UPTAKE OF FOLIC ACID FORTIFIED FLOURS AMONG WOMEN OF REPRODUCTIVE AGE IN IFAKARA, MOROGORO REGION

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Msc (Applied Epidemiology) Dissertation
Muhimbili University of Health and Allied Sciences
October 2017

Muhimbili University of Health and Allied Sciences
Department of Epidemiology and Biostatistics

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By

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A dissertation submitted in (partial) Fulfillment of the Requirements for the Degree of Master of Science (Applied Epidemiology) of Muhimbili University of Health and Allied Sciences

October 2017

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled***Uptake of folic acid fortified flours among women of reproductive age in Ifakara, Morogoro region,*** in (partial) fulfillment of the requirements for the degree of Master of Science (Applied Epidemiology) of Muhimbili University of Health and Allied Sciences.

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I, **Ipyana Frank Mwandelile**, declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other University for similar or any other degree award.

Signature..... Date.....

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ACKNOWLEDGEMENT

First and foremost, I would like to thank God almighty who has given me life and strength to bring this work into existence, without Himthiswork could be void.

My sincere gratitude should extend to my supervisors, Dr Rose Mpembeni and Rogath Kishimba who offered me an unspeakable assistance in accomplishing this work.Their enormous and indefatigable guidance at any time needed has made this work successful.

My regards should extend to all Tanzania Field Epidemiology and Laboratory Programme staff for their technical support which I was given accordingly.

My gratitude would not spare the CDC and Ministry of Health Community Development Gender Elderly and Children for funding this study.

I express my in-depth gratefulness to the Birth defects department, CDC-Atlanta, Georgia staff, Jenny Williams, Rosenthal George and Chen Meng-Yu to name a few, for their great contribution on this work from early stages of proposal development.

I greatly thank all administrative levels, the Morogoro regional medical officer (RMO), Ifakara Town Council executive directorand local leaders for their profound contribution by allowing me to conduct this study free of hurdles.

My research assistants worked without hesitation despite some challenges faced. Thank you a lot to all. I am glad to thank all women of reproductive age who showed interest and willingly participated in this study, without whom nothing could have been gathered.

Lastly but not least of importance I would like to thank my wife and two sons for their tolerance they had in my absence.

DEDICATION

I dedicate this work to my lovely wife Oliver Mwasenga and my two sons, Brian and Brighton. Their good wish, encouragement, support and prayers have played an important role. I know a great vacuum they felt in my absence or tense times when I could not offer my all love to them.

My mother Tusekelege Lukomo deserves this dedication too; she played fatherhood roles and kept encouraging me tirelessly.

ABSTRACT

Background

Folic acid food fortification has been in place for over two decades after several studies proving folic acid beneficial effects on prevention ofneural tube defects (NTDs).Tanzania has adopted mandatory fortification policy on wheat and maize flour. Essentially all wheat flour in Tanzania is fortified.Fortified maize flour from smaller mills is also available but less common. Uptake of fortified flours is important in prevention of the micronutrient deficiency among women of reproductive age (WRA) as well as NTDs to unborn babies. However, the uptake of folic acid fortified flours among WRAis unknown. Therefore this study intended to determine awareness, uptake of folic acid fortified flours,influencing factors and reasons hindering uptake among WRA in Ifakara Town Council, Morogoro region.

Methods

This was a cross sectional study involving698 WRA, conducted from March to April 2017 in Ifakara. A multistage cluster random sampling technique was used to select study participants. Pretested interviewer administered questionnairesand observation checklists were used to collect information on uptake and availability of fortified wheat and maize floursfrom local retail shops. Data were managed and analyzed by Epi Info7 and STATA 13. Association between uptake of folic acid fortified flours and independent variables was assessed using odds ratios through cross tabulations and significance testing was done using Chi square or Fishers's exact test. P value of 0.05 was considered significant. Factors with p-value of ≤0.2 at bivariate analysis including conventional confounders such as age were entered in multiple logistic regression model to assess significant independent factors associated with fortified flours uptake among WRA and to control for potential confounders.

Results

A total of 698WRA participated in the study. Awareness of folic acid and fortified flours were found to be 6.9% (5.2%-9.0%) and 7.5% (5.7%-9.6%) respectively. The uptake of fortified flours was found to be 63.3% (59.7%-66.8%). Fortified wheat flour was found available in all 9 villages involved in the study while fortified maize flour was found in only one village. Factors that were significantly associated with fortified flours uptake included; Being employed, AOR=1.99(1.27-3.13), household size of 5 or more people, AOR=1.37(1.02-1.85) as well as nulliparity, parity of 1-4 children, AOR=2.74(1.54-4.87) and 1.92(1.17-3.13) respectively and awareness of folic acid, AOR=2.67(1.37-5.19. The common reasons mentioned to hinder uptake of fortified flours included: not knowing that the flour is fortified and unaffording to buy fortified flours.

Conclusion and recommendations

Uptake of fortified flours among WRA is relatively high however, low for maize flour accompanied with low awareness of folic acidand existence of fortified flours.All9 villages involved in the study had an access to fortified wheat flour and only one village had an access to fortified maize flour. Being employed, having fewer children, household size of 5 or more people and awareness of folic acid are significant influencing factors for uptake of folic acid fortified flours.Not knowing thatflour is fortified and unaffordability were commonly mentioned hindering reasons for fortified flours uptake. To increase uptake of fortified flours, institutions like Tanzania Food and Nutrition Centre (TFNC) should be used to increase awareness on the benefits of folic acid fortified flours among women and the general community.

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LIST OF ABBREVIATIONS

CDC	Centers for Disease Control
EPI	Expanded Program of Immunization
FACT	Fortification Assessment Coverage Tool
HKI	Helen Keller International
LMICs	Lower and Middle Income Countries
MMWR	Morbidity and Mortality Weekly Report
MOHCDGEC	Ministry of Health Community Development Gender Elderly and Children
MUHAS	Muhimbili University of Health and Allied Sciences
NBS	National Bureau of Statistics
NFFA	National Food Fortification Alliance
NTD	Neural tube defects
OPD	Out Patient Department
PPS	Probability Proportion to Size
RMO	Regional Medical Officer
TC	Town Council
TFELTP	Tanzania Field Epidemiology and Laboratory Training Program
TFNC	Tanzania Food and Nutrition Centre
TFP	Targeted Fortified Products
Tshs	Tanzanian shillings
USA	United States of America
USD	United States of America Dollar
WHO	World Health Organization
WRA	Women of Reproductive Age

DEFINITION/OPERATIONAL TERMS

Food fortification: refers to addition of micronutrients to processed foods

Folic acid: Any form of folic acid including folic acid single tablets, folic acid powder, multivitamin containing folic acid and folic acid fortified foods

*Fortified flours uptake:*Uptake of folic acid fortified wheat or maize flour products within 7 days prior interview

Folic acid fortified flour: Wheat and maize flour containing folic acid, iron, vitamin B12, zinc, thiamin, riboflavin, niacin, vitamin A and folic acid, iron, vitamin B12 respectively

*Fortified flour and folic acid fortified flour:*used interchangeably

Awareness: Having heard or seen anything about folic acid or existence of fortified flours

*Women of reproductive age (WRA):*Women who are in their active reproductive years. In this case considered to be 18-49 years.

Street: A public road in a city or town, with houses and buildings on one or both sides

Hamlet: Asettlement smaller than a village

Household: People who slept in the house last night and ate from the same cooking pot

CHAPTER ONE

INTRODUCTION

1.1. Background

Food fortification has a far long history in developed countries for control of various micronutrient and vitamin deficiencies such as vitamin A and D, B vitamins, iron and iodine successfully (1).Adoption of folic acid food fortification has been in place for over two decades after several studies proving folic acid beneficial effects on prevention of Neural Tube Defects (NTDs). In USA and Canada folic acid food fortification was mandatory since late 1990's(2). To date there are over fifty countries with mandatory folic acid wheat flour fortification regulations(3).

Consumption of a multivitamin containing 400mcg of folic acid daily among WRA is the recommended amount of folic acid known to reduce NTDs and other birth defects(4).In developed countries despite sufficient knowledge a higher proportion of WRA do not implement the recommendations to take folic acid periconceptionally and a substantial proportion remain unaware of the requirement despite many public-health campaigns(5). Supplements intake requires behaviour change while mass fortification does not; For this reason fortification of foods with folic acid for mass consumption is considered important for increasing blood levels of folic acid in the population(4,6).

Folic acid fortification is cost-saving. Data from the US and other countries affirm that fortification saves up to 299-603 million USD/year related to direct medical and indirect costs like parental care for spina bifida and preventing up to 767 cases of spina bifida annually. MMWR, 2010 reports that each 1 USD invested in fortification about 100 USD are saved (6,7). Despite the fact that food fortification is a very cost effective public health intervention, an obvious requirement is adequate consumption of fortified foods by a large proportion of the individuals targeted in a population(1). This implies that large population should be covered with availability and easy access of fortified foods.

Tanzania has passed a policy for mandatory fortification of commercial wheat and maize flour with effect from 2011.Wheat flour is fortified with folic acid, iron, vitamin B12, zinc, thiamin, riboflavin, niacin and vitamin A, while maize flour is fortified with folic acid, iron and vitamin B12. Most common used wheat flour is produced by few large companies which do fortification.

