190.0	52.77

4.2 Housing Information

Housing and other surrounding environment indicated high level of poverty. More than three quarters (85.62 %) of the houses were roofed with thatches from coconut trees. Walls and floors were also made from muddy (64.37%) and soil (95.67 %). Some of them particularly from Maziwa Ng'ombe and Kiuyu used blocks made from stones but doors

and windows were covered with coconut branches ("*kumba*") which indicates the status of impoverishment. Nearly all villagers (96.35%) depended on fire woods as their chief source of fuel for house hold activities (Table 3).

Table 3: Housing information (n=360)

	Frequency	Percentage
Roofing		
Iron sheet	47	13.05
Thatches/ branches of coconut tree	313	86.94
Floor		
Cemented	17	4.72
Muddy/Soil	343	95.27
Walls		
Blocks	100	27.77
Stones	32	8.88
Muddy	228	63.33
Source of fuel		
Fire woods	343	95.27
Charcoals	17	4.72
Kerosene	-	0.00
Electricity	-	0.00
Gas	-	0.00

4.3 Health Services Accessibility

Even though reproductive services are in their vicinity, home deliveries attended by traditional birth attendants (TBA) dominate more than two thirds (65.27%) of the respondents versus hospital delivery. Each of the four villages has a health center in its locality, three of them (Wingwi Mtemani, Maziwa Ng'ombe and Kiuyu Mbuyuni) have maternity wards where reproductive services can be provided with a health professional personnel. This implies that about half (51.66%) of the respondents walk short distance to health centers (Table 4).

Table 4: Clinical attendance during pregnancy (n=360)

Interval of attendance	Frequency	Percent
Never	2	0.005
Once	50	13.88
Twice	170	47.22
Thrice	100	27.78
More than thrice	10	2.78
Not sure	28	7.78
Place of delivery		
Hospital	97	26.94
Home	235	65.27
Not sure	28	7.78
Distance to the health center		
Less than 1 km	186	51.66
1-2 km	108	30.00
2-3 km	33	9.17
More than 3 km	33	9.17

Meanwhile, immunization coverage (Nov-Jan 2014/2015) was sound good for early and middle vaccinations like after birth, after six weeks and after 10 weeks but started to decline from nine months (measles one) and became more deteriorated after 18 months (measles two).

4.3.1 Common childhood morbidity

More than a quarter (35.27%) of the children was reported to suffer from a certain illness during the survey. Diarrhea and respiratory infection (coughing) were the dominant illnesses reported by mothers and caregivers (Table 5).

Table 5: Common illness of the children (n=360)

Child morbidity	Frequency	Percent
Children sick in the previous day	127	35.27
Fever	15	4.10
Diarrhea	82	22.77
Coughing	30	8.33

4.3.2 Response to vitamins and mineral supplements

About 90.0% of mothers were not aware of the vitamins and minerals supplementation such as multi-vitamin and mineral supplements in forms of syrup or powder such as sprinkles, lipid nutrient supplement such as nutri-butter or plumpydoz/plumpy-nut and supplementary food such as corn soya blend. Only 9.64% were aware of these but they had not received any of the mentioned supplements. None of the respondents had reported receiving food aid from general food rations, vouchers for food or cash assistance to help purchase food. Virtually, coverage of Vitamin A supplementation was consistent since all mothers had reported that their children had received Vitamin A capsule during the past six months.

4.4 Feeding Practices among Children 6-23 Months Old.

Information on infant feeding practices collected from various techniques including focus group and caregiver's interviews indicated the inappropriateness. Even though the study concentrated on complementary feeding, it was worth to give a highlight of some breastfeeding practices.

4.4.1 Breast feeding practices

Nearly all the children (98.0%) had ever been breastfed while less than half (48.8%) having been initiated to breastfeeding timely (within one hour of birth). Half of the mothers (50.0%) had breastfed their new born three hours after delivery. Interviewed mothers showed that majority (83.33%) of the children were still breastfeeding compared to 16.67% who had stopped breastfeeding at the time of the study. Also three quarters (77.76%) of the children had received colostrum (Table 6).

Table 6: Breast feeding practices (n=360)

Breast feeding	Frequency	Percent
Breast feeding status		
Yes	300	83.33
No	60	16.66
Initiation of breast feeding		
Within an hour	38	10.56
After 1-3 hours	102	28.33
After 3 hours	200	55.55
Don't know	20	5.56
Breastfed colostrum		
Yes	280	77.76
No	60	16.66
Don't know	20	5.56

4.4.2 Complementary feeding practices

All children (100%) had received solid, semi-solid or soft foods the previous day before interview. Majority of the mothers reported to have introduced other foods apart from breast milk as early as when their babies were less than one to two months old. Tea and honey were common foods that had been given as starter, followed by light porridge and boiled rice, but from four months onwards babies were usually fed with same foods that had been prepared for family members. The meal pattern was dominated by rice with coconut milk, black tea, white bread for toasting and African- doughnut (refer frequency of consumed foods before intervention).

Fig. 2 shows types of foods and feeding frequency of the foods commonly used for complementary feeding in sea weed farming livelihood zone. Energy dense foods such as cereals and cereal products were consumed more compared to other types such as root and tubers, fruits and vegetables which typically declares monotony kind of dietary pattern. The consumption trends before intervention were dominated by rice with coconut milk, wheat bread and doughnut, maize and wheat porridge.

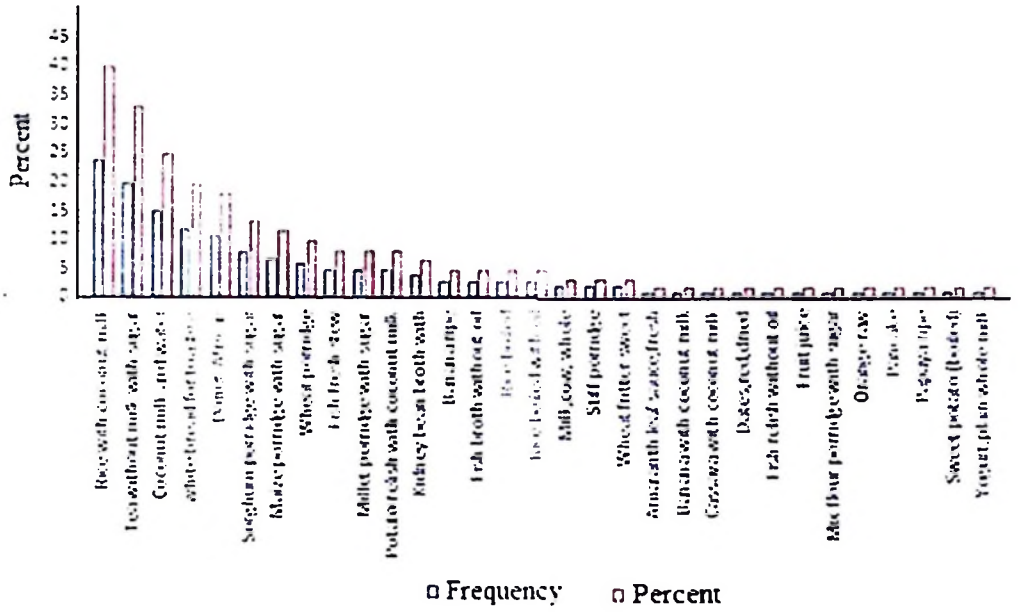

Figure 2: Most frequently consumed foods before intervention

There was a slight change of food consumption pattern after intervention. Other food groups were introduced as snacks particularly fruits hence to some extent the meal become diversified.

Fig. 3 shows the foods and consumption pattern used in complementary foods after intervention. Although rice with coconut milk, and black tea were still in the leading trends but at least fruits (mango) and fish stew had been reported after intervention which is a tremendous improvement compared to previous results. Moreover, other animal source foods such as milk and other fruits like banana and green vegetables had been taken though in a low frequency.

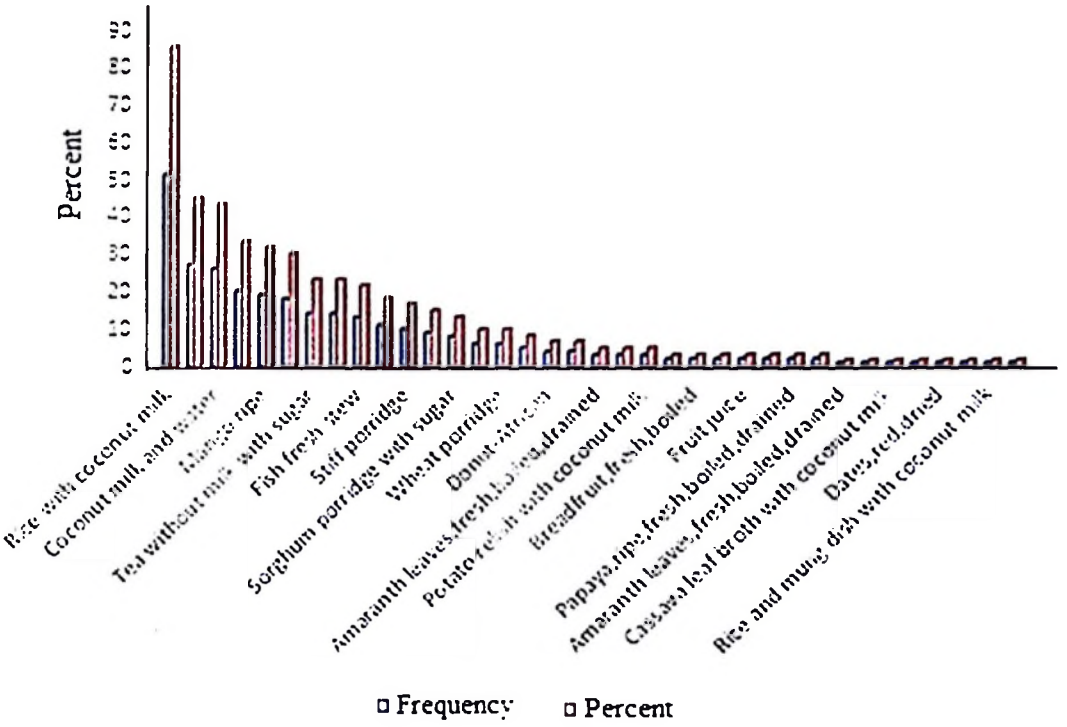

Figure 3: Most frequently consumed foods after intervention.

4.5 Farmers Engagement in Food Crop Production

Most of the respondents (67.5%) were engaged in production of cereals, root and tubers followed by banana (12.5%) whereas 10% of the respondents were not engaged in farming activities. Production of legumes, fruits and vegetables were still petty even to cater for household's consumption (Fig. 4).

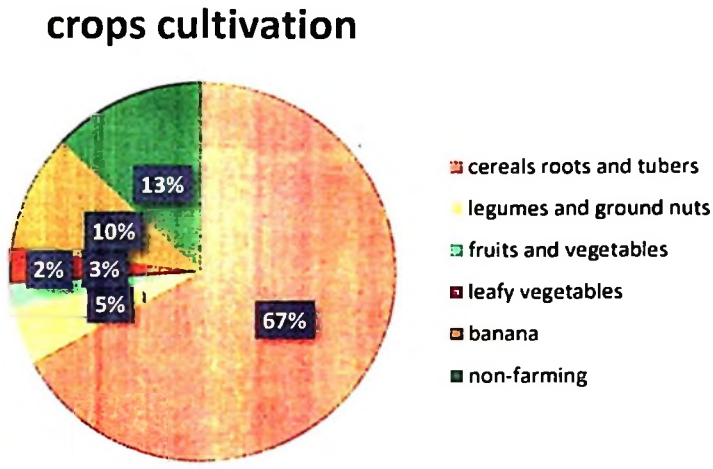

Figure 4: Percentage of farmers who engaged in different crop production

Livestock keeping

Concurrently, in seaweed livelihood zone domestic animal keeping was considered as petty even for subsistence purposes, because majority of the keepers had a range of one to 10 indigenous cattle (115), goats (58) and poultry (106). With the exception of poultry keeping where at least one among household owned more than 50 indigenous chickens (Table 7).

Table 7: Livestock keeping

	Number of keepers for a given range				
Range of animals	**1-10**	**11-20**	**21-30**	**31-40**	**41-50**
Cattle	115	11	-	-	-
Goats	58	4	-	-	-
Poultry	106	54	10	5	1

4.6 Nutritional Characteristics of the Participating Children

Data were obtained from four nutritional surveys involving 360 children. Of these, 49.72% were females and 50.28% were males. Results showed that (29.57%) were underweight i.e mildly malnourished using WAZ score, (20%) wasting using WHZ score, and (23.61%) were stunting using HAZ score. The results also depicted moderate underweight (14.07%);

wasting (11.38%); and stunting (5.37%), similar to MUAC mildly (28.32%) and moderate (16.07%). Severe cases were found particularly in under-weight (9.17%) and wasting (10%) while few of them were found to be stunted (2.22%) (Table 8).

Table 8: Nutritional status of the surveyed children from four villages

	WAZ		WHZ		HAZ		MUAC	
	N	%	N	%	N	%	N	%
Normal								
Male	70	38.67	102	56.35	105	58.01	93	51.38
Female	103	57.54	109	60.89	143	79.88	99	55.3
Total	**173**	**48.05**	**211**	**58.61**	**248**	**68.88**	**192**	**53.34**
Mild								
Male	59	32.59	33	18.2	58	32.04	50	27.93
Female	46	25.69	40	22.3	28	15.62	54	29.83
Total	**105**	**29.17**	**72**	**20**	**85**	**23.61**	**104**	**28.88**
Moderate								
Male	29	16.02	22	12.15	15	8.28	29	16.2
Female	20	11.17	21	11.73	2	1.11	12	6.62
Total	**49**	**13.6**	**41**	**11.38**	**19**	**5.27**	**41**	**11.38**
Severe								
Male	23	12.7	24	13.25	8	4.46	11	6.07
Female	10	5.58	12	6.7	0	0	12	6.7
Total	**33**	**9.17**	**36**	**10**	**8**	**2.22**	**23**	**6.38**

Average anthropometric characteristics from villages

On average children from all four villages expressed mild under-nutrition based on analyzed anthropometric indices. Under-weight and wasting were more prevailing in Kiuyu Mbuyuni (-1.03 and -1.10) and Maziwa Ngo'mbe (-1.09; -0.95). All these and other indices indicate the condition of under-nutrition (Table 9).