To the contrary maize flour is produced by many small scale millers who have limited access to resources or incentives to fortify their products(8). Morogoro region is among regions in which SANKU fortification project is operating. The project supports some small-scale millers to conduct maize flour fortification by providing fortification dossifiers, premixes and technical assistance(9).

Despite the recommendations for use of fortified flours among WRA and the general population, there is little information on uptake of fortified flours among WRA in Tanzania ever since the policy was introduced.

This study intended to assess uptake of folic acid fortified flours, influencing factors and reasons hindering uptake among WRA in Ifakara.

1.2. Problem Statement

NTDs are among major congenital anomalies affecting infants worldwide. They rank among the common causes of mortality and disabilities in infants(10). Studies in Lower and Middle Income Countries(LMICs) have demonstrated a prevalence rate of 2.05/1000 taking into account live births stillbirths and termination of pregnancies(11). There is lack of systematically collected birth defects surveillance data in Tanzania. However, information from retrospective hospital records reviews found an incidence of 3.02/1000 live births at Muhimbili National hospital, (12)and a recent study done in Dar es salaam shows an NTDs prevalence of 9.9/10,000 live births(13).

Food fortification with folic acid has been recommended as one of the strategic option for prevention of NTDs and controlling the micronutrient deficiency among WRA(2,4). Consumption of fortified flours by WRA isone of the effective methods to prevent NTDs to

infants expected to be borne by WRA, since a large proportion of pregnancies are unplanned even in high-income countries(4)

A study done in Australia found an uptake of folic acid fortified foods of 61%. It further stipulates that years of education, family income and timing of pregnancy were factors that influenced uptake. Mothers who had lower level of education and lower family income were found to be less likely to take folic acid tablets or foods or beverages with added folate(14).

Tanzania has adopted mandatory wheat and maize flourfortificationpolicy as a measure to combat micronutrient deficiencies among women of childbearing age, (used in other countries).

However, uptake of folic acid fortified flours among WRA in Tanzania is unknown.

Therefore, this study helps to understand the magnitude of fortified flours uptake among women of reproductive age, factors influencing and reasons hindering uptakeinIfakara.

1.3. Conceptual Framework

The figure on next page shows the relationship that may exist between factors influencing uptake of folic acid fortified flours and uptake of folic acid fortified flours.

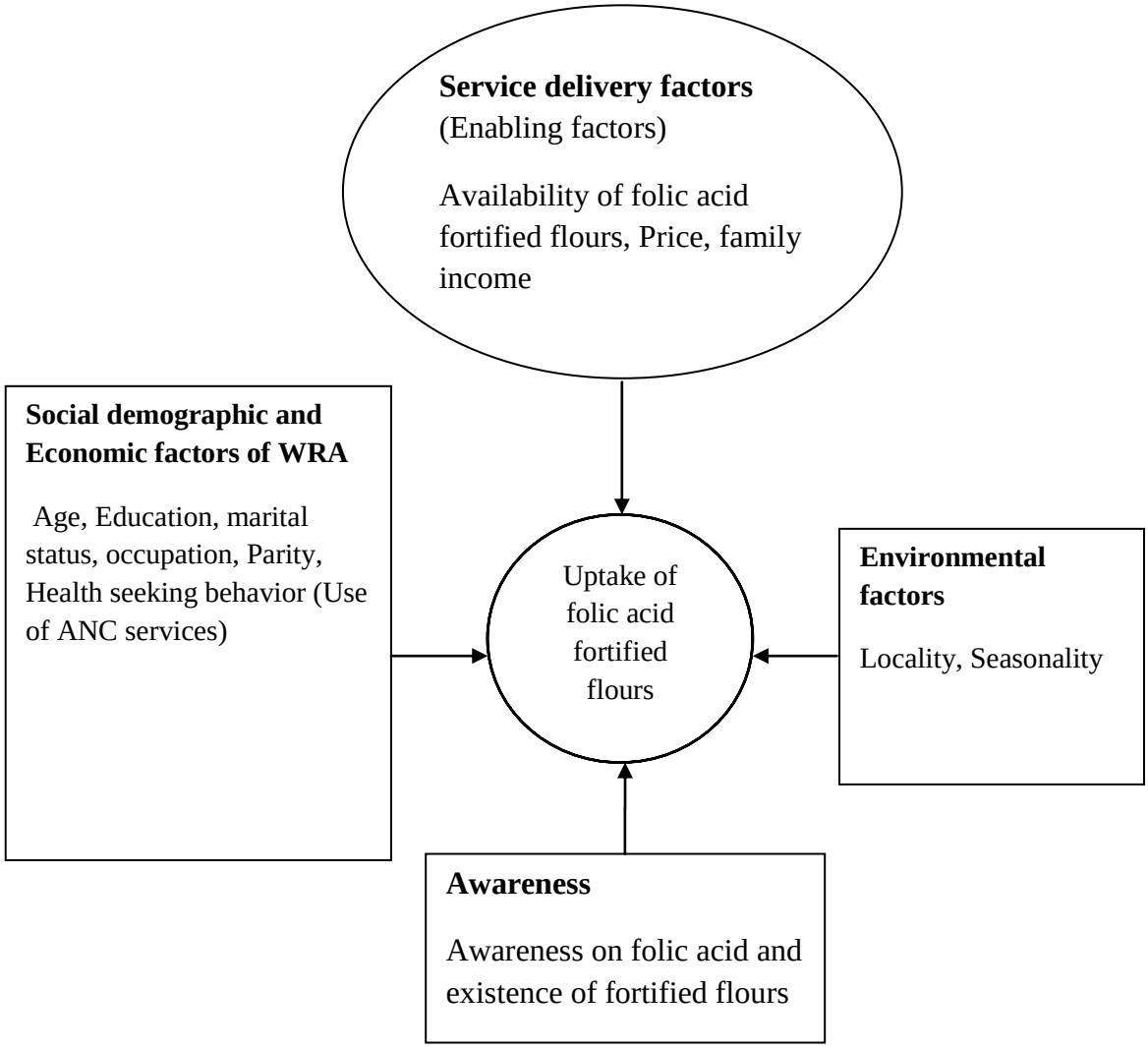


Figure 1: *Conceptual Framework*

The framework shows the relationship that may exist between uptake of fortified flours and women socio-demographiccharacteristics such as Age, education, parity, use of ANC services, awareness of folic acid,and awareness of existence of fortified flours as well as availability, price and family income. Socio-demographic characteristics like education may influence uptake due to knowledge gained at school or through information seeking behavior among this group. Socio-

economic characteristics like income may influence uptake in a sense that those with more income tend to have high purchasing power and hence easy access to fortified flours. Those who are aware of folic acid and existence of fortified flours may have more uptake by further seeking benefits of the products and hence increasing demand to them.

Environmental factors that may influence uptake include locality of WRA and seasonal variations. However, these factors could not be studied because the study was done in a small area of the same district.Seasonality may influence uptake in a sense that WRA may tend to use their own flours produced during harvesting time and therefore reducing the possibility of buying fortified flours.

1.4. Rationale

In Tanzania like in other countries pregnancies are unplanned by large proportion rendering difficulties to target interventions during the peri-conception period. Although the importance of peri-conception use of folic acid among pregnant women to prevent neural tube defects is scientifically well known, evidence shows that most of WRA do not fulfill this requirement when they wish to bear children.This creates a demand to provide adequate nutrition to all women throughout their reproductive years (4).

Food fortification with folic acid has been recommended as one of the strategic option for controlling the micronutrient deficiency but this can only correct the deficiency if the targeted population has access and do use the fortified foods.

With ongoing maize fortification project in Ifakara and large industries supply of fortified wheat flours in the area, findings from this study will add into the body of knowledge and help in designing strategies to increase uptake of folic acid fortified flours among WRA.

1.5. Research questions

i. What is the proportion of WRA in Ifakara who are aware of folic acid in Ifakara?
ii. What is the proportion of WRA in Ifakara who are aware of the existence of fortified flours?

iii. What isthe proportion of WRA who ate folic acid fortified flours within seven days prior to the survey in Ifakara?
iv. Is fortified flour available in retail local shops along study sites in Ifakara?
v. What factors influence uptake of folic acid fortified flours among WRA in Ifakara?
vi. What are the reasons hindering uptake of folic acid fortified flours among WRA in Ifakara?

1.6. Objectives

1.6.1. Broad objective

To determine uptake of folic acid fortified flours and the associated factors among women of reproductive age in Ifakara Town Council, Morogoro Region, Tanzania

1.6.2. Specific objectives

i. To determine the proportion of WRA who are aware of folic in Ifakara
ii. To determine the proportion of WRA who are aware of existence of fortified flours in Ifakara.
iii. To determine the proportion of WRA who ate folic acid fortified flours within seven days prior to the survey in Ifakara.
iv. To assess availability of fortified flours in retail local shops along study sites in Ifakara.
v. To determine factors influencing uptake of folic acid fortified flours among WRA in Ifakara.
vi. To determine reasons hindering uptake of folic acid fortified flours among WRA in Ifakara

CHAPTER TWO

LITERATURE REVIEW

2.1 What is Folate or Folic acid

Folate is a form of vitamin B9, naturally-occurring. The term folate denotes a generic name for a group of related compounds with similar nutritional properties while folic acid (pteroylmonoglutamic acid) is a synthetic form of vitamin B9 used in supplements and added to processed food products like flour and breakfast cereals (15). Folic acid is a water soluble B vitamin which is involved in amino acid metabolism (16,17).

2.2 Folate rich sources

The richest sources include liver, dark green vegetables and kidney. Others include fruits, pulses and nuts (17,18). Most diets provide an estimate of 200-400mcg/day, however losses may be 50-90% during cooking (19).

Folate can also be obtained as a supplement in form of vitamin or fortified foods (20).

2.3 Folate deficiency

Deficiency of folate is commonly due to poor diet but may also result from malabsorption caused by medicines such as anti-epileptics. Deficiency leads to macrocytic anaemia a second common nutritional anaemia after iron deficiency. During pregnancy folic acid deficiency has been found to cause neural tube defects in babies(17)hence pregnant women are advised to take 400mcg/kg of folic acid daily due to increased demand (19). The same applies to pregnant mothers with history of recurrent NTDs whose recommended dose is 4mg from the day pregnancy is planned to 3 months post conception (21)

2.4 Folic acid food fortification impact

In 1992, the United States of America, Public Health service, recommended that all women of childbearing age should use 400 micrograms of folic acid daily to reduce their risk of having an

NTD affected pregnancy. In 1998, mandatory fortification of cereal grain products labeled as enriched was instituted. There was a decline of NTDs prevalence by 28% from 1999-2011 following fortification (22,23).

In 2003 South Africa fortified staple foods with folic acid and the prevalence of NTDs declined by 30.5% from 1.41 to 0.98 per 1,000 births(24).

2.5 Folic acid food fortification adverse effects

Consumption of folic acid has raised concerns that it might cause some harmful effects such as blunting of antifolate effect in drugs like methotrexate and phenytoin, progression of nervedamage in persons with vitamin B12 deficiency, accelerated elderly cognitive decline, cancer and epigenetic hypermethylation. However these concerns have been associated with consumption of high folic acid supplements other than from fortification (6).When recommended levels of folic acid are taken, there has been no conclusive evidence that folic acid causes the mentioned concerns. Therefore to ensure that folic acid does not bring negative consequences to public health continued monitoring and research is required (6).

2.6 Awareness of folic acid

Women have should be aware of the benefits of folic acid if they have to use it. Several studies have been done to assess awareness of WRA on folic acid. Studies in Europe, Nepal, New Zealand, USA, and Honduras found proportions of awareness of 70%, 40%, 98%, 84% and 46.4% respectively (25–29). Another study conducted in Turkey found that 42.2% of the WRA reported to have heard of folic acid(30).

The awareness of folic acid and linkage with prevention of birth defects among WRA has been reported by several studies as well. A study done by Köken et al. 2013 found that 48.2% of those who heard about folic acid reported that it can prevent birth defects (30). Studies done in Europe, New Zealand and Honduras found that 25%, 28% and 62% respectively of participants who were aware of folic acid stated that it can prevent some birth defects (25,27,31).

2.7 Awareness of existence of fortified flours

A study that included rural and urban women attending health care in India, found that knowledge about targeted fortified foods(TFP's) to pregnant women was 53.3% among rural and 65.5% among women of urban population. Doctors/health care workers were the knowledge source about TFP's. The same study found that 80% and 89.33% of rural and urban mothers respectively had an opinion that TFP's should be used for pregnant women(32).

A study done in Qatari among WRA, 40.6% who heard about folate were aware that green leafy vegetables had been fortified with folic acid(33). An Australian survey on community knowledge and attitudes regarding the fortification of food with folic acid shows that mothers who were aged 18-44 years were more aware that folate was fortified to breakfast cereals and other products than those with 45 years or above (34).

A study by Oddy et al. 2007, revealed that 47% of the women who participated in the study had no awareness or were unsure that folic acid was added to foods in Australia(35). Another study in Uganda found no women heard about food fortification or recognized signs on available fortified foods(36).

2.8 Uptake of fortified flours among WRA

A National survey conducted in Senegal found that there was high consumption of fortifiable wheat flour (90%), among WRA(37). Another survey in Uganda found that 30% and 28% of participants consumed folic acid fortified wheat and maize flour respectively at least once on survey days(38). In Tanzania 51.5 % of the general population consume wheat flour but only 33.1% consume fortified wheat flour(8). The same survey found that 75% of the population consume maize flour but only 2.5% consume fortified maize flour(8).

2.9 Factors influencing uptake of folic acid fortified flours

There are limited studies on factors influencing uptake of fortified flours among WRA. One study done in rural and peri-urban areas of Kenya about factors determining use of fortified foods (vitamin A fortified sugar) found that age and income had negative influence on uptake

while information from peers or other sources such as media, trust of fortification process, awareness of fortified foods and knowledge on importance of vitamin A had positive influence. An increase in age reduced by 1% of consumption fortified sugar while income reduced by 18%. Knowledge of the importance of vitamin A in diets increased the probability of consuming fortified sugar by 115% while consumer's awareness of vitamin A fortification increased the consumption of fortified sugar by 193% (39).

An Australian study found that mothers with a lower level of education and lower family income were less likely to take folic acid tablets, foods, or beverages with added folate(14).

In Tanzania there is limited information regarding uptake of folic acid fortified flours among WRA and factors influencing uptake. Therefore, this study intended at assessing uptake of folic acid fortified flours and associated factors among WRA in Ifakara.

CHAPTER THREE

METHODOLOGY

3.1. Study Area

The study was conducted in Ifakara Town Council, Kilombero district in Morogoro region. We selected Ifakara purposely due to being among high birth defects prevalent districts, particularly NTDs (40).

Ifakara Town Council is among nine councils of Morogoro region. It liesalong Kilombero valley and most of its area extends below Udzungwa Mountains. Ifakara Town Council is bordered by Ulanga district to the south and most of its area by Kilombero district. The council has9 wards, 16 villages, 11 streets and 64 hamlets with a population of 106,424 people. There are 24,269 households with an average household size of 4.5 people(41). The estimated total number of WRA is 25,542(42).

The main economic activities include subsistence farming, fishing and animal husbandry. Staple foods used by majority are paddy, maize and banana, which serve as cash crops as well.

With regard to health care services, the council has 13 health facilities; 2 of them are owned by the government, 9 by private owners and 2 by religious owners. Among these facilities, there is one hospital and health centre and the rest are dispensaries.

As part of Morogoro region, there is SANKUflour fortification project in Ifakara, which provides training, equipment and fortification premixes to maize flour small scale millers(9).

3.2. Study Design

This was a community based cross sectional study conducted from March-April, 2017.

3.3. Study Population

The study involvedwomen of reproductive age (18-49 years) in Ifakara town council.

3.4. Sample Size

The sample size was calculated using Kish Leslie formula, (1965) for cross sectional studies;

$$n = \frac{(Z^2 \times p \times q) \times DEFF}{d^2}$$

Where

Z =Standard normal deviate at 95% confidence interval corresponding to 1.96

p = prevalence of folic acid fortified wheat flour consumption in community, 33.1%(8)

q= 1- p

d= margin of error, assumed to be 5%

DEFF= design effect= assumed to be 1.8(arbitrary deff) for 'p' around 25-30% (43)

$$n = \frac{1.96^2 \times 33.1 \times (100-33.1) \times 1.8}{5^2} = 621$$

Assuming non-response of 10%, the minimum required sample size was621/(100%-10%) = 690 WRA.

Our study used a minimum of 30 clusters, which is popular in population-based surveys(44).

Given a sample size of 690 WRA, number of households required per cluster were 690/30 = 24

Number of households needed;

Given Household size=4.5

Proportion of WRA in Ifakara=25,542/106,424= 24%=0.24

Then number of households required= 690/(4.5×0.24)= 639 households(45).

Assuming 10% non response=639/(100%-10%)=710 households

Therefore, total households with WRA required were 710.

3.5. Sampling Procedure

A multistage cluster sampling technique was used to select participants of the study. We firstselectedfive wards by simple random sampling method from nine wards followed by selection of nine villages from 16 villages as first stage units by using a similar method. Total population of villages was used to calculate required number of clusters per each village. Thirty clusters (hamlets/streets) were selected as second stage units by probability proportion to size (PPS). Twentyfour households from each cluster were selected to be involved in the study as third stage units. Households included in the study were selected randomly usingWHO EPI Cluster sampling method where by a hamlet/street central location was identified and a direction selected at random by spinning a pen. Allhouses were counted in straight line following this directionuntil the edge of the hamlet/street was reached.One of the counted houses was picked at random to create the starting point of the study. The second house visited was one that was nearest to the front door of the first household visited. Then followed by next household until sample size was reached.

Only one eligible woman of the household found was included in the study. If more than one woman of the household weas found eligible, numbers were assigned and only one was selected by simple random sampling method.If no member of the household was eligible we moved to the next household. Refusals or absent women were accounted as non respondents.

3.6. Inclusion Criteria

Females aged 18-49 years found in selected householdswho gave consent to participate were included in the study.

3.7. Exclusion Criteria

WRA 18-49 years who were unable to communicate/talk or women who had stayed in the council for less than 6 months were excluded in the study.

3.8. Recruitment and training of research assistants

Research assistants who had a minimum of secondary education were recruited and trained for two dayson the purpose of the study, data collection tools and methodology of the study.