Table 9: Average anthropometric characteristics from villages

	Wingwi Mtemani		Tumbe east		Maziwa Ng'ombe		Kiuyu Mbuyuni	
	mean	s d	mean	s d	mean	s d	mean	s d
Weight (kg)	8.69	1.62	8.57	1.69	7.83	1.44	7.63	1.04
WAZ	-0.92	1.55	-0.75	1.68	-1.09	1.51	-1.03	1.06
Height (cm)	73.43	3.36	71.7	2.97	69.96	2.43	68.99	3.60
HAZ	-0.68	2.53	-0.54	1.98	-0.81	1.65	-0.51	1.23
WHZ	-0.73	2.11	-0.89	0.76	-0.95	0.88	-1.10	0.58
MUAC (cm)	12.98	1.20	13.87	1.13	13.43	1.36	13.47	0.98
MUACZ	-1.43	1.19	-0.53	1.00	-0.84	1.29	-0.74	0.97

4.7 Monitoring Phase

After the baseline survey which had exposed the prevalence of nutritional status, fifteen malnourished children were then recruited from each village. Thus a total of 60 households (i.e. 60 children) were enrolled for monitoring stage.

4.8 Socio-demographic Characteristics

Table 2 presents socio-demographic characteristics of the respondents/parents from the four study villages Wingwi Mtemani, Tumbe East, Maziwa Ng'ombe and Kiuyu Mbuyuni. More than half of mothers (56.67%) were of age between 20–30 years and 40% fathers were between 31-40 years. About 63.3% and 60% of mothers and fathers respectively had no formal education. More than half of mothers (55%) were engaged in seaweed farming activities whereas about 57% of the fathers were engaged in fishing activities. The average family size was seven, with a maximum of 10 and minimum of three members (Table 10).

4.9 Parent's Average Earnings for the Dominant Income Generation Activities

Mean monthly incomes for common occupation in seaweed farming livelihood zone were 60 000 -70 000 Tshs and 150 000 Tshs for small scale seaweed farmers and fishermen; while for medium scale they were 150 000 Tshs and 300 000 Tshs for seaweed farmers and fishermen respectively.

Table 10: Parent's socio - demographic characteristics of the monitored respondents from the four villages (n=60)

	Mother		Father	
	Frequency	Percentage	Frequency	Percentage
Age (years)				
20 - 30	34	56.67	20	33.30
31- 40	23	38.35	24	40.00
41- 50	3	5.00	13	21.67
51- 60	0	0.00	2	3.33
60 +	0	0.00	1	1.67
Education				
No formal education	38	63.33	36	60.00
Primary school	17	28.33	11	18.33
Secondary school	5	8.33	12	20.00
VETA	0	0.00	1	1.67
College/ university	0	0.00	0	0.00
Occupation				
Petty trades	14	23.33	0	0.00
Seaweed farming	33	55.00	3	5.00
Crop farming	13	21.67	5	8.33
Carpentry	0	0.00	4	6.67
Entrepreneurship	0	0.00	7	11.67
Employee	0	0.00	2	3.33
Fishermen	0	0.00	34	56.67

Children enrolled in this phase were then categorized into two age groups six to 11months and 12-20 months and breastfeeding status (i.e breastfed and non-breastfed). Mid upper arm circumference was used as a criteria to enter in the monitoring phase. It must be noted that age 12-20 months allowed children to be monitored for duration of three months while still remaining in under two years.

4.9.1 Anthropometric indicator of the monitored children (based on MUAC)

During analysis these children were classified either as severely or not severely malnourished using cut-off points (<115mm). About 26.08 and 16.00% of 12-23 months old children and who were still being breastfed respectively, were severely malnourished (Table 11).

Table 11: Malnourished children based on (MUAC<115 mm)

	Frequency	Percent	Frequency	Percent
		06-11months		12-23 months
Not severely malnourished	29	78.30	17	73.90
Severely malnourished	8	21.60	6	26.08
Total	37	100.00	23	100.00
	Breastfed		**Non-breastfed**	
Not severely malnourished	42	84.00	8	80.00
Severely malnourished	8	16.00	2	20.00
Total	**50**	**100.00**	**10**	**100.00**

4.9.2 Anthropometric indicator of the monitored children before intervention using WHZ

Almost 73.3% of the children in age group 12-23 months were acutely malnourished compared to 70.20% for six to11 month's age group. Non-breastfed children were more affected (80%) compared to breastfed children (74%) and thus expressed the high level of wasting (Table 12).

Table 12: Acutely malnourished WHZ-score

	Frequency	Percent	Frequency	Percent
	06-11 months		12-23 months	
Acutely malnourished	26	70.20	17	73.30
Not acutely malnourished	11	29.70	6	26.70
Total	**37**	**100.00**	**23**	**100.00**
	Breastfed		**Non-breastfed**	
Acutely malnourished	37	74.00	8	80.00
Not acutely malnourished	13	26.00	2	20.00
Total	**50**	**100.00**	**10**	**100.00**

4.9.3 Anthropometric indicator of the monitored children before intervention using (HAZ)

From the 6-11 months children monitored 13.50% were stunted. The age group 12-23 months was more stunted (30.4%) than six to 11months counterparts. Similarly, non-breastfed were more affected (30.0%) compared to breastfed children (16.0%) (Table 13).

Table 13: Proportion of stunted children based on (HAZ)

	Frequency	Percent	Frequency	Percent
Age group		**06-11months**		**12-23 months**
Not stunted	32	86.40	18	78.20
Stunted	5	13.50	7	30.40
Total	**37**	**100.00**	**23**	**100.00**
	Breastfed		**Non-breast fed**	
Not stunted	42	84.00	7	70.00
Stunted	8	16.00	3	30.00
Total	**50**	**100.00**	**10**	**100.00**

4.9.4 Anthropometric indicator of the monitored children using (WAZ)

More than half (51.35%) of the six to 11 months aged of the monitored participants were underweight. Indeed, 64.00% and 60.00 % of the children aged 12-23 months and non-breastfed respectively were more affected by under-weight compared to breastfed children (56%) (Table 14).

Table 14: Underweight (weight-for-age <-2Z)

	Frequency	Percent	Frequency	Percent
Age group	**06-11 months**		**12-23 months**	
Not underweight	18	48.60	9	36.00
Underweight	19	51.35	16	64.00
Total	**37**	**100.00**	**23**	**100.00**
	Breastfed		**No-breastfed**	
Not underweight	22	44.00	4	40.00
Underweight	28	56.00	6	60.00
Total	**50**	**100.00**	**10**	**100.00**

4.9.5 Association between nutritional status and socio-demographic characteristics

Using Chi-square test, regression and multivariate analysis only occupation was found to be significantly associated with WHZ at ($p = 0.04$). Other socio-demographic characteristics like parent's age and education were not significantly associated with child growth indicators (WAZ and HAZ).

4.9.6 Comparison of anthropometric means before and after intervention

Comparing data using F-test based on Duncan Multiple Range Test (DMRT) it was found that only two groups (12-23 months and who were still being breastfed) indicated a significant difference at ($p < 0.05$). The same aged group showed a significant difference in MUAC at $p < 0.05$ (Table 15).

Table 15: Result of anthropometric measurement means before and after intervention

State of intervention	Age			Strata	Breastfeeding status		
	weight	height	MUAC		weight	height	MUAC
6-11 months				**Breastfed**			
Before	6.431a	69 a	117.118 a	Before	**6.73a**	71.52a	115.439a
After	7.016a	71.895a	125.947a	After	**8.883b**	73.333a	129.25a
12-23 months				**Non-breastfed**			
Before	**7.313a**	76.583a	**114.736a**	Before	7.05a	74.6a	119.6a
After	**9.454b**	78a	**130.402b**	After	8.458a	**76.091a**	127.958a

Means in the same column followed by the same letter are not significantly different at $P \leq 0.005$

4.10 Responses from FGDs

Information compiled from FGDs expressed the overall picture that dietary diversity was low in most settings in the four villages. Food groups rich in protein and iron such as meat, fish, legumes as well as fruits and vegetables for other micronutrients were most missing.

Although coconut milk and sugar comprised most of the prepared recipes, most of mothers in Maziwa Ng'ombe and Kiuyu perceived that "it is laborious to prepare cereal grains such as bulrush millet and sorghum", though they are locally produced. Instead they opt to buy porridge which has already been prepared from other shanty food dealers that are usually diluted. Also, it has been exposed that beans and ground nuts were neglected to be

include in preparing complementary foods from all four villages, mothers avoided these foods in order to prevent flatulence.

Similarly, despite the abundance of various cultivars of leafy vegetables in their locality such as pumpkin leaves, yams and drum stick leaves, villagers tend to select few species of leafy vegetables notably from cassava, sweet potatoes and amaranths. This resulted into inconsistency in vegetable consumption. Also participant's in FGDs revealed that the tendency of mothers to resume seaweed farming activities while their children were still at tender aged contribute to poor feeding practices.

4.11 Market Survey

Generally, most of the foods were available in the markets during survey. However, from the FGDs it was revealed that sweet potatoes, carrots and some fruits like mango are available in specific months compared to the rest of the foods which are available throughout the year.

Roots and tubers were cheaper foods which cost 1,000 Tsh about 3000g equivalent to (33.33 Tshs per 100g) of edible potion. Fish and legumes were costly than other food stuffs, ranging from 2000-4000 Tsh/ 1000g and 1500-2000 Tsh/1000g respectively. Fig. 5 shows average costs of different foods available in the markets in the four villages studied.

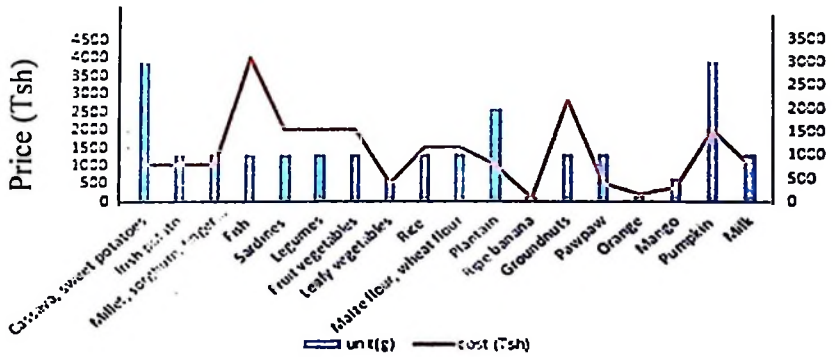

Figure 5: The average costs of different food stuffs during the market survey

4.12 Dietary Diversity and Meal Frequency

Despite the fact that dietary diversity increased as the child grew, none of the age group had achieved minimum dietary diversity of 4 food groups out of the 7 recommended by WHO/USAID/FANTA/IFPRI/UNICEF (2008). Amazingly, after intervention significant number of children (33.3%) were able to meet minimum dietary diversity. Meanwhile, before intervention nearly half of the children (43.3%) failed to reach the minimum meal frequency in a 24-hour period, but after intervention substantial number of children (91.7%) were able to meet minimum meal frequency (Table 16). Virtually, all children did not meet the minimum acceptable diet due to the fact that neither of them had attained minimum dietary diversity nor minimum meal frequency.

Table 16: Proportion of children who met minimum dietary diversity and minimum meal frequency (n=60)

	Minimum Dietary Diversity		Minimum Meal Frequency	
Before intervention	N	%	N	%
6-11 months	36	0	21	58.30
12-23 months	24	0	5	20.80
Total	60	0	26	43.3
After intervention				
6-11 months	7	36.80	18	94.70
12-23 months	13	31.70	37	90.20
Total	20	33.3	55	91.70

4.13 Energy Intake

4.13.1 Recommended energy consumption in a 24-hour period.

Before intervention energy consumption (expressed as percentage of RDA) was below the recommendation (36.7%) but rectified after intervention (50.0%). Children aged 12-23 months and non-breastfed seemed to be more affected (4.2%) and (10.0%) respectively, but after intervention 85.4% of children aged 12-23 months managed to meet recommendation, while the non-breastfed children failed to meet recommendation (Table 17) Refer RDA in Appendix 3.

Table 17: Proportion of children consuming recommended median energy (kilocalories) in a 24-hour period. - stratified by age group and breastfeeding status

Energy recommendation, AGE=06-11 months.					
Before intervention			**After intervention**		
Energy recommendation	**Frequency**	**Percent**	**Energy recommendation**	**Frequency**	**Percent**
Who didn't meet RDA	15	41.7	Who didn't meet RDA	1	5.3
Who met RDA	21	58.3	Who met RDA	18	94.7
Total	36	100.0	**Total**	19	100.0
Energy recommendation, AGE=12-23 months					
Who didn't meet RDA	23	95.8	Who didn't meet RDA	29	70.7
Who met RDA	1	4.2	Who met RDA	12	29.3
Total	24	100.0	**Total**	41	100.0
Energy recommendation: Breastfed.					
Energy recommendation	**Frequency**	**Percent**	**Energy recommendation**	**Frequency**	**Percent**
Who didn't meet RDA	29	58.0	Who didn't meet RDA	18	37.5
Who met RDA	21	42.0	Who met RDA	30	62.5
Total	50	100.0	**Total**	48	100.0
Energy recommendation: Non-breastfed.					
Who didn't meet RDA	9	90.0	Who didn't meet RDA	10	83.33
Who met RDA	1	10.0	Who met RDA	2	16.67
Total	10	100.0	**Total**	12	100.0
Energy recommendation	**Frequency**	**Percent**	**Energy recommendation**	**Frequency**	**Percent**
Who didn't meet RDA	38	63.3	Who didn't meet RDA	30	50.0
Who met RDA	22	36.7	Who met RDA	30	50.0
Total	60	100.0	**Total**	60	100.0

RDA: For breastfed six to11 months 202-307 kcal; non-breastfed six to11 months 615-686 kcal; for breastfed 12-23 months ~548 kcal; for non-breastfed 12-23 months 894 kcal (IOM, 2000).

4.13.2 Recommended energy consumption per kilogram of child's weight

To investigate recommended energy consumption per kilogram of body weight, before intervention it was observed that 60% of the children were able to meet energy recommendation whereas after intervention 88.3% of children were able to meet energy recommendation. Age group 12-23 months and non-breastfeeding children were still far from attaining recommendation but tremendous improvement was noted after intervention (Table 18). Refer RDA in Appendix 3.

Table 19: Comparison of energy densities before and after intervention and intake before and after intervention

Category	Energy density of the diet	Energy intake (kcal)
Age group		
6-11months		
Before	22.382[a]	9719.223[a]
After	43.588[b]	10614.17[b]
12-23months		
Before	31.069[a]	6901.205[a]
After	49.787[b]	22022.202[b]
Breast fed		
Before	57.333[a]	14550.925[a]
After	62.901[a]	25043.498[b]
Non-breastfed		
Before	11.756[a]	2964.450[a]
After	15.838[a]	6701.427[b]
Total		
Before	43.301[a]	10509[a]
After	44.794[a]	19044[b]

N.B. Means with the different letters are significant different at $p < 0.05$ (F-test) based on Duncan Multiple Range.

4.14 Specific Nutrient Intake

Nutrient intakes from three 24-hour recalls were compared with the Dietary Reference Intakes. None of the group has attained the estimated recommendations of specific nutrient intake.

Intake of iron, zinc and calcium were most deficient minerals among the six specific nutrients. Meanwhile 12-23 months and non-breastfed children were the most affected groups in all reported nutrients because were still far from recommendation.

Even though children failed to meet the recommended dietary allowances before intervention for protein and vitamin C 76.7%; and 61.7% but tremendous improvement was attained after intervention 90%; and 66.7%. In contrary, extremely poor intake of important minerals notably iron, zinc, vitamin A and calcium was observed. That is to say

none of them had attained the recommended intake of these minerals (Table 20). Refer RDA in Appendix 3.

Table 20: Proportion of children who met recommended specific nutrient intake before and after intervention

Group	Protein (g)	Iron (mg)	Zinc (mg)	Vitamin A (µ/RE)	Vitamin C (mg)	Calcium (mg)
Before intervention						
6-11 months	86.1	0.0	0.0	11.1	61.7	0.0
12-23 months	62.5	0.0	0.0	0 0.0	16.7	0.0
Breastfed	68.0	0.0	0.0	8.0	72.0	0.0
Non-breastfed	20.0	0.0	0.0	0.0	10.0	0.0
Total	**76.7**	**0.0**	**0.0**	**6.7**	**61.7**	**0.0**
After intervention						
6-11 months	94.7	0.0	0.0	21.1	94.7	5.3
12-23 months	87.8	8.2	0.0	9.8	53.7	9.8
Breastfed	87.8	6.3	0.0	16.7	88.8	10.4
Non-breastfed	50.0	6.3	0.0	0.0	58.3	0.0
Total	**90.0**	**6.3**	**0.0**	**13.3**	**66.7**	**8.3**

N.B The proxy EAR for the Specific Nutrient Intake.

Protein: six-11 months, 1.3-2.0g for breastfed; 6-6.3g for non-breastfed.

12-23 months, 3.3g for breastfed; 7.2g for non-breastfed.

Iron: six-11 months, 7.1mg for breastfed; 3.8mg for non-breastfed.

12-23 months, 7.3mg for breastfed; 4.0mg for non-breastfed.

Zinc: six-11 months, 3.5 – 3.6mg for breastfed; 4.2mg for non-breastfed.

12-23 months, 4.8mg for breastfed; 5.4mg for non-breastfed.

Vitamin A: six-11 months 9.3- 30.0mcg RAE for breastfed; 250.0mcg RAE for non-breastfed;

12-23 months 90.0 mcg RAE for breastfed; 285.7mcg RAE for non-breastfed.

Vitamin C: six-11 months, 0mg for breastfed; 20.8mg for non-breastfed.

12-23 months, 6.7mg for breastfed; 25.0mg for non-breastfed.

Calcium: six-11 months, 280 -294.2mg for breastfed; 437.5mg for non-breastfed.

12-23 months, 163.3mg for breastfed; 291.7 mg for non-breastfed

Recommended Dietary Allowances (IOM, 2000).

4.14.1 Comparison of specific nutrients before and after intervention

With the exception to six to 11 months old children, it was observed that there was significant difference in protein intake before and after intervention at $p< 0.05$ for age group of 12-23 months and for both breastfed and non-breastfed children.

Similarly, there were significant differences in other specific nutrients such as vitamin A, C and calcium at $p < 0.05$. In contrast, findings had observed that there was no significant difference of intake for iron, zinc, vitamin A and calcium in non-breastfed children before and after intervention (Table 21).

Table 21: Results for specific nutrient intake with respect to six nutrients: protein, iron, zinc, vitamin A, vitamin C and calcium

Category	Protein (g)	Iron (mg)	Zinc (mg)	Vitamin A (μRE)	Vitamin C (mg)	Calcium (mg)
Age group						
6-11months						
Before	144.645[a]	41.788[a]	29.372[a]	295.6[a]	88.34[a]	1097.66[a]
After	157.87[a]	44.905[a]	30.62[a]	755.073[b]	315.512[b]	1134.679[b]
12-23months						
Before	112.488[a]	26.037[a]	19.641[a]	367.534[a]	150.206[a]	590.427[a]
After	354.05[b]	102.931[a]	75.283[a]	1597.073[b]	640.929[b]	3021.366[b]
Breast fed						
Before	266.048[a]	59.847[a]	42.321[a]	539.934[a]	179.576[a]	1265.382[a]
After	406.575[b]	115.929[a]	85.463[a]	1750.342[b]	616.19[b]	3593.254[b]
Non-breastfed						
Before	44.31[a]	11.095[a]	6.94[a]	123.2[a]	58.47[a]	422.705[a]
After	92.12[b]	28.79[a]	19.192[a]	301.804[a]	340.251[b]	562.791[a]
Total						
Before	162.21[a]	42.57[a]	29.56[a]	397.9[a]	142.83[a]	1012.9[a]
After	299.22[a]	86.83[a]	62.79[a]	1411.3[b]	573.86[b]	2493.6[b]

N.B. Means with the different letters are significant different at $p < 0.05$.

4.14.2 Specific nutrient intakes consumed in a 24-hour period before and after intervention

Table 22 presents data for total average means and standard deviations of the analyzed specific nutrients intake. When these means compared before and after intervention using T-test only protein and vitamin C indicated significant difference at p = 0.0011and 0.0012 respectively. There was no significance difference for iron (p= 0.356); zinc (p=0.097); and vitamin A (p=0.062), however slightly attainment observed for calcium (p= 0.0542).

Table 22: Description of average means and standard deviation for specific nutrient intakes

	Protein (g)		Iron (mg)		Zinc (mg)		Vitamin A (µRE)		Vitamin C (mg)		Calcium (mg)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Before intervention												
Age group												
6-11months	4.3853	2.6107	1.2474	0.7153	0.8506	0.4802	8.2111	20.7635	2.44	6.1488	30.4906	55.015
12-23months	4.687	2.5644	1.0849	0.6109	0.7767	0.3937	15.3139	22.6435	6.2586	13.2917	24.6011	29.4527
Total	**4.506**	**2.5747**	**1.1824**	**0.6749**	**0.821**	**0.4456**	**11.0522**	**21.6319**	**3.9674**	**9.7395**	**28.1348**	**46.2828**
Breast feeding status												
Yes	4.521	2.3341	1.1969	0.6752	0.8464	0.4473	10.7987	21.3485	13.2917	7.9897	25.3076	45.0171
No	4.431	3.7132	1.1095	0.7046	0.694	0.4369	12.32	24.1685	5.847	16.4193	42.2705	52.3719
After intervention												
Age group												
6-11months	7.6129	2.4509	2.1993	0.9311	1.5459	0.5192	39.7407	55.6163	16.6059	15.3817	59.7199	97.3757
12-23months	8.6354	3.9041	2.5105	1.0203	1.8362	0.6754	38.953	45.4543	15.6324	16.0255	73.6919	88.1913
Total	**8.3116**	**3.5208**	**2.412**	**0.9957**	**1.7442**	**0.6404**	**39.2024**	**48.4206**	**15.9407**	**15.7004**	**69.2674**	**90.6024**
Breast feeding status												
Yes	8.4703	3.592	2.4152	1.024	1.7805	0.6379	36.4655	48.8357	12.8373	12.6622	74.8595	99.5271
No	7.6767	3.2877	2.3992	0.9153	1.5993	0.6572	50.1503	47.1357	28.3543	20.6633	46.8993	31.9782

4.15 Sources and Relevance of Information on Complementary Feeding

Majority of mothers reported that they got information regarding complementary feeding from the health facility, while others disclosed that they got information from family and friends, which perchance were the source of misleading information. Although mothers declared that the information received from the health facilities was beneficial in ensuring that their children become healthy, however compliance to these messages were still lower.

4.15.1 Summary of the main findings on mothers' perceptions beliefs, and food myth on complementary feeding

During monitoring phase there were challenges and barriers including myths and beliefs some of which were related to certain food and feeding practices as identified during home visit. Table 23 summarizes the identified barriers and the suggested solutions provided to facilitate the adoption process of the recommendations.

Table 23: Matrix of solutions (Form II-2.4)

Recommendation 1: Increase meal frequency **Barriers** • Time is limited for frequent feeding because most mothers returns from their seaweed farming activities at late hours • Frequent feeding need repeated food preparation and more firewood • Most families delayed to prepare lunch, so often meal is taken at evening hours and dinner become an optional for children • Child felt restless at night if she/he eat more meals	**Suggested solution** • Prepare enough food before you leave and cover it properly so that your child can get another meal when you are not around • Give your child main meal which has been prepared for household • Give your child more snacks between the main meal to avoid short term hunger • Give your child reasonable portion size so that can sleep restfully
Recommendation 2: Feed your child portion of fish whenever available to increase protein density **Barriers** • Fish causes dental caries and gingivitis "*Njovu*" to young children • Fish causes intestinal worms to young children • Fish usually have sharp piercing bones which is dangerous to child • If child is given fish at early stage will becomes craving towards fish	**Suggested solution** • Additional sugar and other sweeteners which can stick to the child teeth such as candy are the major causes of dental caries and gingivitis • Childhood teeth /milk teeth are normally temporally and strong teeth emerged later. • Dust, soiled food and other dirty environment where the child spends with no protection are the major sources of worms infestations • Mothers/caregivers supposed to be responsive to assist child during eating. • Use different recipes to mix food with fish example use of sardines with fragile bones
Recommendation 3: Add snacks especially (fruits) between each main meal **Barriers** • Some fruits are seasonally available • Some fruit example oranges are expensive even during on season • Some fruits need to be blended cause a child can't eat fresh	**Suggested solution** • Pawpaw and ripe banana are locally available throughout a year, so use them effectively • Use other citrus fruit which are locally available example lemon/lime • Use local methods to squeeze fruits (pineapple, mango, lemon, and tamarind) to get juice.
Recommendation 4: Feed/add vegetables to the child meal **Barriers** • During dry season few vegetables are available in our locality. • Vegetables are taken as an alternative to fish • More coconuts required for cooking vegetables and main dish • Fruit vegetables like sweet pepper and carrots not locally produced in our locality hence become expensive whenever available	**Suggested solution** • Try other vegetables like pumpkins leaves, cowpea leaves, drumstick leaves • Instigate eating vegetables even when fish are available • Tyr to use little cooking oil in vegetable preparation • Try to get even once per week if you can afford • Use tomatoes effectively because are locally available • Home gardens of sweet potato leaves and amaranths which can be easily managed can guarantee vegetable accessibility
Recommendation 5: Add milk to the child meal **Barriers** • Milk from vendors are not guaranteed since can get sour before boiled • Family can't afford to pay monthly bill • Some children refuse to drink fresh milk	**Suggested solution** • Use special utensil and wash it properly to ensure standard of hygiene • Buy little milk from local kiosk at least twice per week • Try to improve taste by adding some sugar and convince your child to drink a little.

4.15.2 Motivations that were put into practice

Following observations and information from the FGDs awareness was created so that participants could be well convinced to ensure that they put recommendations into practice during and after monitoring. Hence mothers and caregivers were motivated using proverbs with nutritional message that target behavioral changes in general feeding practices. These proverbs were also useful in controlling some negative perceptions raised during monitoring. Each recommendation had its own motivation (Table 24).

Table 24: Matrix of motivation (Form II-2.3)

Recommendation	Motivation
1. Increase meal frequency	Your child will gain weight faster
2. Feed your child leafy or fruits vegetables	Your child will be strong, healthy and smart with good immunity. Good sources of vitamin A improve vision and can prevent night blindness
3. Feed your child portion of fish whenever available to increase protein density	Your child will grow properly Animal source foods reduce anemia
4. Add snacks between main meals especially fruits whenever available.	Will enhance food diversity Increase appetite and child will eats more
5. Add milk to your child's food/meal	This will help your child grow well with strong bones and teeth.

Monitoring had also influenced behaviour changes to participants in nutrition-related practices such as

i) Increased belief in benefits of dietary diversity (perceived benefits) including fruits and vegetables rather than based on staple foods only

ii) Increased preference for targeted foods (food preference) such as intake of Iron, Calcium, Zinc, Vitamin A and C rich foods.

iii) Increased meal frequency among young children

iv) Increased understanding of the benefits of continued breastfeeding along with complementary foods.

v) Increased awareness of the consequences of short-term hunger to their tender aged children while mothers were far away from their dwellings.

4.16 Recipes Creation Exercise

With the help of mothers, four improved recipes were developed and tested for the purpose of encouraging mothers to adopt some recommendations that could assist in addressing the existing nutrient gap. Except for energy density, fish stew presented high densities for specific nutrients compared to other recipes. Analyzed results (Table 25) represent ingredients, energy and specific nutrient densities and their cost per 100g of the preparation.