3.9. Pretesting of tools

After being trained, the research assistants conducted pretesting of data collection tools. This was done at Sagamaganga village in Kilombero district, a site different from the study area. This ensured that all unclear questions or questions with improper flow were identified and were corrected before the tools were finalized for actual data collection.

3.10. Data Collection

Before data collection, the survey team paid a visit to the Town Council Medical Officer for self-introduction and the Town council Medical Officer introduced us to the Town Council Executive Director who offered the permission to conduct the study. On behalf of the Town Council Executive Director, the Town Council Medical Officer wrote formal letters explaining the purpose of the study to introduce the team to selected villages. Communication through mobile phones to local leaders was done to inform them of the dates when we will visit their respective areas. In each cluster, leaders or local guides were used to introduce the research team to the members of households.Data were collected using interviewer administeredKiswahili interview schedules.

The Principal investigator using observation checklists did assessment of the availability of fortified flours in retail shops along study sites. Brands with fortification logo and price per kilogram for both wheat and maize flour at retail shops within each cluster were noted.

3.11. Variables

i. Dependent variable

- Uptake of folic acid fortified flours.

ii. Independent variables

- Individual factors (predisposing factors); These included age, education, income, marital status, occupation, parity, health seeking behavior (during last pregnancy), pregnancy plan and awarenessof folic acid and existence of folic acid fortified flours.
- Service delivery factors (enabling factors); This included availability of folic acid fortified flours

3.12. Data management and analysis

3.12.1. Data quality control

The Principal Investigator supervised closely research assistants during data collection period and did on spot cross checking of filled questionnaires before the interviewees leave. Missing information and errors conducted during interview were corrected immediately in the field before living the cluster to ensure data quality (i.e. ensuring questionnaires were complete and any applicable question was answered).

Data wereentered in Epi Info 7 and analyzed by Epi Info 7 and STATA 13. Data cleaning by running frequencies to account for inconsistencies, double entries and other errors was done. Before data analysis coding of some variables including uptake of fortified flours, agegroup, marital status, education status was conducted.

3.12.2. Data analysis

Univariate analysis was done to describe general characteristics of the study sample and determining uptake of folic acid fortified flours. Categorical variables were summarized by running frequencies while continuous variables were summarized by measures of central tendency and dispersion.

Association of uptake of folic acid fortified flours with independent variables was determined by odds ratios (OR) through cross tabulations at bivariate analysis. Chi square and Fisher exact tests wereused to test for associations of fortified flours uptake with independent variables. Statistical significance was set at p-value less or equal to 0.05.

Multiple logistic regression analysis was done to ascertain independent factors influencing uptake of folic acid fortified flours among WRA while controlling for potential confounders.

All variables with p-value ≤0.2 at bivariate level as well as conventional confounders such as age were added in the multiple logistic regression model.

3.13. Ethical considerations

The Muhimbili University of Health and Allied Sciences (MUHAS) institutional review board reviewed the study protocol for ethical issues and approved it before data collection. In addition, permission to conduct the study was sought and granted from Regional, council and local authorities in Ifakara town council.

The study involved participants who signed the written consent and were voluntarily willing to participate after explaining to them the purpose of the study. For individuals who were illiterate a thumb print was used. Participants were informed of freedom to withdraw at any time from the study without impinging their social needs. Data collected were kept confidential and only used for the purpose of this study; No participant name or identifier was included in data collection tools. Questionnaires were kept enclosed in a cabinet and the Principal investigator only accessed electronic data.

CHAPTER FOUR

RESULTS

4.1. Socio demographic and economic characteristics

A total of 698WRA participated in the study, a response rate of 98.3%. Nearly half 333(47.7%) were from Ifakara village. Their median age was 30 years with an age range of 18-49 years. Majority of them had primary level of education 564(80.8%) and unemployed 501(71.7%). Nearly two third 420(60.2%) were married or cohabiting. More than half 365(52.3%) belonged to households with a household size of equal or more than five people [**Table 1& 2**].

Table 1: *Socio-demographic and economic characteristics of the respondents, (N=698)*

Village of residence	Number	%
Ifakara	333	47.7
Mlabani	162	23.2
Ihanga	46	6.6
Mahutanga	44	6.3
Kilama	23	3.3
Kining'ina	21	3.0
Lungongole	23	3.3
Machipi	23	3.3
Michenga	23	3.3

Table 2: *Socio-demographic and economic characteristics of the respondents, (N=698)*

Characteristic	Number	%
Age group		
18-24	195	27.9
25-35	271	38.8
36+	232	33.2
Education		
Primary or less	564	80.8
Secondary or more	134	19.2
Marital status		
Married/ Cohabiting	420	60.2
Divorced/separated/Widowed	88	12.6
Single	190	27.2
Occupation		
Employed (including Self employed/business)	197	28.3
Unemployed (including Peasant/ Maid/housewife/student	501	71.7
Income/month		
< 150,000	121	17.3
150,000-325,000	441	63.2
> 325,000	36	5.2
Don't know	100	14.3
Household size		
<5	333	47.7
≥5	365	52.3
Relationship with Head of HH		
Head of HH	119	17.1
Wife/partner	399	57.2
Others	180	25.8
Parity		
0	108	15.5
1-4	501	71.8
5+	89	12.8

4.2. Use of ANC services during last pregnancy

Out of 698 WRA 590(84.5%) had ever given birth while 108(15.5%) of them had never given birth. Of those who have ever given birth 577 (97.7 %) of them reported to attend antenatal care during their last pregnancies. Of these 189(32.8%) reported that they booked for antenatal care during the first trimester. Nearly two third, 356(61.7%) reported that they attended antenatal care four times or more [**Table 3**].

Table 3*: Use of ANC services during last pregnancy(Those who attended ANC, N=577)*

	Number	**%**
Attended Antenatal care		
Yes	577	97.8
No	13	2.3
ANC visits booking		
1st trimester	189	32.8
2nd trimester	282	48.9
3rd trimester	70	12.1
Don't know/remember	36	6.2
ANC visits number		
1-3 times	152	26.3
≥4 times	356	61.7
Don't know/remember	69	11.9

4.3. Awareness of folic acid

Among all WRA who participated in the study only 48(6.9% (CI 5.2%-9.0%)) reported to have heard of folic acid. Among these only five (10.4%) heard that folic acid can prevent some birth defects. Awareness of folic acid was more among those with secondary education or more, 18(13.4%) and the difference was statistically significant, $p<0.01$ [**Table 4**].

Table 4: *Awareness of folic acid by Socio-demographic/economic characteristics and use of ANC services (N=698)*

	Aware of folic acid		
Characteristic	Yes n(%)	No n(%)	P value
Heard of folic acid	48(6.9(5.2-9.0))	650(93.1)	
Age group			
18-24	17(8.7)	178(91.3)	0.49
25-35	17(6.3)	254(93.7)	
36+	14(6.0)	218(93.9)	
Education			
Primary or less	30(5.3)	534(94.7)	
Secondary or more	18(13.4)	116(86.6)	<0.01*
Marital status			
Married/ Cohabiting	32(7.6)	388(92.4)	0.41^
Divorced/separated/ Widowed	3(3.4)	85(96.6)	
Single	13(6.8)	177(93.2)	
Occupation			
Employed (including Self employed/business)	12(6.1)	185(93.9)	
Unemployed (including Peasant/Maid/housewife/student	36(7.2)	465(92.8)	0.73
Income/month			
< 150,000	7(5.9)	114(94.2)	
150,000-325,000	29(6.6)	412(93.4)	
> 325,000	4(11.1)	32(88.9)	0.46^
Household size			
<5	21(6.3)	312(93.7)	
≥5	27(6.4)	338(92.6)	0.68
Parity			
0	8(7.4)	100(92.6)	
1-4	36(7.2)	465(92.8)	0.72^
5+	4(4.5)	85(95.5)	
Attended ANC last pregnancy			
Yes	40(6.9)	537(93.1)	1.00^
No	0(0)	13(100)	
ANC Booking			
1st Trimester	16(8.5)	173(91.5)	0.55^
2nd Trimester	20(7.1)	262(92.9)	
3rdTrimester	3(4.3)	67(95.7)	
ANC visits number			
1-3 times	8(5.2)	144(94.7)	
≥4 times	29(8.2)	327(91.8)	0.34

Missing values for income, ANC booking and ANC visits number.*Statistically significant; ^Fisher exact test

4.4. Awareness of existence of fortified flours

Only 52(7.5% (CI 5.7%-9.6%)) reported to have heard of existence of folic acid fortified flours. There were no statistically significant differences in awareness of fortified flours with socio-demographic/economic characteristics and use of ANC services during last pregnancy. However, awareness is observed to decrease as age and income increases. Also WRA who booked for ANC early in first and second trimester of their last pregnancies have high awareness (8.9%) compared to those who booked for ANC late in third trimester [**Table 5**].