Table 25: Analyzed results of the energy and specific nutrients densities of the developed recipes

Food preparation	Ingredients	Energy (g/100 kcal)	Protein (g/100 kcal)	Calcium (mg/100 kcal)	Iron density (mg/100 kcal)	Zinc density (mg/100 kcal)	Vit A (µRE)/100 kcal)	Vit C (mg/100 kcal)	Cost (Tsh) per 100 g
Rice	Rice, carrots, coconut milk, salt.	1.65	1.70	3.18	0.6	0.53	20.30	0.14	80.00
Fish stew	Fish, Tomato, onions, sweet pepper, carrot, salt.	0.065	11.72	25.22	1.11	0.76	124.68	56.43	83.33
Sweet potatoes	Sweet potatoes, coconut milk tomatoes, sweet pepper, sardines, onions, salt.	2.2	2.28	17.04	0.55	0.06	66.3	12.45	80.75
Cooked toast	Toast, milk, ground nuts, sugar	5.01	2.92	17.14	0.34	0.35	3.23	-	90.0
Irish potatoes	Irish potatoes, tomatoes coconut milk, salt. Sweet pepper, sardines.	6.1	0.92	3.52	0.41	0.2	9.41	3.74	92.0

N.B Calculation of energy density, nutrient density and cost analysis of various preparations refer Appendix 2

4.16.1 Acceptability and compliance with the proposed recipes and tested recommendations

4.16.2 Description of the results for testing recommendation: Wingwi Mtemani

During final visit all mothers (100%) were able to remember and put into practice the recommendation one and two. Sixty four percent (64%) of them managed to give their children leafy vegetables. Nevertheless, 86% of the respondents were still able to remember the proposed recipes that were tested during recipe creation exercise but only about half of the mothers (57%) managed to practice the preparation (Table 26). Comprehensive details for compatibility see (Appendix 1).

Table 26: Matrix of the acceptability and feasibility analysis of recommendations tested (Form II- 2.6): Wingwi Mtemani

CRITERIA		Recommendation 1	Recommendation 2	Recommendation 3	Recommendation 4	Tested Recipes
Acceptability or Compliance	Percentage of mothers who put recommendation into practice	100%	86%	71%	64%	57%
	Number of times/week they put into practice	7	3-7	2-5	1-2	1
	Number of times /day they fed it to the child (recipe)	3	2	1-2	-	-
	Child's acceptability (recipe)	2	2	2	1	1
	Perceived positive consequences.	1	1	1	1	1
Feasibility	Compatibility with beliefs and knowledge	1	0	1	1	1
	Cost in economic resources	1	2	1	1	1
	Cost in time and effort	0	1	2	1	2
	Complexity	1	2	1	1	1

4.16.3 Description of the results for testing recommendation: Tumbe East

Less than half (43%) of the respondents were able to remember and managed to practice the proposed preparation (recommendation five) that were tested during recipe creation exercise. Acceptability of the child was good in all recommendations (Table 27). Comprehensive details for compatibility see (Annex 1).

Table 27: Matrix of the acceptability and feasibility analysis of recommendations tested (Form II- 2.6): Tumbe east

CRITERIA		Recommendation 1	Recommendation 2	Recommendation 3	Recommendation 4	Tested Recipes
Acceptability or Compliance	Percentage of mothers who put recommendation into practice	100%	100%	100%	71%	43%
	Number of times/week they put into practice	4 -7	3 - 7	2 - 3	1 - 3	1
	Number of times /day they fed it to the child (recipe)	3	2	1	-	-
	Child's acceptability (recipe)	2	2	2	2	2
	Perceived positive consequences.	1	1	1	1	1
Feasibility	Compatibility with beliefs and knowledge	0	0	1	0	1
	Cost in economic resources	1	2	1	1	1
	Cost in time and effort	1	1	2	1	1
	Complexity	2	1	2	1	1

4.16.4 Description of the results for testing recommendation: Maziwa Ng'ombe

All mothers (100%) were able to remember and put into practice the recommendation one, two and three, by increasing meal frequency, giving their child portion of fish and add snacks between main meals. Response towards the tested recipe (recommendation 5) was less than half (45%) and in a wide-ranging interval (Table 28). Comprehensive details for compatibility values described in (Appendix 1).

Table 28: Matrix of the acceptability and feasibility analysis of recommendations tested (form II- 2.6) - Maziwa Ng'ombe

CRITERIA		Recommendation 1	Recommendation 2	Recommendation 3	Recommendation 4	Tested Recipes
Acceptability or Compliance	Percentage of mothers who put recommendation into practice	100%	100%	100%	70%	45%
	Number of times/week they put into practice	7	4 -7	3-4	1-2	1
	Number of times /day they fed it to the child (recipe)	3	2	1	-	-
	Child's acceptability (recipe)	2	2	2	1	1
	Perceived positive consequences.	1	1	1	2	1
Feasibility	Compatibility with beliefs and knowledge	1	0	1	2	1
	Cost in economic resources	1	2	1	1	1
	Cost in time and effort	1	1	2	2	1
	Complexity	2	1	2	1	1

4.16.5 Description of the results for testing recommendation: Kiuyu Mbuyuni

All (100%) of mothers managed to memorize recommendation one, i.e meal frequency increased every day. Next was recommendation two where 90% mothers managed to feed their babies with fish at least 4 days per week. More than half of the mothers (62%) managed to add milk in their child's meal (Table 29). Comprehensive details for compatibility are described in Appendix 1.

Table 29: Matrix of the acceptability and feasibility analysis of recommendations tested (form II- 2.6) - Kiuyu

CRITERIA		Recommendation 1	Recommendation 2	Recommendation 3	Recommendation 4	Tested Recipes
Acceptability or Compliance	Percentage of mothers who put recommendation into practice	100%	92%	85%	62%	85%
	Number of times/week they put into practice	7	4-6	3-4	1-2	1
	Number of times /day they fed it to the child (recipe)	3	2	1	-	-
	Child's acceptability (recipe)	2	2	2	1	1
	Perceived positive consequences.	2	1	1	2	1
Feasibility	Compatibility with beliefs and knowledge	0	0	1	1	1
	Cost in economic resources	1	2	1	0	1
	Cost in time and effort	1	1	2	1	1
	Complexity	2	1	2	1	1

CHAPTER FIVE

5.0 DISCUSSION

There are abundant literatures detailing the causes of child malnutrition, especially under-nutrition, and the means of reducing it. But conceptual frame work of malnutrition categorized them into immediate underlying and root causes (UNICEF, 2013) and suggested that apart from the poor composition of the diet, inappropriate caregiver-feeding behaviors may play an important role in child nutrition and development. Indeed, appropriate infant feeding depends on accurate information and skilled support from the family, community and health care system (UNICEF, 2008).

5.1 Socio-demographic Characteristics

Food, health and care are determinants of nutritional status, but normally affected by social, economic and political factors (UNICEF, 2013). Therefore, understanding the immediate and underlying causes of under-nutrition in a given context is critical in delivering appropriate, effective and sustainable solutions that adequately meet the needs of the most vulnerable communities (UNICEF, 2013).

Even though, elsewhere multivariate analysis reports (Senarath, 2007; Patel *et al.*, 2010; Joshi *et al.*, 2011 and Nyaruhucha *et al.*, 2006) suggested that the education level and age of parents has consistently become a determinant of infant feeding, but in this study regression and multivariate analysis had shown a significant different at ($p = 0.04$) only in occupation. Obvious this conclude that, time spent by the mother in their occupational areas tends to undermine the care practices and eventually influence the prevalent of undernourished status of children as it has been observed by Msuya (2006) similar to Hussein (2005) who emphasized that although there was an increase in household

food supply, mothers had less time for cooking and care of young children. The level of illiteracy of parents from the monitored households which account for more than third part can be debated due to its insignificant but concurrently traditional believes, number of misconceptions and incorrect perceptions described by mothers during FGDs and home visiting, automatically affiliates with an adverse impact to general care practices, proper choice of nutritious food and appropriate feeding practices. These features are related to nutritional status of their children.

The main economic activities of community members in the study area are fishing, seaweed farming and petty trading. Livestock keeping can contribute to household's income but the number of animals kept is still low. Furthermore, subsistence farming from the coral rag area (particularly Maziwa Ng'ombe and Kiuyu) indicates a certain level of poverty and impoverishment. Indeed the measures of household food security do appear to carry significant signals about the nutritional status of children that reside within the households. Factors such as production activity and production level affect the household economic status and consequently the food availability and accessibility. This situation aligns with views from Kimani-Murage *et al.* (2011) who acknowledged that because of poverty and poor living conditions most of the children were likely to be predisposed to sub-optimal complementary feeding practices.

5.1.2 Morbidity, water hygiene and sanitation

Diarrhoea and malnutrition are known to have a bi-directional relationship, that is, they are potentially causing each other (WHO, 2007). Frequent episodes of acute diarrhea and respiratory infections could be one among the critical influence of the prevalence of wasting and underweight in this communities as it has been established by numerous

previous studies including Brown (2003); Njuguna and Muruka (2011) and Temu *et al.* (2012). It also concurs with the proclamation that in addition to malaria, diarrhoeal diseases and respiratory infections are also common among children in Tanzania (UNICEF /REPOA, 2007). All of these diseases affect food intake as well as the body use of energy and other nutrients and consequently undermining the child's nutritional status and threatening death. Following this bi-directional association between diarrhea and malnutrition it is also well-meaning to say the deficiency of zinc had jeopardized children from this community into frequency of diarrhea as it has been established by other researchers (Black and Sazawal, 2001; Lucacick *et al.*, 2008). They cautioned that zinc deficiency was associated with an increased risk of gastrointestinal infections, adverse effects on the structure and function of the gastrointestinal tract, and impaired immune function. It has been verified by Shubh *et al.* (1997) that behaviors that are embodied in various sanitation and hygiene practices are very crucial in determining the level of malnutrition. Parallel to poor access to safe water and sanitation, diarrhoeal diseases are more likely to be rampant and could lead to poor nutritional status as noted by Goon *et al.* (2011) and Black *et al.* (2013) that poor water and sanitation is associated with increased frequency of water and sanitation related morbidity.

5.1.3 Mothers' perceptions, beliefs, and food myths on complementary feeding

According to IFPRI (2014) in Global Nutrition Report, nutrition is central for sustainable development. But this can't be achieved under low utilization of basic services including lack of nutrition education, low use of ante and post-natal care services, and poor child protection services. Most pregnant women delayed to visit clinics for antenatal care, which has also been noted by Khanal (2011) and Twin'omujuni (2013). Concurrently, the domination of home delivery is an indication of failure to utilize the basic service effectively even when the services are adjacent to their dwellings, consequently,

generating social exclusion that accompanied with numerous misconceptions like food myth. Probably, this might be influenced by the traditional birth attendants (TBA) in their locality, which is also the origination of food restrictions in these communities. This behavior of not seeking and adhering to counselling from the health profession have an impact in poor feeding practices and poor health to their new born and young children.

5.2 Nutritional Status of Children Aged Six to 23 Months

Overall, the magnitude of under- nutrition was high among children 6-23 months of age based on the three indices: underweight, wasting and stunting (Table 10). This finding is similar to various studies including Korir (2013) and Zhang *et al.* (2013). The high burden could be attributed to double burden of poor feeding practices and high morbidity which have immediate consequences on the nutritional status of children as notified by conceptual frame work (WHO/UNICEF, 2008). Meanwhile, stunting, underweight, and wasted children have an increased risk of morbidity from diarrhoea, pneumonia, measles, and other infectious diseases (Black *et al.*, 2008). This interaction between under-nutrition and infection creates a potentially lethal cycle of worsening illness and deteriorating nutritional status (UNICEF, 2012).

In the meantime, growth retardation and micronutrient deficiency disorders are prevalent, well known consequences for children's health and development, and are primary contributors to the diseases (Brown, 2003). Vitamin A and iron deficiencies also have been demonstrated to cause growth faltering, however only when the deficiency state is severe (Rivera *et al.*, 2003). But there is strong evidence for the contribution of zinc deficiency to growth faltering among children; even mild to moderate zinc deficiency may affect growth. This is due to the fact that it is ubiquitous within the body and is vital to protein synthesis, cellular growth, and cellular differentiation (Brown, 2003).

Simultaneously, with the exception of weight and MUAC (in breastfed children aged 12-23 months) other parameters showed no significant differences among the groups before and after intervention. This implies that inadequate food intake remains among the primary reason of nutrients shortage which obvious seemed to influence this prevalence. Studies have shown that feeding with appropriate, adequate and safe complementary foods from the age of 6 months onwards leads to healthier body and growth outcomes as documented by Bhutta (2008). The also commented that even with optimum breastfeeding children will become stunted if they do not receive sufficient quantities of quality complementary foods after six months of age. Also in vulnerable populations especially, good complementary feeding practices have been shown to reduce stunting markedly and rapidly (Dewey and Seth, 2008).

5.3 Dietary Diversity and Meal Frequency

Consumption of foods from at least 4 food groups on the previous day would mean that in most populations the child has a high possibility of consuming at least one animal-source food and at least one fruit or vegetable that day, in addition to a staple food (grain, root or tuber) (FAO, 2011a). Despite the fact that dietary diversity increased as the child grew, none of the age group before intervention had achieved minimum dietary diversity of 4 food groups out of the 7 recommended by WHO/USAID/FANTA/IFPRI/UNICEF (2008). When diversity does not exist across the food items, it negatively affects the outcomes of minimum acceptable diet and consequently resulting into nutrients inadequacy (FAO, 2011a). PAHO/WHO (2003) also reasoned that even with optimum breastfeeding, stunted growth will be prevalent among children if they do not receive sufficient dietary diversity and meal frequency after 6 months of age.

Further, the best sources of micronutrients (minerals and vitamins) are green leafy vegetables, small fish species particularly if the bones are consumed, eggs, dairy products and some legumes. But evidence from FGDs and 24 hour dietary recall these items were the least consumed food groups in the study population. Lack of these food groups could explain the poor nutrients availability notably micronutrients inadequacy. These findings are similar to other studies testing the utility of dietary diversity as an indicator of nutrient adequacy in the diet of preschool and school age children (Hussein, 2005). Numerous studies had been emphasizing dietary diversity and clarified that diets that do not contain animal source foods is difficult meet all nutrient needs unless fortified products or nutrient supplements are given (Lindsay, 2003; FAO/WHO, 2005). Furthermore, eating meat including fish is related to a greater nutrient intake and higher dietary quality (PAHO/WHO, 2003).

Indeed, findings from four villages of seaweed farming livelihood zone revealed that mothers did not give their children fish, since they believe that it could cause gingivitis and dental caries while others claimed that fish can cause intestinal worms. Similar results reported from Bangladesh that nearly half the mothers believe that all meat and fish were harmful to children under-two years of age (Shubh *et al.*, 1997). The authors cautioned that food beliefs that restrict foods in the child's diet may be harmful if other foods are not specially obtained or prepared for the child.

PAHO/WHO (2003) defined minimum meal frequency as: two times for breastfed infants six to eight months; three times for breastfed children nine to 23 months; and four times for non-breastfed children six to 23 months. Unfortunately, this practice is inhibited since mothers spent about six hours during high tide and eight hours during low tide (based on Arabic calendar) on seaweed farming activities, which was also observed by Msuya (2006). Virtually, all children did not meet the minimum acceptable diet due to the fact

that they neither had attained minimum dietary diversity nor minimum meal frequency. Similar findings were observed by Korir (2013) and Khanal (2011).

In a second analysis of data after intervention, there was a tremendous improvement in complementary feeding practices, meal frequency increased, protein rich sources and fruits were observed during interview using 24 hours recall. This was accredited by some indicators such as minimum dietary diversity, minimum meal frequency and minimum acceptable diet however other parts remained the same.

Reasons for this attainment includes changes in meal frequency of reported foods from pre- to post-intervention which was obviously commanded by number of snacks between each main meal and the introduction of fish intakes with high protein content. The enlightened outcomes for vitamin C and A was boosted by frequent snacks notably mangoes which were plenty during the season of October to January. However, the intake of trace minerals such as iron and zinc remained unchanged, obviously because of inconsistent supplies of rich sources from animal origin that boost bioavailability.

5.4 Feeding Practices

Two of the most important caring practices for good nutrition in early life are breastfeeding and complementary feeding (WHO/UNICEF, 2008). Infant and young child feeding is a key area to improve child survival and promote healthy growth and development. The first two years of a child's life are particularly important, as optimal nutrition during this period lowers morbidity and mortality, reduces the risk of chronic disease, and fosters better development overall (Black *et al.*, 2013).

Exclusive breastfeeding for 6 months has many benefits for the infant and mother. Chief among these is protection against gastrointestinal infections which is observed not only in developing but also industrialized countries. Indeed, early initiation of breastfeeding, within one hour of birth, protects the newborn from acquiring infections and reduces newborn mortality (Balck *et al.*, 2013). The risk of mortality due to diarrhea and other infections can increase in infants who are either partially breastfed or not breastfed at all (WHO/UNICEF, 2008). Inappropriately, this practice in the studied subjects is still sub-optimal as expressed by lower number of mothers who delayed introduction of breast milk exclusively, lower frequencies and early introduction of solid foods. There is also a belief that a new pregnancy could contaminate breast milk and harm the lactating newborn. For this reason, mother should quit breastfeeding as soon as she finds out has conceived, the same scenario reported by Pelto and Thairu (2008). This might be contributed to high percentage of home delivery because most mothers do not get proper information on breastfeeding tips and counseling and consequently children become more susceptible to illnesses and growth faltering. Apparently, under such circumstance nutrient demands tends to increase and suddenly health deterioration experienced by both mother and child which suggested to be the cause of problems.

Moreover, early resumption to seaweed farming activities had shown to have an adverse impact to general feeding practices as observed by Moshy *et al.* (2013). Children are not assisted during eating, and are let to eat themselves once they reached 15 months. Mothers/caregivers argue that children can eat by themselves without being assisted when reaching this particular age, what is essential is to serve ample food so as to compensate for the dispersed amount during eating.

Nutrient intake

Energy recommendations are based on the percentage of children who meet their median energy recommendation (Dewey and Brown, 2003). The majority of food items given to studied children were from the Food Group 1 dominated by cereals (polished grains) particularly rice with coconut milk, roots and tubers that are rich in carbohydrate (energy). This result correlated with observation in Unguja Island by Kinabo *et al.* (2013) which revealed that energy dense foods were the most consumed foods. Since the recommendation is based on a median, by definition if 50% or more of the children meet the recommendation, then you consider that the complete sample met the recommended energy intake (IOM, 2000).

Although more than a third of the children attained a protein recommendation intake but according to PAHO/WHO (2013) and IOM (2000) children are considered to meet the RDA if 100% of the sample meet the recommendation. Definitely, this implies that protein intake was inadequate. Therefore, a substantial suggestion is that children from these communities are prone to protein-energy malnutrition (PEM), which normally develops in children whose consumption of protein and energy (measured by calories) is insufficient to satisfy their nutritional needs.

Protein deficiency can occur when a person's diet provides enough energy but lacks an adequate amount of protein, in most cases deficiency will exist in both total calorie and protein intake (FAO, 2011b). Protein energy malnutrition may also occur in children with frequent illnesses that jeopardize them into poor absorption of vital nutrients or convert them to the energy essential for healthy tissue formation and organ function (WHO/UNICEF, 2007).

Obviously, low intake of foods with high protein density such as animal source affect the dietary recommended allowances of most children, and probably impairs the absorption of micronutrients notably iron and zinc. Parallel to WHO/UNICEF (2008) joint report described that low intake of protein exacerbates the availability of some minerals remarkably zinc and iron.

Presumably, is not surprising that children from this livelihood zone have a higher risk of developing iron deficiency anemia (IDA) because dietary intake of animal source foods contain heme iron which is believed to be more bio-available were extremely tiny (Fidler *et al.*, 2009).

Correspondingly, food consumption before intervention (Fig. 2) had shown that black tea was frequently consumed as a traditional drink, similar findings had been reported in Pemba by Pelto and Thairu (2008) and in Unguja by Kinabo *et al.* (2013). This could interfere the absorption of iron from other sources (non-heme). Likewise some studies (Teucher *et al.*, 2004) and FAO (2011b) denoted that deficiency of vitamin A and C could also lead into condition of iron deficiency anemia (IDA). In the meantime, Vitamin A deficiency is a recognized risk factor for severe measles and since 1987 the WHO/UNICEF has recommended vitamin A treatment of children with measles (WHO/UNICEF, 1988). Unfortunately, performance of immunization coverage was destabilized from nine and 18 months, under such circumstances it is obvious that immunity status of children from this livelihood zone are threaten by measles.

Apart from the poor food choice that determines the quality of complementary food, the exposed results of micronutrient insufficiency for both minerals and vitamins notably iron, zinc, calcium, vitamin A and C has been due to little quantity of food (low portion size)

that eventually make children fail to meet the recommended intake of these vital nutrients. The World Health Organization has defined iron, zinc, and calcium as 'problem nutrients' in many complementary diets in developing countries, because of the large discrepancy between the amounts of these inorganic nutrients in complementary foods compared to the corresponding estimated needs of the infant from complementary foods. A similar trend has been identified for the densities of iron, zinc, and calcium in complementary foods compared to their corresponding desired nutrient densities (Dewey and Brown, 2003).

5.5 Recipe Creation Exercise and Test Recommendations

The developed recipes with the potential to meet most of the nutritional need of children aged six to 23 months in four villages was nutritious and most affordable foods. Most of recipes were acceptable, feasible, and mothers complied with them during the study period. Acceptability and feasibility of the tested recommendations displayed a remarkable outcome as presented in Table 28-31. Each recommendation was evaluated using the Test of Recommendations form to each participating mother for a period of three months. Most of the mothers put the recommendation into practice after second visits.

However, when comparing results among recommendations, the "*Increase meal frequency*" was the most feasible and adopted followed by "*Give a child portion of fish*" and "*Add snacks between each main meal particularly fruits*". The most difficult recommendation to adopt was "*Feed /give the child leafy vegetables*" and "*Add milk to the child meal*". These two recommendations were difficult to remember and appeared complex for the mothers to practice due to various reasons. Probably the hindrance factors could be limited time, ignorance and poverty. Zhang *et al.* (2013) also observed that consumption of vegetables and meat were minor, and mothers justified that children could not chew these effectively because they have no teeth.

5.6 General Observations

The study revealed that households in these villages are too congested which obstructs proper general hygiene of surrounding environment, and sufficient living area for proper ventilation. Apart from that, abandonment of the children at the tender age is customary to seaweed farming mothers, whereas, children are often left with their juvenile caregivers. This was observed during home visiting which obvious indicate the negligence and poor upbringings of children along this livelihood zone. This exposed them into number of risk factors including worm's infestations, short term hunger and frequency diarrhea episodes due to poor hygienic control.

5.7 Study Limitations

The results reported here must be interpreted in light of some limiting factors. Mothers were asked to estimate the amount of the food eaten by the child with their ingredients. Food analyses were then performed using software program data that give an output of nutrients and not in the food laboratory, hence findings from this study may be affected by factors influencing the accuracy of measurements. Therefore cannot be attributed to the entire population of young children at Micheweni District. In this regards the findings apply only to the children who are living in these four villages though it can be related to other communities along the seaweed farming livelihood zone so long as they share several socio-demographic features including recipes for complementary foods.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study revealed that a high proportion of children were consuming energy rich foods such as roots, tubers and cereals accompanied with coconut milk in most preparations. In contrary, despite the fact that fishing had dominated fathers occupation that sustain the availability of fish, sardines and other marine products at household level which are rich source of some minerals and vitamins, most specific nutrients intake was below recommendation notably iron, zinc and calcium. This reflect that, intake of animal source foods notably meat and fish in children are very occasional and minimal. Therefore, this also suggest that, greater determinants for a high prevalence of chronic dietary inadequacy among six to 23 months aged, which dictate the predominance of under-nutrition of children in seaweed farming livelihood zone, intensified by inadequate knowledge about appropriate complementary foods, poor feeding practices, and misconceptions. Indeed, childhood ailments specifically diarrhea episodes seemed to weaken nutrition status of many children.

Regardless of the suboptimal prevalence of IYCF practices in seaweed farming livelihood zone, ProPAN module II had seemed to be effective in widening knowledge and changing attitudes among the study population. Moreover, the study gave insight into how nutritional recipes could be created, tailored to a local context and exposed the barriers that mothers faced on feeding their children with nutritious food. Through clarification and motivation against various barriers, the tested recommendations and developed recipes were accepted resulted into moderate improvement in dietary diversity and meal frequency which signify the extent of progress.

6.2 Recommendations

For complementary feeding, education and counselling on improving use of locally available foods is the cornerstone of interventions in all contexts. Overall, results from this study suggest that interventions in the future need to have a holistic approach and mediation strategies needs to be tackled at multiple levels, this is due to the fact that there is still misconceptions and false impression on complementary feeding practices along the seaweed farming livelihood zone. The following are recommendations.

i) Department of Food Security and Nutrition (MANR) and Nutrition Unit (MOH) should promote optimal complementary feeding and dietary diversity through nutrition sensitive agriculture (kitchen/home gardening, cooking demonstration) to and specific nutrition counselling to enhance bioavailability.

ii) Department of Food Security and Nutrition (MANR) and Nutrition Unit (MOH) should develop a surveillance system in order to assess, monitor and evaluate long-term impacts which can combine with biochemical indicators.

iii) The government should encourage community nutrition by recruit and allocate more knowledgeable nutritionists to work at community level and provide supportive supervision through home visiting. This should be on hand with more emphasis in public health education to avoid preventable diseases outbreak.

iv) Many other components of society have potentially influential roles in promoting good feeding practices. These elements include:

   a) Education authorities should help to shape the attitudes of community about infant and young child feeding. So accurate information should be provided through schools and other educational channels to promote greater awareness and positive perceptions. This can be done by introducing some topics in the primary and secondary school syllabus, examples "*General care practices for infants and young children*"; or "*Principles of maternal and child nutrition*".

b) District authority should advocate child care practices at communities and household level by increasing demand in utilization of health services. Mass media example ("*radio jamii*") should advocate a nutrition issue via radio programs since is a most popular channel listening in Micheweni District. Parallel to this, involvement of religious leaders is paramount important in inspiring the community into adoption of changes through preachments. This can influence general attitudes and behavioral changing practices such as parenting responsiveness, hygiene and sanitation as well as feeding practices.

c) Women empowerment should be assured for improved family savings, better food security and eventually better childhood nutrition. Honestly, there is a need for the concerning institution like (Ministry of Women, Gender and Children Affairs), seaweed companies and seaweed co-operative unions from these communities to enhance mutual collaboration between them. This including official registration of their producers and initiate reciprocal support during period of lactation through legal contracts. This will help mothers to delay resuming to their farming activities as soon after delivery which interfere the overall feeding practices.

d) Appropriate supportive measures should be put in place at the community and household levels as well, and alleviating the lactating mother's workload to allow her time for relaxation and breastfeeding.

e) Milk expression technique should be introduced and supported as one among the strategy to sustain breastfeeding practices in seaweed livelihood zone.

REFERENCES

Anir, L. and Veikila, V. (2010). The historical development of seaweed farming, including roles of men and women, and prospects for its future development in Fiji. *SPC Women in Fisheries Information Bulletin* (21): 1-2.

Arimond, M. and Ruel, M. T. (2002). Assessing care: Progress towards the measurement of selected childcare and feeding practices, and implications for programs: Food and Nutrition Technical Assistance Project, Academy for Educational Development; Washington D.C.

Bhutta, Z. A. (2008). What Works? Interventions for maternal and child under-nutrition and survival; *Lancet,* 371(9610): 417–440.

Black, R. E. and Sazawal, S. (2001). Zinc and childhood infectious disease morbidity and mortality. *British Journal of Nutrition,* 85: 125–9.

Black, R. E., Allen, L. H. and Bhutta, Z. A. (2008). Maternal and child under-nutrition: global and regional exposures and health consequences. *The Lancet,* 371 (9608): 243–260.

Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., De Onis, M., Ezzati, M., Mathers, C. and Rivera, J. (2008). Global and regional exposure and health consequences for the Maternal and Child Undernutrition. *The Lancet,* 371: 243-260.

Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A. , Christian, P., de Onis M., Ezzati, M. and Grantham-McGregor, S. (2013). Maternal and child malnutrition in low-income and middle income countries. *The Lancet,* 382(9890): 427-51.

Bowman, B. A., Russell, R. M. (2001). *Present Knowledge In Nutrition* (8th edition). International Life science Institute Press; Washington D C. pp22-31.

Brandenburg, S and Kamugisha, E. (2014). Treating Malnutrition in Zanzibar, United Republic of Tanzania; UNICEF Media Centre; Dar-es-salaam Tanzania.

Brown, K. H. (2003). Diarrhea and malnutrition. *Journal of Nutrition* 133(1): 328-332

Cai, W.T. and Brown, D.W. (2012). Global trends in exclusive breastfeeding. *International Breastfeeding Journal*, 7(1): 7-12.