Table 5: *Awareness of existence of folic acid fortified flours by Socio-demographic/economic characteristics and use of ANC services (N=698)*

	Aware of existence of fortified flours		
Characteristic	Yes n(%)	No n(%)	P value
Heard of fortified flours	52(7.5(5.7-9.6))	646(92.5)	
Age group			
18-24	17(8.7)	178(91.3)	0.56
25-35	21(7.8)	250(92.3)	
36+	14(6.0)	218(93.9)	
Education			
Primary or less	38(6.7)	526(93.3)	
Secondary or more	14(10.5)	120(89.5)	0.19
Marital status			
Married/ Cohabiting	29(6.9)	391(93.1)	
Divorced/separated/ Widowed	7(7.9)	81(92.1)	
Single	16(8.4)	174(91.6)	0.79
Occupation			
Employed (including Self-employed/business	16(8.1)	181(91.9)	0.79
Unemployed (including Peasant/Maid/housewife/student	36(7.2)	465(92.8)	
Income/month			
< 150,000	13(10.7)	108(89.2)	0.26^
150,000-325,000	32(7.3)	409(92.7)	
> 325,000	1(2.8)	35(97.2)	
Household size			
<5	28(8.4)	305(91.6)	0.44
≥5	24(6.6)	341(93.4)	
Parity			
0	6(5.6)	102(94.4)	
1-4	40(7.9)	461(92.0)	0.66
5+	6(6.7)	83(93.3)	
Attended ANC			
Yes	46(7.9)	531(92.3)	0.61^
No	0(0)	13(100)	
ANC Booking			
1st Trimester	17(8.9)	172(91.0)	0.46^
2nd Trimester	25(8.9)	257(91.1)	
3rdTrimester	3(4.3)	67(95.7)	
ANC visits number			
1-3 times	9(5.9)	143(94.1)	
≥4 times	36(10.1)	320(89.9)	0.17

Missing values for income, ANC booking and ANC visits number.^Fisher exact test

4.5. Uptake of folic acid fortified flours

Almost two-thirds 442/698 (63.3% (CI 59.7%-66.8%)) of women reported uptake of folic acid fortified flours at least once within 7 days prior the survey. Of these only three, (0.68%) had taken up fortified maize flour and, 436(98.6%) had taken up wheat flour only. The other three (0.68%) had taken up both fortified maize and wheat flour.

Uptake of fortified flours was high, (74.6%) among WRA who had secondary education compared to those who had primary education or less and the difference was statistically significant, $p<0.01$. Employed ones had a higher proportion of fortified flours uptake, (74.1%) compared to unemployed women and the difference was statistically significant, $p<0.001$.

Moreover, those who had no children (nulliparous) had statistically significant high proportion, 71.3%, $p<0.01$of uptake compared to those with children. Booking for antenatal care in first trimester was associated with high proportion of fortified flours uptake (63.9%) compared to those who booked late and the difference was statistically significant, $p=0.01$. WRA who heard of folic acid had high proportion of fortified flours uptake 81.3% compared to those who had not heard of folic acid, the difference was statistically significant, $p<0.01$[**Table 6&7**].

Table 6: *Uptake of folic acid fortified flours by Socio-demographic and economic characteristics(N=698)*

	Uptake of fortified flours		
Characteristic	Yes n(%)	No n(%)	pvalue
Age group			
18-24	129(66.2)	66(33.9)	0.63
25-35	169(62.4)	102(37.6)	
36+	144(62.1)	88(37.9)	
Education			
Primary or less	342(60.6)	222(37.9)	
Secondary or more	100(74.6)	34(25.4)	<0.01*
Marital status			
Married/ Cohabiting	261(62.1)	159(37.9)	
Divorced/separated/ Widowed	51(57.9)	37(42.1)	
Single	130(68.4)	60(31.6)	0.18
Occupation			
Employed (including Self employed/business)	146(74.1)	51(25.9)	<0.001*
Unemployed (including Peasant/Maid/housewife/student	296(59.1)	205(40.9)	
Income/month			
< 150,000	74(61.2)	47(38.8)	
150,000-325,000	289(65.5)	152(34.5)	
> 325,000	27(75.0)	9(25.0)	0.29
Household size			
<5	203(60.9)	130(39.0)	
≥5	239(65.5)	126(34.5)	0.22
Relationship with Head of HH			
Head of HH	76(63.9)	43(36.1)	
Wife/partner	245(61.4)	154(38.6)	
Others	121(67.2)	59(32.8)	0.41
Parity			
0	77(71.3)	31(28.7)	<0.01*
1-4	322(64.3)	179(35.7)	
5+	43(48.3)	46(51.7)	

Missing values for income* Statistically significant

Table 7: *Uptake of fortified flours by use of ANC services and awareness of folic acid/fortified flours*

	Uptake of fortified flours		
Characteristic	Yes n(%)	No n(%)	pvalue
Attended ANC			
Yes	355(61.5)	222(38.5)	0.39^
No	10(76.9)	3(23.1)	
ANC Booking			
1st Trimester	129(63.9)	60(31.8)	0.01*
2nd Trimester	177(62.8)	105(37.2)	
3rd Trimester	34(48.6)	36(51.4)	
ANC visits number			
1-3 times	88(57.9)	64(42.1)	
≥4 times	227(63.8)	129(36.2)	0.25
Heard of folic acid			
Yes	39(81.3)	9(18.8)	<0.01*
No	403(62.0)	247(38.0)	
Heard of fortified flours			
Yes	37(71.2)	15(28.9)	0.22
No	405(62.7)	241(37.3)	

Missing values for ANC booking and ANC visits number.* Statistically significant

4.6. Availability of folic acid fortified flours

Assessment of available brands of fortified flours involved 57 retail shops, which were available in the clusters selected for the study.Ifakara village had more shops visited 22(38.6%) due to its number of clusters it had (10) compared to other villages. Every village had an access to fortified wheat flour but almost allvillages had no fortified maize flour available [**Table 8**].

Differences in prices per kilogram were minimum ranging from 1200-1400 Tshs for wheat flour and 1800-2200 Tshs for maize flour. Maize flour prices were similar for both fortified and non-fortified brands. Shops in more periphery villages had the maximum prices.

Table 8:*Availability of folic acid fortified flours in the study area (N=57).*

Village	Wheat flour n(%)	Maize flour n(%)
Ifakara, n=22	22(100)	6(27.3)
Mlabani, n=17	17(100)	0(0)
Ihanga, n=5	4(80)	0(0)
Mahutanga, n=5	5(100)	0(0)
Kilama, n=2	2(100)	0(0)
Kining’ina, n =1	1(100)	0(0)
Lungongole, n=3	3(100)	0(0)
Machipi, n=1	1(100)	0(0)
Michenga, n=1	1(100)	0(0)

4.7. Factors associated with folic acid fortified flours uptake at Bivariate and Multivariate level

In Bivariate analysis it was found that WRA who had secondary education or more were almost two times more likely to have taken up fortified flours than those who had primary education or less, the difference was statistically significant, OR=1.82(1.19-2.78). Those who were employed were almost two times more likely to have taken up fortified flours than unemployed, OR=1.98(1.37-2.87), the difference was statistically significant. It was also found that women who had no children had nearly three times of uptake of fortified flours compared to those with 5 children or more, OR=2.66(1.45-4.88). Those who had1-4 children were almost two times more likely to have taken up fortified flours compared to those with 5 children or more, OR=1.92(1.22-3.04), the results are statistically significant.The odds of taking up folic acid were 2.6 times more among WRA who heard of folic acid compared to WRA who had not heard of folic acid,OR=2.66(1.26-5.60)[**Table 9**].

Multiple logistic regression analysis was done to control for potential confounding factors. Adjustment for cluster effect was done at this stage as well. Factors with $p \leq 0.2$ at bivariate analysis were included in the multiple logistic regression model.

The results revealed that the odds of fortified flours uptake was almost two times among employed WRA compared to unemployed women, [AOR=1.99(1.27-3.13]. The odds of taking up fortified flours was 37% more likely among households with 5 or more people compared to those with less than 5 people, [AOR=1.37(1.02-1.85)].

Moreover nulliparous women were nearly three times more likely to have taken up fortified flours compared to those who had five children or more, [AOR=2.74(1.54-4.87)]. Women who had 1-4 children were almost two times more likely to have taken up fortified flours compared to those who had five or more children, [AOR=1.92(1.17-3.13)].

Awareness of folic acid influenced uptake of fortified flours nearly three times compared to those who were not aware, [AOR=2.67(1.37-5.19)] [**Table 9**].

Table 9*: Factors influencing uptake of folic acid fortified flours*

	Uptake of fortified flours		
Factors	Yes n(%)	cOR (95% CI)	aOR(95% CI)
Age group			
18-24	129(66.2)		Ref
25-35	169(62.4)	0.85(0.58-1.25)	1.05(0.72-1.52)
36+	144(62.1)	0.84(0.56-1.25)	1.23(0.72-2.11)
Education			
Primary or less	342(60.6)		Ref
Secondary or more	100(74.6)	1.82(1.19-2.78)	1.41(0.87-2.30)
Marital status			
Married/ Cohabiting	261(62.1)		Ref
Divorced/separated/ Widowed	51(57.9)	0.84(0.53-1.34)	0.89(0.48-1.69)
Single	130(68.4)	1.32(0.92-1.90)	1.06(0.71-1.59)
Occupation			
Employed (including Self employed/business)	146(74.1)	1.98(1.37-2.87)	1.99(1.27-3.13)[a]
Unemployed (including Peasant/ Maid/housewife/student	296(59.1)		Ref
Household size			
<5	203(60.9)		Ref
≥5	239(65.5)	1.21(0.89-1.65)	1.37(1.02-1.85)[a]
Parity			
0	77(71.3)	2.66(1.45-4.88)	2.74(1.54-4.87)[a]
1-4	322(64.3)	1.92(1.22-3.04)	1.92(1.17-3.13)[a]
5+	43(48.3)		Ref
Heard of folic acid			
Yes	39(81.3)	2.66(1.26-5.60)	2.67(1.37-5.19)[a]
No	403(62)		Ref
Heard of fortified flours			
Yes	37(71.2)	1.47(0.79-2.73)	1.04(0.61-1.78)
No	405(62.7)		Ref

a: Statistically significant

4.9. Reasons hindering uptake of fortified flours

Frequently mentioned reasons hindering uptake of fortified flours were not knowing flour is fortified (44.3%) and unaffordability (24.5%). The least mentioned reasons was unavailability (1.1%) [**See figure 2**].