Carriquiry, A. L. (2003). Estimation of usual intake distributions of nutrients and foods. *Journal of Nutrition,* 133: 601–608.

de Onis, M., Yip, R. and Mei, Z. (1997). The development of MUAC-for-age reference data recommended by a WHO Expert Committee. *WHO Bulletin OMS*, 75(4): 333-341.

de Renzi, B., Lesh, N., Parikh, T. S., Sims, C., Mitchell, M., Maokola, W., Chemba, M. Hamisi, Y., Schellenberg, D. and Borriello, G. (2008). Improving Pediatric Health Care in Low-Income Countries. ACM Conference on Computer-Human Interaction (CHI), Florence, Italy.

Dewey, K. G. (2005). *Complementary Feeding in Encyclopedia of Human Nutrition.* edited by B. Caballero, L. Allen and A. Prentice, Elsevier Ltd, Amsterdam. pp 465–470.

Dewey, K. G. and Brown, K. H. (2003). Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs. *Food and Nutrition Bulletin,* 24: 5-28.

Dewey, K. G. and Seth, A. A. (2008). Systematic Review of the Efficacy and Effectiveness of Complementary Feeding Interventions in Developing Countries, *Maternal and Child Nutrition*, 4: 24–85.

District Health Management System (DHMS) (2012). *Health Information Bulletin:* Ministry of Health Zanzibar, Zanzibar.

Dyson, L., McCormick, F. M. and Renfrew, M. J. (2005). Interventions for promoting the initiation of breastfeeding. Cochrane Database System Review. John Wiley and Sons, Ltd; UK.

Engle, P. L. and Bentley, P. (2000). Care for nutrition and development. *Journal of Indian Medical Association* 98(9): 530-535.

Fidler, M.C., Davidsson, L., Zeder, C. and Hurrell, R. F. (2009). Erythorbic acid is a potent enhancer of nonheme-iron absorption. *American Journal of Clinical Nutrition,* 79(1): 99-102.

Food and Agricultural Organization (FAO) (1990). Seaweed collection and culture in Tanzania. Fisheries and Aquaculture Department United Nations Publications; Rome, Italy.

Food and Agricultural Organization (FAO) (2005). Nutrition; A Guide to Data Collection, Analysis, Interpretation and Use. Food Security Analysis Unit for Somalia (FSAU); Nairobi.

Food and Agricultural Organization (FAO) (2011). Guidelines for measuring household and individual level dietary diversity United Nations Publications; Rome, Italy.

Food and Agriculture Organization (FAO) (2011). Complementary Feeding for Children aged six to 23 months. A recipes book for mothers and caregivers; United Nations Publications; Rome, Italy.

Food Agricultural Organization (FAO)/ World Health Organization, (2005). *Vitamin and Mineral Requirements in Human Nutrition*, 2nd ed. Geneva. pp33-35.

Food Agricultural Organization (FAO)/ World Health Organization (WHO)/ World Food Programme (WFP) (2007). Preventing and controlling micronutrient deficiencies in populations affected by an emergency. Multiple vitamin and mineral supplements for pregnant and lactating women, and for children aged six to 59 months. Geneva.

Goon, D. T., Abel, L. T., Brandon, S. S, Lateef, O. A., Makama, A. M., Oluwadare, A. and Olubola, A. A. (2011). Anthropometrically determined nutritional status of urban primary schoolchildren in Makurdi, Nigeria; *BMC Public Health,* 11: 769.

Hussein, A. K. (2005). Breastfeeding and complementary feeding practices in Tanzania. *East African Journal of Public Health*, 2 (1): 27-29.

Institute of Medicine (IOM) (2000). *Dietary Reference Intakes: Applications in Dietary Assessment*. National Academy Press: Washington D. C. pp33-36.

International Food Policy Research Institute (IFPRI), (2014). Global Nutrition Report 2014: Actions and Accountability to Accelerate the World's Progress on Nutrition Washington, DC.

Joshi, N., Agho, K. E., Dibley, M. J., Senarath, U. and Tiwari, K. (2011). Determinants of inappropriate complementary feeding practices in young children in Nepal: secondary data analysis of demographic and health survey 2006. *Maternal and Child Nutrition*, 8: 45–59.

Katarzyna, K., Emily, H. S., Deanna, K. O., Joanne, K., James, M. T., Patricia, K. K., Khalfan, S. S., Le Clerq, C., Subarna, K. K. and Stoltzfus, R. J. (2009). The Effects of Iron and/or Zinc Supplementation on Maternal Reports of Sleep in Infants from Nepal and Zanzibar *Journal of Developmental and Behavioral Pediatrics*, 30(2): 131-9.

Khanal, V. (2011). Determinants of complementary feeding practices among Nepalese children aged 6–23 months: findings from demographic and health survey, *BMC Pediatrics*, 13: 131.

Kimani-Murage, E. W. and Ngindu, A. M. (2007). Quality of water the slum dwellers use: The case of a Kenyan slum. *Journal of Urban Health*, 84 (6): 829-838.

Kinabo, J., Msuya, J., Mamiro, P., Mwanri, A., Ntwenya, J., Bundala, N., Kulwa, K., Nombo, A., Mzimbiri, R., Salmini, A. H., Juma, A. H., Ally, F. S., Kimwaga, M. A., Macha, E., Picado, J. I., Ussi, A., Mohamed, S. (2013). Assessment of Infant and Young Child Feeding Practices in Zanzibar Using the Process for the Promotion of Child Feeding (ProPAN) Tool. ProPAN Report.

Korir, J. K. (2013). Determinants of Complementary feeding practices and Nutritional status of children 6-23 months old in Korogocho slum, Nairobi country, Kenya. Thesis submitted in partial fulfillment of the requirements for the award of the degree of Master of Science (Food, Nutrition and Dietetics) in the school of Applied Human Sciences of Kenyatta University, pp 38-43.

Lindsay, H. A. (2003). Interventions for Micronutrient Deficiency Control in Developing Countries: Past, Present and Future. *Journal of Nutrition*, 133: 3875–3878.

Luckacik, M. Thomas, R. L. and Aranda, J. V. (2008). A meta-analysis of the effects of oral zinc in the treatment of acute and persistent diarrhea. *Pediatrics*, 121(2): 326–36.

Lukmanji, Z., Hertzmark, E., Mlingi, N., Assey, V., Ndossi, G., Fawzi, W. (2008). Tanzania Food Composition Table. Muhimbili University of Health and Allied Sciences; Tanzania Food and Nutrition Centre (TFNC) and Harvard School of Public Health (HSPH), Boston, USA.

Medical Aids Film (2012). Film for life, food for life: When and what to feed your child 6 months -2 years. [http://www.healthphone.org] site visited on 20/10/2014.

Moshy, V. H., Masenge, T. J. and Bryceson, I. (2013). Under-nutrition among Under-Five Children in Two Fishing Communities in Mafia Island Marine Park, Tanzania, Canadian Center of Science and Education. *Journal of Sustainable Development* 6(6): 7-10.

Msuya, F. E. (2006). A Study of Working Conditions in Zanzibar Seaweed Farming Industry. Women in Informal Employment; Manchester, United Kingdom.

Msuya, F. E. (2011). The Impact of seaweed farming on the social and economic structure of seaweed farming communities in Zanzibar, Tanzania. *World Aquaculture Society* 42 (3): 45-48, Baton Rouge, Los Angeles USA.

Msuya, F. E. (2012). A Study of Working Conditions in Zanzibar Seaweed Farming Industry, Women in Informal Employment; Manchester, United Kingdom.

National Bureau of Statistics (NBS) (Tanzania) and ICF Macro (2005). Tanzania Demographic and Health Survey. Dar-es-Salaam, Tanzania.

National Bureau of Statistics (NBS) (Tanzania) and ICF Macro (2010). Tanzania Demographic and Health Survey. Dar-es-Salaam, Tanzania.

National Bureau of Statistics (NBS) and Office of the Chief Government Statistician (OCGS) (2012). National Sample Census of Agriculture 2007/2008. Ministries of Agriculture and Natural Resources, Ministries of Livestock and Fishery in Zanzibar; livestock sector, volume VI, Zanzibar.

National Bureau of Statistics (NBS) and Office of the Chief Government Statistician (OCGS) (2012). National Sample Census of Agriculture 2007/2008. Ministries of Agriculture and Natural Resources. Crop sector, volume VII Zanzibar.

National Bureau of Statistics (NBS) and Office of the Chief Government Statistician (OCGS), (2012). Population and Housing Census; United Republic of Tanzania. Dar-es-Salaam.

National Bureau of Statistics (NBS) and Office of the Chief Government Statistician (OCGS) (2013). Population and Housing Census; United Republic of Tanzania. Dar-es-Salaam.

Njuguna, J. and Muruka, C. (2011). Diarrhoea and malnutrition among children in a Kenyan district: a Correlational study Anton Breinl Centre of Public Health and Tropical Medicine. *Journal of Rural and Tropical Public Health,* 10: 35-38.

Nyaruhucha, C. N., Mamiro, P. S. and Kerengi, A. J. (2005). Prevalence of anemia and parasitic infections among under five children in Simanjiro District, Tanzania. *Tanzania Health Research Bulletin*, 7 (1): 38.

Nyaruhucha, C. N., Msuya, J. M., Mamiro, P. S. and Kerengi, A. J. (2006). Nutritional status and feeding practices of under five children in Simanjiro District, Tanzania. *Tanzania Health Research Bulletin*, 8(3): 163-164.

Office of the Chief Government Statistician (OCGS) (2010). Zanzibar Statistical Abstract; Revolutionary Government of Zanzibar.

Pan American Health Organization (PAHO) and World Health Organization (WHO) (2003). Guiding Principles for Complementary Feeding of the Breastfed Child, Pan American Health Organization, Washington, DC, USA; World Health Organization, Geneva, Switzerland.

Pan American Health Organization (PAHO)/ World Health Organization (WHO) (2013). Guiding principles for complementary feeding of the breastfed child; Washington, DC, USA.

Patel, A., Badhoniya, N., Khadse, S., Senarath, U., Agho, K. E. and Dibley, M. J. (2010). Infant and young child feeding indicators and determinants of poor feeding practices in India: secondary data analysis of National Family Health Survey 2006. *Food and Nutrition Bulletin,* 31(2): 314-33.

Paul, K. H., Dickin, K. L., Ali, N. S., Monterrosa, E. C. and Stoltzfus, R. J. (2008). Soy- and Rice-Based Processed Complementary Food Increases Nutrient Intakes in Infants and Is Equally Acceptable with or without Added Milk Powder. American Society for Nutrition; *Journal of Nutritional Sciences*, Cornell University, Ithaca, NY and Public Health Laboratory-Ivo de Carneri, Pemba Island, Tanzania.

Paul, K. H., Muti, M., Khalfan, S. S., Humphrey, J. H., Caffarella, R. and Stoltzfus, R. J. (2011). Beyond food in security: how context can improve complementary feeding interventions. *Food and Nutrition Bulletin,* 32: 244–253.

Pelto, G. and Thairu, L. (2008). Newborn care practices in Pemba Island (Tanzania) and their implications for newborn health and survival; *Maternal and Child Nutrition,* 4 (3): 194–208.

Research on Poverty Alleviation (REPOA) (2006). Children and vulnerability in Tanzania. A brief synthesis special paper 07.25; REPOA. Dar es-Salaam.

Rivera, J. A., Hotz, C., González-Cossío, T., Neufeld, L. and García-Guerra, A. (2003). The effect of micronutrient deficiencies on child growth: a review of results from community-based supplementation trials. *Journal of Nutrition,* 133(11): 4010-4020.

Salah, M. J. (2004). Factors that Affect the Nutritional Status of Children Aged 9-18 Months in East Jerusalem; Palestine; Nablus. Thesis submitted in Partial Fulfillment of the Requirements for the Degree of Master in Public Health, Faculty of Graduate Studies, at An-Najah National University, Nablus, Palestine. pp 26-27.

Seif, R. S. (2013). The influence of price on seaweed farming growth a case of east coast region of Zanzibar. Mzumbe University, Morogoro. A Dissertation Submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Master of Business Administration (MBA)-Corporate Management of Mzumbe University, pp 44 – 49.

Senarath, U., Godakandage, S., Jayawickrama, H., Siriwardena, I. and Dibley, M. (2007). Determinants of inappropriate complementary feeding practices in young children in Srilanka: secondary data analysis of demographic and health survey 2000. *Food and Nutrition Bulletin*, 31: 352–65.

Shazia, S. M., Shaikh, A. S., Rehana, S., Haider, N. and Parkash, A. (2014). Knowledge Attitude and Practices of Mothers regarding Complementary Feeding; *Journal of the Dow University of Health Sciences,* 8 (1): 21-25.

Shubh, K., Kumar, R., Ruchira, N. and Saroj, B. (1997). Child care practices associated with positive and negative nutritional outcomes for children in Bangladesh: A descriptive analysis Food Consumption and Nutrition Division International Food Policy Research Institute, Washington DC, USA.

Standardized Monitoring and Assessment of Relief and Transitions (SMART) (2012). Emergency Nutrition Assessment: Guidelines for field workers; NBN international; Save the Children; United Kingdom.

Temu, A., Kamugisha, E., Mwizamholya, D. L., Hokororo, A., Seni, J. and Mshana, S. E. (2012). Prevalence and factors associated with Group A rotavirus infection among children with acute diarrhea in Mwanza, Tanzania. *Journal of Infection in Developing Countries,* 6 (6): 508-515.

Teucher, B., Olivares, M. and Cori, H. (2004). Review Enhancers of iron absorption: ascorbic acid and other organic acids. *International Journal for Vitamin and Nutrition,* 74(6): 403-19.

Thairu, L. and Pelto, G. (2008). Newborn care practices in Pemba Island (Tanzania) and their implications for newborn health and survival; Blackwell Publishing Ltd.

Twin'omujuni, A. Z. (2013). Quality of nutrition services provided at reproductive and child health clinics in addressing maternal under-nutrition in Temeke District, Dar-es-Salaam. A Dissertation submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science in Human Nutrition of Sokoine University of Agriculture. Morogoro, Tanzania. pp 6 -7.

United Nations Children's Fund (UNICEF) (2008). The State of the World's Children: Women and Children - Child Survival; New York.

United Nations Children's Fund (UNICEF) (2009). Tracking progress on child and maternal nutrition: A survival and development priority. New York.

United Nations Children's Fund (UINCEF) (2012). Programming Guide, Infant and Young Child Feeding, UNICEF, New York.

United Nations Children's Fund (UNICEF) (2013). Improving child nutrition. The achievable imperative for global progress. United Nations Publications; New York.