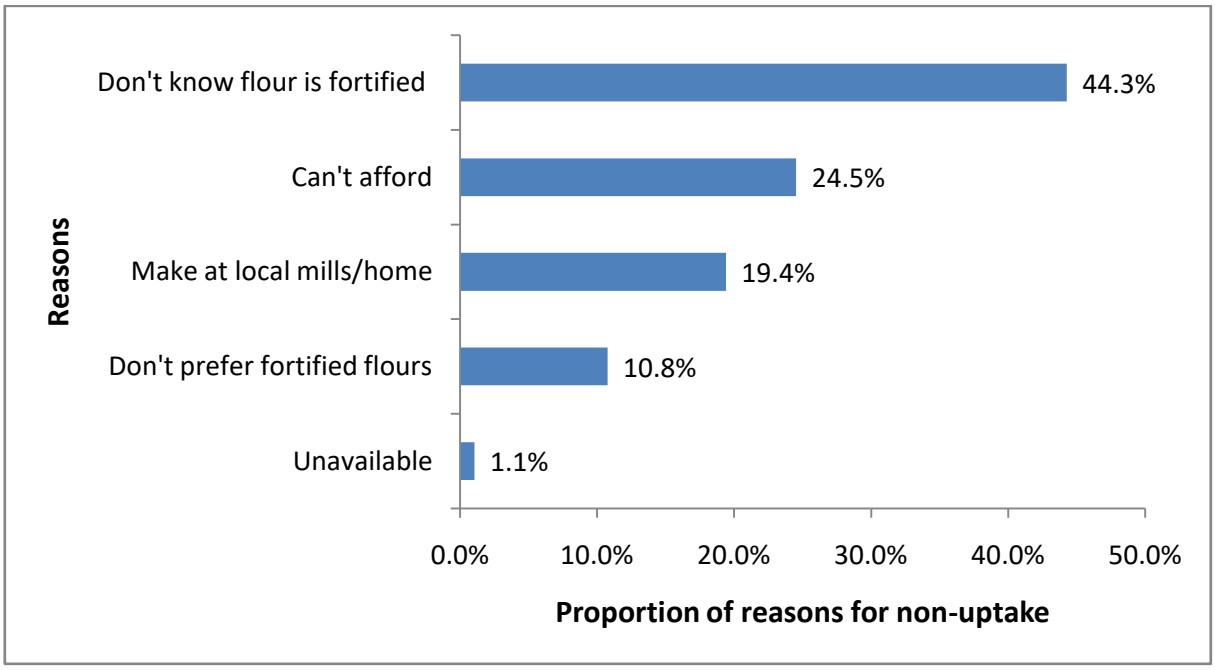


Figure 2:*Reasons hindering uptake of fortified flours (N=567)*

CHAPTER FIVE

DISCUSSION

This study was conducted to assess uptake of folic acid fortified flours among WRA in Ifakara, Morogoro region. This is a reported uptake of any fortified wheat or maize flour product at least once in seven days prior the survey

The study found that uptake was 63.3%. Awareness of folic acid and existence of fortified flours was low. Every village had an access to fortified wheat flour. Factors found to influence uptake include being employed, parity, large household size and awareness of folic acid. The most common mentioned hindering reasons for uptake of fortified flours include not knowing that flour is fortified andunaffordability.

5.1. Awareness of folic acid

Awareness of folic acid was low (6.9%) far less compared to findings from other studies which found higher proportions. Studies in Europe, Nepal, New Zealand, USA, and Honduras found proportions of awareness of 70%, 40%, 98%, 84% and 46.4% respectively (25–29). This lack of awareness in the study area could be attributed by the fact that majority (71.9%) had only primary education or less.

Our study found that only five (10.1%) of WRA who were aware of folic acid heard that folic acid can preventsome birth defects. This is low compared to studies done in Europe, New Zealand and Honduras which found25%, 28% and 62% respectively(25,27,31). This could be attributed by differences in levels of development and health-seekingbehavior, which is low in developing countries than developed ones(46). Another reason could be due to high marketing of foods/goods/drugs in developed countries than the developing countries.

5.2. Awareness of existence of fortified flours

Awareness of existence of fortified flours was found low as well, but higher than a report from a Northern Ugandan study where no women was aware of existence of fortified foods (36). In a study among recently pregnant women in Australia awareness that folate was added to fortified

foods was 53%(35). Thelow level of awareness among WRA in Ifakara could be attributed by low community mobilization and sensitization and the fact that the fortification policy is only four years old since implementation started.

5.3. Uptake of folic acid fortified flours

The uptake of folic acid fortified flours among WRA was 63.3% in general. This finding compares to a study done in Australia which found an uptake of folate added foods of 61% (47). Of this wheat flours uptake contributes a higher proportion than that of maize flour. This could be explained by the fact that all wheat flour brands available in the district were fortified and commonly used for breakfast while most households use maize flour milled by small-scale millers who most of them do not fortify.

5.4. Factors influencing uptake of folic acid fortified flours

This study revealed that employed women were almost two times more likely to have taken up fortified flours than unemployed. This is contrary to a study done in Australia whereby employment was not a significant factor for uptake of folic acid fortified foods (14). Explanation of this phenomenon may be due to the low capacity of unemployed ones to buy foods than the other group or due to use of foods produced by themselves as majority are peasants. In addition, employed women are more likely to be educated than unemployed which mayhave an influence on awareness and uptake of fortified flours.

The same study in Australia found that those who were less educated were less likely to have taken up fortified foods than educated, contrary to our study, which found no significant association between fortified flours uptake and education(14).

Those who belonged to households of equal or more than five people were 37% more likely to have taken up folic acid fortified flours than those who were less than five. This is contrary to a usual understanding that small families may have more economic power to purchase foods. However, we found no relevant literature to support this finding.

Other independent factors influencing uptake of fortified flours among WRA in Ifakara include parity and awareness of folic acid. These findings had no relevant supporting literature.

5.5. Availability and price of fortified flours in Ifakara

This study found that all villages involved in the study had access to fortified wheat flour and limited or no access to fortified maize flour. This could be attributed by the fact that most wheat flour is produced by owners of giant miller industries who have capacity to fortify and distribute/supply widely across Tanzania and adhere to availing food fortification policy. Maize flour production is mainly done by small scale millers who most of them lack the capacity to fortify due to low capital or incentives to do so, (8). Similar market price for fortified and non-fortified maize brands could be one of the barriers for local producers to adhere to fortification program.

5.6. Reasons hindering uptake of fortified flours

Not knowing that flour is fortified was frequently named as an uptake hindering reason, this could be contributed by low or lack of community mobilization and sensitization campaigns. These findings had also no relevant supporting literature.

5.7. Study limitation(s)

The study was dependent on information from study participants, therefore there may be recall bias. This was mitigated by collecting information on uptake of folic acid fortified flours within seven days prior interview.

CHAPTER SIX

CONCLUSION

Uptake of fortified flours among WRA was high however, low for maize flour accompanied with low awareness of folic acid and fortified flours.

Allnine villages involved had an access to fortified wheat flour and only one village had an access to fortified maize flour.

Employment (being employed), parity (<5 children), household size of 5 or more than five peopleand awareness of folic acid were independent influencing factors for folic acid fortified flours uptake.

Not knowing flour is fortified and unaffordability were commonly mentioned hindering reasons for uptake.

CHAPTER SEVEN

RECOMMENDATIONS

1. To increase uptake of fortified flours, institutions such as Tanzania Food and Nutrition Centre (TFNC) should increase awareness on the benefits of folic acid fortified flours among women and the general community

2. The Ifakara health department should educate about health benefits of using folic acid fortified flours through its routine health education sessions in clinics such as ANC, Adolescent health, OPD, and under fives clinics.

3. Local millers in Ifakara should be encouraged and given incentives (if possible) to increase production and availability in most parts; given the fact that there is market competition between millers who fortify and those who don't in terms of price of flour per kilogram.

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APPENDICES

Appendix 1a: INFORMED CONSENT FORM- English Version

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES - DIRECTORATE OF RESEARCH & PUBLICATIONS.

ID-NO _____

Consent to participate in this study

Greetings, My name is …..... from Muhimbili University of Health and Allied Sciences, Dar es Salaam. We are carrying out a study regarding uptake of maize and wheat flours amongwomen of reproductive age in Ifakara town council, Morogoro-Tanzania.

Purpose of the study

The purpose of this study is to collect information on uptake of maize and wheat flours among women of reproductive age in Ifakara town council, Morogoro. You are being asked to participate in this study because you have particular knowledge and experience that may be important to the study.

What participation is involved

If you agree to participate in this study, you will be required to answer a series of questions that have been prepared for the study through interviewing in order to obtain the intended information regarding uptake of maize and wheat flours among women of reproductive age in Ifakara town council, Morogoro.

Confidentiality

I assure you that all the information collected from you will be kept confidential. Only people working in this research will have access to the information. We will compile a report which will contain responses from several women of reproductive age without any reference to any individual. We will not put your name or other identifying information on the records of the information you provide.

Risks

You will be asked questions about uptake of flours. Some questions could potentially make you feel uncomfortable. You may refuse to answer any particular question and stop the interview at

any time. We do not expect any harm to happen to you because of your participation in this study.

Right to withdraw and alternatives

Taking part in this study is completely your choice. If you choose not to participate in the study or if you decide to stop participating in the study you will not get any harm. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve penalty or loss of any benefits to which you are otherwise entitled.

Benefits

The information you provide will help to increase our understanding on uptake of maize and wheat flours among women of reproductive age in Ifakara, Morogoro. Communication of findingsto policy makers in the council and ministry of health for improvement of uptake of maize and wheat flours will be made.

In case of injury

We do not anticipate that any harm will occur to you or your family as a result of participation in this study.

Who to contact

If you ever have questions about this study, you should contact the study Coordinator or the Principal Investigator **DrIpyana Frank Mwandelile-** Muhimbili University College of Health Sciences, P.O.Box 65001, Dar es Salaam) Tel: 0752659027/784226064. If you ever have questions about your rights as a participant, you may call Dr. Joyce Rose Masalu, Acting Chairperson of the Senate Research and Publications Committee, P.O. Box 65001, Dar es Salaam. Tel: 2150302-6, 2152489.

Signature:

Do you agree?

Participant agrees …… Participant does not agree ……..

I, _____ have read the contents in this form. My questions have been answered. I agree to participate in this study.

Signature of participant _____

Signature of research assistant _____

Date consentsigned_____

Appendix 1b: INFORMED CONSENT FORM- Swahili version

CHUO KIKUU CHA AFYA NA SAYANSI YA TIBA CHA MUHIMBILI

KURUGENZI YA UTAFITI NA UCHAPISHAJI

FOMU YA RIDHAAID-NO _____

Ridhaayakushiriki

Hujambo?Ninaitwa……. Ninafanyakaziyakutafitihaliyamatumizi ya unga wa mahindina nganokwawanawakewaliokatikaumriwakuzaakwenyehalmashauri ya mji Ifakara, Morogoro.

Madhumuniyautafiti

Utafitihuuunakusudiakuchunguzahaliyamatumizi ya unga wa mahindi na ngano kwawanawakewaliokatikaumriwakuzaakwenyehalmashauriya mji Ifakara, Morogoro.

Unaombwakushirikikwenyeutafitihuukwasababuunaoujuziamaunafahamu mambo ambayoniyamuhimu.

Ninikinahitajikailikushiriki

Ili kushirikikatikautafitihuuinabidikukubalinakujiungakwakujibumaswalitokakwenyedodosokwaajiliyautafitihuu.

Usiri

Ninakuhakikishiakuwa taarifa zitakazokusanywakutokakwakokupitiadodosohilizitakuasirinahakunamtuyeyoteambayehafanyikazikwenyeutafitihuuatakayeambiwaulichosema.Itaandaliwa tarifa yautafitihuuambayohaitamtajamshirikiyeyote.Jinalakowalautambulishomwinginewowotehautawekwakwenye tarifa unazozitoa.Taarifazakozitaingizwakwenyengamizikwakutumianambazautambulisho.

Hatari

Hakunahatariyeyoteitakayotokeakwakokutokananaushirikiwakokwenyeutafitihuu

Hakiyakujitoaauvinginevyo

Ushirikikatikautafitihuunihiari.Kutokushirikiau kujitoakutokakwenyeutafitihakutakuwanaadhabuyeyotenahutapotezastahilizakoendapoutaonanivemakufanyahivyo.

Faida

Kama utakubalikushirikikwenyeutafitihuuitakuanivemakwavileutafitihuuunalengo la kubainihalihalisiyamatumizi ya unga wa mahindi na ngano kwawanawakewaliokatikaumriwakuzaakwenyehalmashauriya mji Ifakara, Morogoro.

Endapoutapatamadharaau la

Hatutegemeiutapatamadharayoyotekutokananaushirikiwakokatikautafitihuu.

Naniwakuwasilianana ye

Kama kunaswalikuhusiananautafitihuuitakubidikuwasilianamtafitimkuuDr. Ipyana Frank MwandelilewaChuoKikuuchaAfyanaSayansiyaTiba Muhimbili, S.L.P. 65001 DSM. Simu (Tel: 0752659027 au 0784226064). Kama unamaswalizaidiunawezakuwasilianaDr. Joyce Rose Masalu, Makamumwenyekitiwasenetiyautafitinakamatiyamachapisho, S.L.P. 65001, Dar es Salaam. Tel (Simu): 2150302-6, 2152489.

Je, Umekubali?

Mshirikiamekubali…… Mshirikihajakubali……

Mimi……...nimesomamaelezoyafomuhii, maswaliyanguyamejibiwananimeridhika.Nakubalikushirikikatikautafitihuu.

SahihiyaMshiriki……

Sahihiyamtafitimsaidizi……

Tareheyakutiasahihiyakushiriki……

Appendix 1c: QUESTIONNAIRE - English version

UPTAKE OF FOLICACID FORTIFIED FLOURS AMONG WOMEN OF REPRODUCTIVE AGE IN IFAKARA-MOROGORO, 2017.

Questionnaire number_____

Date of Interview_____ Interviewer ID_____

Ward_____Village/hamlet_____Cluster #_____

Now we are going to talk about folic acid and staple flours

SECTION A: <u>KNOWLEDGE ON FOLIC ACID/FORIFIED FLOURS</u>

1. Have you ever heard of folic acid?

i. Yes
ii. No.....If **No**/Don't know/Not sure
skip to question number 4
iii. Don't know/Not sure

2. If **Yes**, what have you heard, read, or seen about folic acid? (*Circle all that apply*)

i. It can prevent some birth defects
ii. It is a vitamin needed for cell growth
iii. It is a type of acid found in some household products that should be avoided in pregnancy
iv. It is good for pregnant women
v. It needs to be taken before pregnancy
vi. It needs to be taken during pregnancy
vii. It is good for health
viii. Don't remember
ix. Others (specify)…….

3. If **Yes** who gave you the information on folic acid? (*Circle all that apply*)

i. Health care providers
ii. Magazine/news papers/books
iii. Radio/television/internet
iv. Family/friend

4. Have you ever heard of fortified flours?

i. Yes
ii. No.....If **No**skip to question number 6

5. If **Yes**, who gave you the information on fortified flours?(*Circle all that apply*)

i. Health care providers
ii. Magazine/news papers/books
iii. Radio/television/Internet
iv. Family/friend

SECTION B: UPTAKE OF FORTIFIED FLOURS

Now we are going to talk about maize flour

MAIZE FLOUR

6. Does your household prepare foods using fortified maize flour?

i. Always
ii. Regularly
iii. Sometimes
iv. Rarely
iv. No, never.....If **No** skip to question number 15
v. Don't know/Not sure……Skip to question number 11

7. Where does your householdget fortified maize flour? *Circle all that apply*

i. Purchase
ii. Get it from relatives/ friends
iii. Receive from food aid
iv. Others (specify)…….

8. If your household purchase maize flour what is the brand of maize flour you have ever purchased? *Circle all that apply*

i. Kindole super sembe ii. Mzalendo super sembe iii. Mgaya super sembe iv. Super seki v. JC super sembe vi. M.K. super sembe vii. Master super sembe viii. Mwangaza super sembe ix.MC Super sembe x. P.M super sembe xi. Super sembe xii. Don't remember xiii. Others (specify)…….

9. In the past seven days have you eaten any of the fortified maize flour products (*like porridge and ugali/posho*?

i. Yes
ii. No.....If **No** skip to question number 16

10. If Yes, How many days have you eaten any of the fortified maize flour productsin the last seven days?_____

11. Do you currently have any maize flour in your household?

i. Yes
ii. No.....If **No**/Don't know
skip to question number 17
iii. Don't know

12. If **Yes**, Could you show me the original package? *Observe on fortification logo*

i. Logo present
ii. Logo absent

13.If**Yes** and packed in original package, *Observe on brand name*

i. Kindole super sembe ii. Mzalendo super sembe iii. Mgaya super sembe iv. Super seki v. JC super sembe vi. M.K. super sembe vii. Master super sembe viii. Mwangaza super sembe ix.MC Super sembe x. P.M super sembe xi.Super sembe xii. Others (specify)…….(***Go to question 17***)

14. If not packed in original package, *Ask what was/is the brand of the flour?*

i. Kindole super sembe ii. Mzalendo super sembe iii. Mgaya super sembe iv. Super seki v. JC super sembe vi. M.K. super sembe vii. Master super sembe viii. Mwangaza super sembe ix.MC Super sembe x. P.M super sembe xi. Super sembe xii. Don't remember xiii. Others (specify)…….(***Go to question 17***)

15. What are the reasons for not preparing food using fortified maize flour in your household? *Circle all that apply*

i. Not available
ii. Expensive
iii. We don't prefer fortified maize flour
iv. We buy readymade products
v. We prepare flour at home/local mills
vi. Buy unknowingly/don't know flour is fortified
vii. Others (specify)…….