United Nations Children's Fund (UNICEF)/ Research on Poverty Alleviation (REPOA) (2007). Children and vulnerability in Tanzania. A brief synthesis special paper 07.25; Dar es-Salaam, REPOA.

Victoria, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L. and Sachdev, H. S. (2008). Maternal and child under-nutrition; consequences for adult health and human capital. *The Lancet*, 371: 340-57.

Waqas, U. K. and Daniel, W. S. (2011). Zinc supplementation in the management of diarrhea. Biological, behavioural and contextual rationale; University of Toronto, Toronto, Canada.

World Health Organization (WHO) (2005). Guiding principles for feeding non-breastfed children 6-24 months of age. WHO: Geneva.

World Health Organization (WHO) (2006). Child Growth Standards methods and development: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age. WHO: Geneva.

World Health Organization (WHO) (2007). Indicators for assessing infant and young child feeding practices Part 1 Definitions. Washington DC: Department of Child and Adolescent Health and Development. WHO: Geneva.

World Health Organization (WHO) / United Nations Children's Fund (UNICEF) (1988). Joint WHO/UNICEF statement on vitamin A for measles. *International Nurses Reviews*, 35:18-21.

World Health Organization (WHO) and United Nations Children's Fund (UNICEF) (2003). Global Strategy for Infant and Young Child Feeding. WHO: Geneva.

World Health Organization (WHO) and United Nations Children's Fund (UNICEF) (2007). Preventing and controlling micronutrient deficiencies in populations affected by an emergency: Multiple vitamin and mineral supplements for pregnant and lactating women, and for children aged 6 to 59 months. Geneva.

World Health Organization (WHO)/ United Nations Children's Fund (UNICEF) (2008) Strengthening action to improve feeding of infants and young children 6-23 months of age in nutrition and child health programmes: report of proceedings, WHO Library Cataloguing-in-Publication Data, Geneva.

WHO/USAID/AED/FANTA/IFPRI/UNICEF (2008). Indicators for assessing infant and young child feeding practices: Part 1 definitions. Geneva.

World Health Organization (WHO) / United Nations Children's Fund (UNICEF) (2009). Child growth standards and the identification of severe acute malnutrition in infants and children: A joint statement by the WHO; UNICEF. Geneva.

World Health Organization (WHO) / United Nations Children's Fund (UNICEF) (2010). Indicators for assessing infant and young child feeding practices. Part 2 Measurement. UNICEF. Geneva.

World Health Organization/ United Nations Children's Fund (UNICEF) (2012). Progress on Drinking Water and Sanitation: Joint Monitoring Programme for Water Supply and Sanitation. Centers for Disease Control and Prevention Atlanta; United States.

Zhang, Y., Michelle, H. M., Ruden, D., Robert, W. S., Josip, C., Vanja, S. and Chen, L. (2013). Improving the intake of nutritious foods in children aged 6-23 months in Wuyi country, China a multi-method approach. *Croatian Medical Journal*, 54(2): 157–170.

APPENDICES

Appendix 1: Analysis of the acceptability and feasibility of the recommendations was evaluated based on the selected criteria from ProPAN guideline (PAHO, 2003).

Feasibility: Feasibility was evaluated based on following criteria

Positive consequences: In the assessment, does the recommended practice have positive consequences (i.e., pleasant or favorable outcomes) that are immediate and perceivable by the person who will adopt it?

-0: no positive consequences (and maybe even some negative consequences)

-1: very few or some

-2: many or a significant number

•*Compatibility with beliefs and knowledge:* Do targeted individuals have beliefs or knowledge that are compatible with complying with the recommended practice?

-0: beliefs/knowledge are incompatible with the recommended practice

-1: beliefs/knowledge are somewhat compatible with recommended practice

-2: beliefs/knowledge are compatible with the recommended practice

•***Cost in terms of cash or in-kind resources:***

Are additional monetary or material resources required to comply with the recommended practice?

-0: requires significant additional resources

-1: requires few additional resources

-2: requires no additional resources or resources already available to the person

•**Cost in time and/or effort.**

Are additional time and/or effort required from the targeted individual to comply with the recommended practice?

-0: requires significant time and/or effort; is not realistic

-1: requires some time and/or effort

-2: requires very little time and/or effort

•*Complexity*: From the point of view of the targeted individual, how complex is the recommended practice in terms of the number of steps it requires?

-0: too complex as it requires too many steps (five or more)

-1: requires several steps (three to four)

-2: requires only a few steps (one or two)

Appendix 2: Formulae used to calculate the Energy density, Nutrient density and Cost analysis of various preparations

Energy density: is the number of kilocalories per gram of preparation (see Glossary). It is calculated using the following formula:

$$\frac{\text{Total kilocalories of preparation}}{\text{Total weight of preparation (grams)}}$$

Nutrient density: The amount of a nutrient per 100 kilocalories of preparation. It is calculated using the following formula:

$$\frac{\text{100 kcal x total amount of nutrient in the preparation}}{\text{Total kilocalories in final preparation}}$$

Cost analysis: Compare prices among several recipes, it calculate the price per 100 g of each recipe, as described in the formula below.

$$\frac{\text{100 grams x total price of the preparation}}{\text{Total weight of the preparation (grams)}}$$

Appendix 3: Recommended Dietary Allowances

The daily median energy (in kilocalories) recommendation used was the following.

- As 202 kcal for breastfed infants, 6-8 months,
- 307 kcal for breastfed infants, 9-11 months,
- 548 kcal for breastfed children, 12-23 months,
- 615 kcal for non-breastfed infants, 6-8 months,
- 686 kcal for non-breastfed infants, 9-11 months,
- 894 kcal for non-breastfed children, 12-23 months

Source: (Institute of Medicine 2000; WHO/UNICEF 1998)

The proxy EAR for the Specific Nutrient intake

Specific nutrient intake	6-11 months		12-23 months	
	Breastfed	Non-breastfed	Breastfed	Non-breastfed
Protein: (g)	1.3 - 2.00	6.0 - 6.3	3.30	7.20
Iron: (mg)	7.10	3.80	7.30	4.00
Zinc: (mg)	3.5 – 3.60	4.20	4.80	5.40
Vitamin A: (µRAE)	9.3- 30.0	250.00	90.00	285.70
Vitamin C: (mg)		20.80	6.70	25.00
Calcium: (mg)	280 -294.20	437.50	163.30	25.00

Source: (Institute of Medicine, 2000)

Appendix 4: Household survey: Anthropometry form (preliminary information)

1. Child's code: _ _ _ _ 2. Date of interview _ _ _ _ _ _ _ _

3. Location: _ _ _ _ Day Month Year

4. Field worker's code: _ _

5. Child's sex (1 = M, 2 = F) 6. Date of birth _ _ _ _ _ _ _ _

Day Month Year

7. Age (months): _ _ (IF THE CHILD IS YOUNGER THAN 6.0 MONTHS OR 24.0 MONTHS OLD OR OLDER, DO NOT APPLY THE SURVEY).

8. Was (child) breastfed yesterday? (0 = No, 1 = Yes)

9. Yesterday, was it a holiday in the community? (0 = No, 1 = Yes)

10. Yesterday, was there a celebration in the family? (0 = No, 1 = Yes)

11. Yesterday, was the child sick with fever, cough or diarrhea? (0 = No, 1 = Yes)

(Anthropometric measurements):

12. Child weight in kilograms: _ _

13. Child height in centimeters _ _ _ _

14. Child MUAC in millimeters _ _ _ _

Appendix 5: Semi-structure interview

I. INTRODUCTION

1. Identity code of mother/caregiver _____
2. Identity code of [child]? _____
3. What is your relation to [child's name]?

Mother.....01
Father.....02
Other, specify: _____ 77

4. Are you the primary caregiver of [child's name]?

Yes.....01
No.....02

II. SCREENING

5. Could you please show me an immunization record or birth certificate with [child's name] birthdate?

Yes.....01
No.....02

6. What is [child's name] birth date? [IF UNKNOWN (If unknown, estimate by asking questions about the proximity of the child's birth to local holidays or festivals.)

Date.....__ __/ __ __/ __ __day month year

7. How many months old is [child's name]? ___ ___ Months
8. Is [child's name] a boy or a girl?

Male.....01
Female.....02

III. BREASTFEEDING AND COMPLEMENTARY FEEDING

9. During the pregnancy with [child's name], how many times did you visit a health care center for a prenatal visit?

Number of visits.....___ ___
Does not know.....99

10. Where was [child's name] born?

In the hospital.....01
In the health center, doctor's office, private clinic.....02
In the home.....03
In the midwife's home.....04
Other, specify: _____.....77
Does not know.....99

11. Was [child's name] ever breast-fed?

Yes.....01

No.....02

Does not know.....99

12. How many hours after birth was [child's name] breastfed for the first time?

Within 1 hour after birth.....01

From 1 to 3 hours after birth.....02

More than 3 hours after birth.....03

Does not know.....99

13. Was [child's name] fed colostrum?
Yes.....01
No.....02
Does not know.....99

14. During the first 3 days after birth, was [child's name] given anything other than breast milk?
Yes.....01
No.....02
Does not know.....99

15. What was [child's name] given?
Tea.....01
Water (includes sugar water).....02
Infant formula.....03
Other non-breastmilk milks.....04
Other, specify.....77
Does not know.....99

16. During the first 3 days after birth, were you offered any practical support or advice to help you start breastfeeding [child's name]?
Yes.....01
No.....02
Does not know.....99

17. Yesterday, was [child's name] breastfed?
Ye s.....01
No.....02
Does not know.....99

18. Yesterday, did [child's name] drink breast milk from a cup or a bottle?
Yes.....01
No.....02
Does not know.....99

19. Yesterday, was [child's name] breastfed whenever he/she wanted or on a fixed schedule?
Whenever the child wanted.....01
On a fixed schedule.....02
Does not know.....99

20. Who mainly decides what [child's name] should and should not eat?

The mother.....01

A grandparent.....02

A sibling.....03

An aunt/uncle.....04

A neighbor/friend.....05

The father.....06

Other, specify: _____ 77

Does not apply (child does not eat solid foods).....88

21. Generally speaking, how is [child's name]'s appetite when she/he is healthy?

Eats too much.....01

Eats well.....02

Eats a little.....03

Does not know.....99

22. At what age was [child's name] fed his/her first solid/semi-solid food? By solid or semi-solid foods we mean food that is thick, not a soup, broth or thin porridge.

Age in months .....___ ___

Less than 1 month.....00

Does not know.....99

23. Are you the person who fed [child's name] yesterday?

Ye s.....01

No.....02

24. Yesterday, what liquids other than breast milk was [child's name] given?

None.....01

Tea.....02

Water (includes sugar water) 03

Infant formula.....04

Other non-breast milk milks.....05

Other, specify: _____ 77

Does not know.....99

25. Yesterday, did [child's name] have anything to drink from a bottle with a nipple?

Ye s.....01

No.....02

Does not know.....99

26. Yesterday, did [child's name] eat any solid or semi-solid foods?

Yes 01

No.....02

Does not apply (child does not eat solid foods).....88

Does not know.....99

27. The last time [child's name] was sick, did you offer less, more or the same amount of breast milk as when [child's name] is healthy? (If response is "less", ask additional questions to determine why.)

Less, because the child did not want it.....01
Less, because mother's decision.....02
More.....03
The same.....04
Child never breastfed or child breastfeeding before last illness.....05
Child has never been sick.....88
Does not know.....99

28. The last time [child's name] was sick, did you offer less, more or the same amount of non-breast milk liquids as when [child's name] is healthy? (If response is "less", ask additional questions to determine why.)

Less, because the child did not want it.....01
Less, because mother's decision.....02
More.....03
The same.....04
Child never fed non-breast milk liquids.....88
Does not know.....99

29. The last time [child's name] was sick, did you offer less, more or the same amount of foods as when [child's name] is healthy? IF THEY RESPOND "LESS" THEN PROBE "WHY?")

Less, because the child did not want it.....01
Less, because mother's decision.....02
More.....03
The same.....04
Child never fed foods.....88
Does not know.....99

30. After the illness ended, did you offer less, more or the same amount of food as when [child's name] is healthy? (If response is "less", ask additional questions to determine why.)

Less, because the child did not want it.....01
Less, because mother's decision.....02
More.....03
The same.....04
Does not know.....99

IV. HEALTH AND OTHER SERVICES

31. In the past 3 months, since _____ (MONTH), have you taken [child's name] to a hospital, health center, mobile unit, or any other health service?

Hospital.....01
Health center, clinic.....02
Community health post.....03
Mobile unit.....04
Doctor's office.....05
Other, specify _____ 77
Has not taken child.....88
Does not know.....99

32. In the past 3 months, at any of these places (health facilities), was [child's name] measured for:

	Yes	No	Does not know
Weight	01	02	99
Length	01	02	99
Upper arm	01	02	99

33. During the past 3 months, since _____ (MONTH), did [child's name] ever take/receive any of the following?

	Yes	No	Does not know
Iron supplement or syrup? (For example, ferrous sulfate)	01	02	99
A multi-vitamin and mineral supplement, syrup or powder (such as Sprinkles)?	01	02	99
Lipid nutrient supplement, (such as Nutri-butter or Plumpydoz or Rutf)	01	02	99
Supplementary food, (such as Corn Soya Blend	01	02	99
General food rations	01	02	99
Vouchers for food	01	02	99
Cash assistance to help purchase food	01	02	99

V. HOUSING INFORMATION

34. What is your occupation, that is, what kind of work do you mainly do?

Vendor.....01
Agricultural worker.....02
Office worker.....03
Service worker.....04
Education/research.....05
Healthcare.....06
Other, specify _____ 77

35. Does anyone in your household grow food? If yes, tell me about all the types of food that are grown.

Yes (grains, roots, tubers).....01
Yes (legumes, nuts).....02
Yes (orange or yellow fruits & vegetables).....03
Yes (green leafy vegetables).....04
Yes (any other fruits & vegetables).....05
Yes (other: specify_____).....77
No.....07

36. Does this household own livestock, herds, other farm animals, poultry or fish? If yes, tell me about all the types of animals that you have.

Yes (chickens, ducks, or other birds: for the meat)..... 01
Yes (chickens, ducks, or other birds: for the eggs).....02
Yes (cows, goats, sheep, pigs, camels or other large mammals for the meat)..... 03
Yes (cows, goats, sheep, or camels for the milk).....04
Yes (rabbits, guinea pigs, or other small mammals)..... 05
Yes (fish).....06
No.....07

37. What is the main source of drinking water for members of your household?

Piped water Piped into dwelling.....01
Piped into compound, yard or plot.....02
Piped to neighbor.....03
Public tap / standpipe.....04
Tube well, Borehole.....05
Dug well Protected well.....06
Unprotected well.....07
Water from spring Protected spring.....08
Unprotected spring.....09
Rainwater collection.....10
Tanker-truck.....11
Cart with small tank / drum.....12
Surface water (river, stream, dam, lake, pond, canal, irrigation channel).....13
Bottled water.....14
Other, specify:.....77
Does not know.....99

38. How long does it take to go there, get water and come back?

Number of minutes.....___ ___
Does not know.....99

39. Do you do anything to the water to make it safer to drink?

Ye s.....01
No.....02
Does not know.....99

40. What do you usually do to make the water safer to drink?
Boil.....01
Add bleach / chlorine.....02
Strain it through a cloth.....03
Use water filter (ceramic, sand, composite, etc.).....04
Solar disinfection.....05
Let it stand and settle.....06
Other, specify:.....77
Does not know.....99

41. What kind of toilet facility do members of your household usually use?
Flush / Pour flush Flush to piped sewer system.....01
Flush to septic tank.....02
Flush to pit (latrine).....03
Flush to somewhere else.....04
Flush to unknown place / Not sure /Does not know where.....05
Pit latrine Ventilated Improved Pit latrine (VIP) 06
Pit latrine with slab.....07
Pit latrine without slab / Open pit.....08
Composting toilet.....09
Bucket.....10
Hanging toilet, Hanging latrine.....11
No facility, bush, field.....12
Other, specify:.....77
Does not know.....99

42. What type of fuel does your household mainly use for cooking?
Electricity.....01
Liquefied Petroleum Gas (LPG).....02
Natural gas.....03
Biogas.....04
Kerosene.....05
Coal / Lignite.....06
Charcoal.....07
Wood.....08
Straw / shrubs / grass.....09
Animal dung.....10
Agricultural crop residue.....11
No food cooked in household.....12
Other, specify:.....77

Appendix 6: 24 - hrs recall form

Shehia.....**Date**.....

Child Identification code..... .....**Age**.....**sex**.....

Food name:

Meal pattern	Ingredients	Amount used (household measure)	Amount used (grams)		Cooked (Yes or No)	Breast feeding status
			Served	Consumed		

Appendix 7: Consent Letter and Form (Form I-2.1)

i) Consent form

I AGREE TO PARTICIPATE IN THIS STUDY: YES ( ) NO ( )

PARTICIPANT'S IDENTIFICATION CODE

_____

SIGNATURE: _____ OR FINGER PRINT:

DATE: __ __/ __ __/ __ __

FIELD WORKER'S NAME AND CODE:_____ _____

FIELD WORKER'S SIGNATURE: _____

ii) Participant consent

[city] / [month] / [year]

Dear Ms. [Code of caregiver]:

You are cordially invited to participate in a study about feeding practices of children under 2 years of age. If you decide to participate, I will ask you questions about [child's name], such as, for example, the age at which [child's name] was first offered foods other than breast milk, how many times a day [child's name] eats, how much of each food [child's name] eats, and how you prepare the foods for [child's name]. It will take approximately [amount of time in minutes or hours].

You have the right to decline to participate, and you also have the right to leave the study at any time. The information you will provide during the interviews is strictly confidential, will only be available to the project investigators and no one else. Declining to participate will not affect your access to health and nutrition services offered in the community.

There will be no immediate benefit for you or [child's name] for participating in this project. However, the information you provide will help strengthen child nutrition programs in [country/region]. Participation in the project poses no risk to you or [child's name].

If you have any questions, comments, or complaints about the study, please contact [name of Study Coordinator],

Study Coordinator, by calling [telephone number].

Sincerely,

_____

[Name and title of Study Coordinator]

_____

[Institution]

_____

[Address and phone numbers]

Appendix 8: Market Survey Form (Form I-5.1)

1. Name of retail location: _____

2. Address/location: _____

Field Worker name: _____ / _____ 3. Field Worker's code: 4. Survey date: _____ / _____

Supervisor name: _____ / _____ 5. Supervisor's code: 6. Supervision date: _____ / _____

				10-12. Prices			13. All year	seasonality											
7. Food code	7a. Food name	8. Retail unit	9. Net weight(g)	Price 1	Price 2	Price 3		14. J	15. F	16. M	17. A	18. M	19. J	20. J	21. A	22. S	23. O	24. N	25. D

Appendix 9: Registration form for the Focus Group (FORM II-3.1)

1. Focus group number: ___ ___
2. Date of focus group: __ __/ __ __/__ __ __ __
   day month year

*3. Meeting place:*_____

4. Moderator's name and code:

_____/ ___

5. Note-take date and code:

_____/ ___

6. Participants' names and codes:

_____/ ___

_____/ ___

7. Participants' information:

CODE	AGE		

8. Starting time:

_____ _____:_____ _____

9. Ending time:

_____ _____:_____ _____

10. Topics to cover during focus group:

_____

_____

_____

11. Observations and comments about the group
    - *Participation level*
    - *Was the question guide completed?*
    - *Other*

_____

_____

Appendix 10: Matrix for the Analysis of the Focus Group (Form II-3.2)

RECOMMENDATION/ QUESTION	KNOWLEDGE, REASONS AND ATTITUDES

Appendix 11: Photos of various preparations in recipe creation exercise

PHOTOS: RECIPE CREATION EXERCISE.

Plate 1: Rice with carrots

Recipe ingredients: Rice, coconut milk, carrots, iodized salt

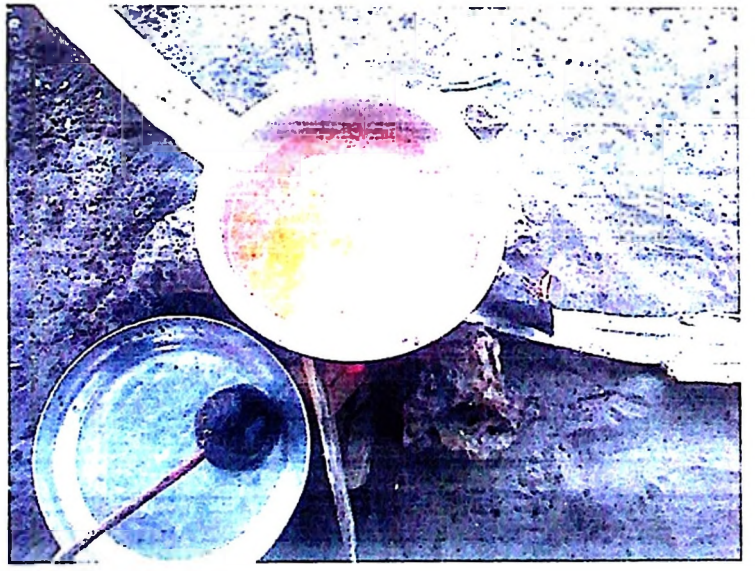

Plate 2: Fish stew

Recipe ingredients: Fish, onions, sweet pepper, tomatoes, turmeric, iodized salt.

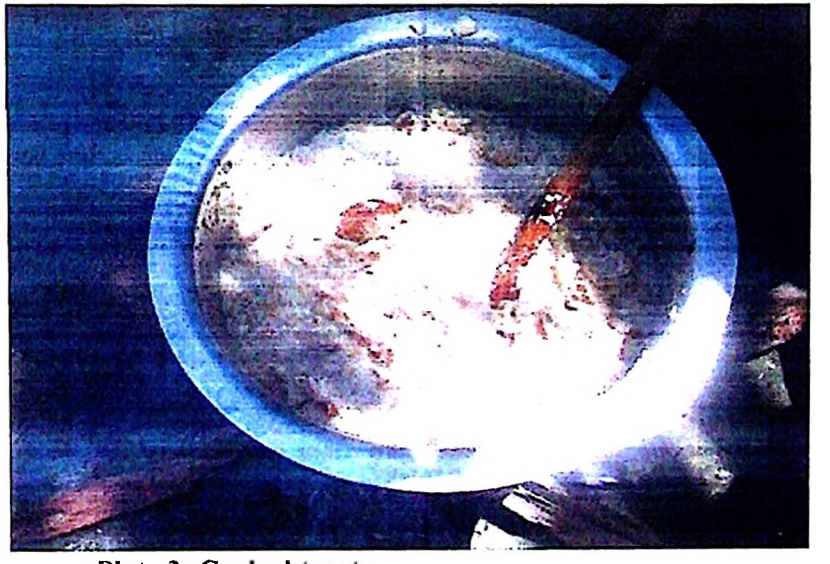

Plate 3: Cooked toast

Recipe ingredients: Toast, milk, ground nuts, and sugar.

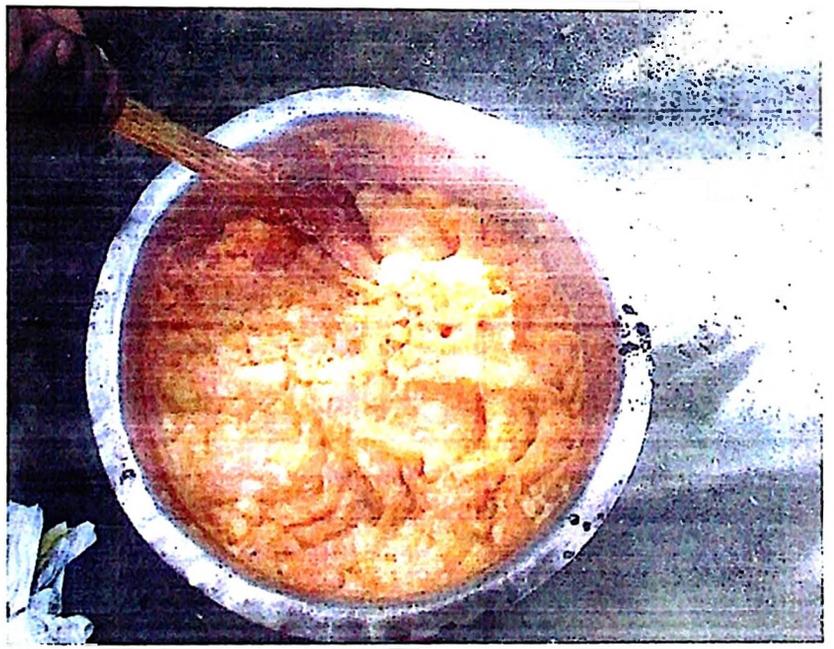

Plate 4: Mashed Irish potatoes Recipe ingredients: Irish potatoes, coconut milk, sweet pepper, tomatoes, onions, iodized salt

Plate 5: Mashed sweet potatoes Recipe Ingredients: Sweet potatoes, sweet pepper, tomatoes, onions, sardines, iodized salt.

COMMON UTENSILS USED FOR MEASUREMENT DURING 24 HOUR RECALL

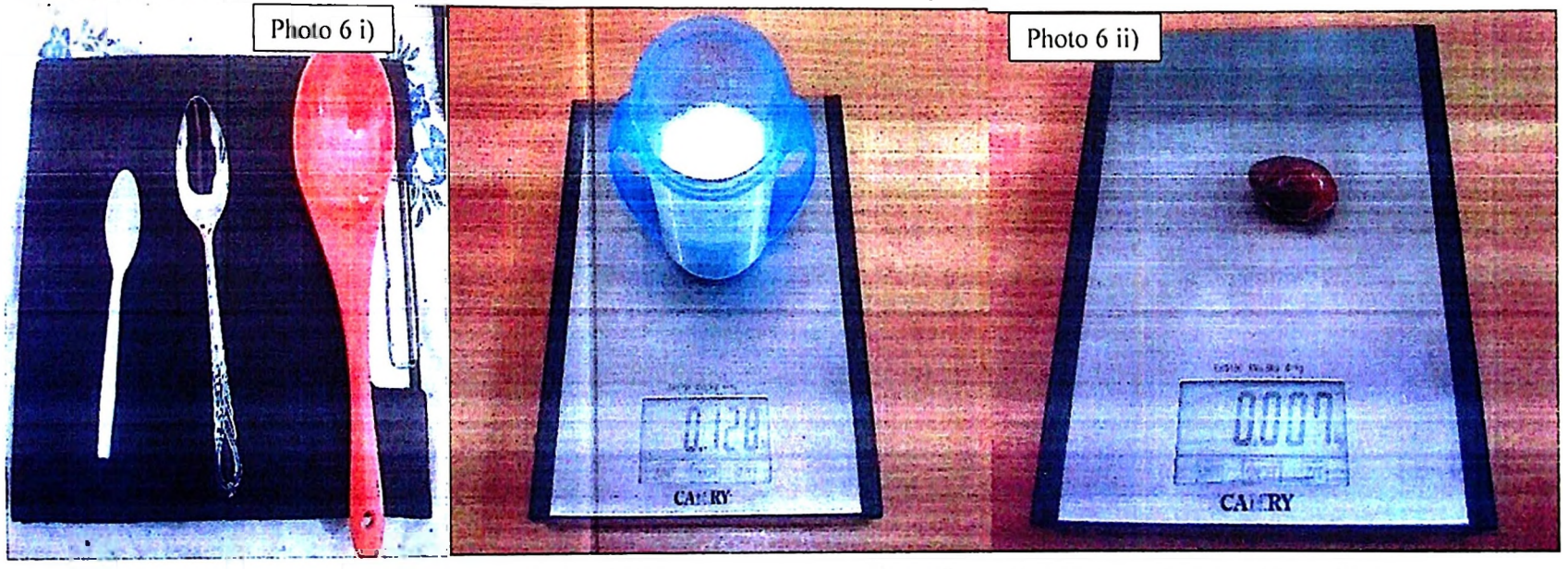

Plate 6: i) Spoons (tea spoon 5 g; table spoon 15 g; serving spoon 50 g -80 g depends on viscosity of the prepared meal.

Photo 6 ii) Sensitive scale: For measuring food and liquids during 24 hours recall

MARKET SURVEY

Plate 7: Common fruits available during market survey.

Plate 8: Local shop displays fruits (ripe bananas, pumpkin, mangoes), leafy vegetables (sweet potato leaves), coconuts and other food stuffs.

Plate 9: Bulrush millet in the winnower (common cultivated cereal) in Maziwa Ngo'mbe and Kiuyu Mbuyuni).