16. What are the reasons for not eating fortified maize flour products in the last seven days?

i. Not available
ii. Expensive
iii. I/we don't prefer fortified maize flour
iv. I/we bought readymade products
v. Prepared flour at home/local mills
vi. Out of stock
vii. Others (specify)…….

WHEAT FLOUR

17. Does your household prepare foods using wheat flour?

i. Always
ii. Regularly
iii. Sometimes
iv. Rarely
v. No, never.....If **No** skip to question number 21
vi. Don't know/remember……**Go to question 22**

18. Where does your household get wheat flour? *Circle all that apply*

i. Purchase
ii. Get it from relatives/ friends
iii. Receive from food aid
iv. Others (specify)…….

19. If your household purchase wheat flour what is the brand of wheat flour you have ever purchased? *Circle all that apply*

i. Azania ii. Pembe iii. Maisha iv. Safi v. Poa vi. Taifa vii.Azam viii. Nyati

ix. Jumbo x. Sunkist xi. Don't know/remember xii. Others (specify)…….**Go to question 22**

20. What are the reasons for not preparing food using wheat flour? *Circle all that apply*

i. Not available
ii. Expensive
iii. We don't prefer fortified wheat flour
iv. We buy readymade products
v. Buy unknowingly/don't know flour is fortified
vi. Others (specify)…….

21. In the past seven days have you eaten any of the wheat flour products?(*like bread, buns, chapatti, cake etc*)

i. Yes
ii. No..... If **No** skip to question number 24

22. If Yes, How many days have you eaten any of the wheat flour productsin the last seven days?_____**Go to question 24.**

23. What are the reasons for not eating wheat flour products in the last seven days?

i. Not available
ii. Expensive
iii. I/we don't prefer fortified wheat flour
iv. I/we bought readymade products
v. Out of stock
vi. Others (specify)…….

24.Do you currently have any wheat flour in your household?

i. Yes
ii. No.....If **No/**Don't know skip to question number 28
iii. Don't know

25. If **Yes**, Could you show me the original package? *Observe on fortification logo*

i. Logo present
ii. Logo absent

26.If**Yes** and packed in original package, *Observe on brand name*

i. Azania ii. Pembe iii. Maisha iv. Safi v. Poa vi. Taifa vii.Azam viii. Nyati ix. Jumbo x. Sunkist xi. Others (specify)…….

27. If not packed in original package, *Ask what was/is the brand of the flour?*

i. Azania ii. Pembe iii. Maisha iv. Safi v. Poa vi. Taifa vii.Azam viii.Nyati ix.Jumbo x. Sunkist xi. Don't remember xii. Others (specify)……

Go to question 28

SECTION C: SOCIO-ECONOMC AND DEMOGRAPHIC CHARACTERISTICS

28. How old are you now?..... (Years)

29. What is the maximum level of education you attained? *Circle one response*

i. Informal/illiterate
ii. Primary school
iii. Secondary and high school
iv. Diploma
v. University

30. What do you do to earn a living? *Circle one response*

i. Student
ii. Peasant
iii. employee
iv. Self employed/business
v. Unemployed/Housewife/maid

31. What is your household estimated maximum monthly income?.....Tshs

32. What is your current marital status? *Circle one response*

i. Never married
ii. Married
iii. Cohabiting
iv. Divorced/separated
v. Widowed

33. How many are you in your household, including you?.....

34. What is your relationship with the head of household?

i. I am the head of household
ii. I am the wife/ partner of head of household
iii. I am a relative/child of head of household
iv. I am a house girl/non-relative

35. Have you ever given birth to a child/children?

i. Yes
ii. No.....If **No** (***END HERE)***

36. How many timeshave you given birth to children including (if any) those who died while seven months pregnant or more?.....

37.***Now we are going to specifically talk about your LAST pregnancy.***

During your last pregnancy did you attend at antenatal clinic?

i. Yes
ii. No.....If **No** skip to question number 40

38. If Yes, in what month of pregnancy did you start attending antenatal clinic?_____

39. How many times did you attend at antenatal clinic? _____

40. Did you plan your latest pregnancy with a health care provider?

i. Yes
ii. No

END

Thank you for your participation

Appendix 1d: QUESTIONNAIRE - Swahili version

ULAJI WA VYAKULA VITOKANAVYO NA UNGA WENYE VIRUTUBISHO MIONGONI MWA WANAWAKE WALIO KATIKA UMRI WA KUZAA, IFAKARA-MOROGORO, 2017.

Nambari ya dodoso_____

Tarehe ya usaili_____ Namba ya msaili_____

Kata_____Kijiji/kitongoji_____Na. ya cluster____

SEHEMU A: UFAHAMU NA UELEWA JUU YA UNGA WENYE VIRUTUBISHO NA FAIDA ZAKE

1. Je umewahi kusikia kuhusu virutubisho (vitamin) vya folic acid?

i. Ndiyo ii. Hapana (Kama **Hapana** nenda swali la 4)

2. Je umesikia, kusoma au kuona nini kuhusu folic acid? (***Zungushia jibu zaidi ya moja***)

i. Inaweza zuia baadhi ya magonjwa ya upungufu/udhaifu wa viungo utotoni
ii. Ni vitamin inayo hitajika kwa ukuaji wa seli za mwili
iii. Ni aina ya asidi inayopatikana katika baadhi ya bidhaa za nyumbani na inatakiwa kuzuiliwa kwa waja wazito
iv. Ni nzuri kwa wajawazito
v. Inatakiwa kutumiwa kabla ya kupata ujauzito
vi. Inatakiwa kutumiwa wakati wa ujauzito
vii. Ni nzuri kwa afya
viii. Mengineyo (taja)…….

3. Je ni nani aliyekupa tarifa kuhusu folic acid?(***Zungushia jibu zaidi ya moja***)

i. Wahudumu wa afya ii. Magazeti/vitabu iii. Redio/televisheni/internet

iv. Ndugu/rafikiyangu

4. Je umekwisha wahi kusikia kuhusu unga uliongezewa virutubisho?

i. Ndiyoii. Hapana(Kama **Hapana** nenda swali la 6)

5. Je ni nani aliyekupa taarifa kuhusu unga ulio ongezewa virutubisho?

i. Wahudumu wa afya ii. Magazeti/vitabu iii. Redio/televisheni/internet

iv. Ndugu/rafikiyangu

SECTION B: ULAJI WA VYAKULA VITOKANAVYO NA UNGA WENYE VIRUTUBISHO

UNGA WA MAHINDI

6. Je katika nyumba yenu mnapikachakula kwa kutumia unga wa mahindi ulio ongezewa virutubisho?

i. Ndiyo mara zote ii. Ndiyo mara kwa mara iii. Ndiyo mara chache iv. Mara chache sana

v. Hapana, hatujawahi..... Kama **Hapana** nenda swali la 15

vi. Sifahamu/sikumbuki.....Kama **Sifahamu/sikumbuki** nenda swali la 11

7. Je mnaupata wapi unga wa mahindi uliongezewa virutubisho? (***Zungushia jibu zaidi ya moja)***

i. Tunanunua ii. Tunapewa na ndugu/rafiki iii. Tunapewa msaada

iv. Mengineyo (taja)…….

8. Kama mnanunua unga wa mahindi je ni nembo/kampuni yenye jina gani mmeshawahi kununua? (***Zungushia jibu zaidi ya moja****)*

i. Kindole super sembe ii. Mzalendo super sembeiii. Mgaya super sembe iv. Super seki

v. JC super sembe vi. M.K. super sembe vii. Master super sembe viii. Mwangaza super sembe ix.MC Super sembe x. P.M super sembe xi.Super sembe xii.Sijui/sikumbuki xiii. Mengineyo (taja)…….

9. Je katika siku saba zilizopita umewahi kutumia vyakula vyovyote vitokanavyo na unga wa mahindi ulioongezewa virutubisho?(***kama vile uji, ugali/posho n.k****)*

i. Ndiyo ii. Hapana (Kama **Hapana** nenda swali la 16)

10. Kama ndiyo, Je ni siku ngapi za wiki umetumia vyakula vitokanavyo na unga wa mahindi uliongezewa virutubisho?_____

11. Je kwa sasa unao unga wa mahindi uliongezewa virutubisho?

i. Ndiyo ii. Hapana (Kama **Hapana** nenda swali la 17)

12. Kama **Ndiyo** na upo kwenye mfuko/kifungashio cha asili, ***Angalia nembo ya unga huo***.

i. Nembo ipo ii. Nembo haipo

13. Kama **Ndiyo** na upo kwenye mfuko/kifungashio cha asili, ***Angalia jina la kibiashara la unga huo*** *(Zungushia jibu moja)*

i. Kindole super sembe ii. Mzalendo super sembeiii. Mgaya super sembe iv. Super sekiv. JC super sembe vi. M.K. super sembe vii. Master super sembe
viii. Mwangaza super sembe ix. MC Super sembe x. P.M super sembe xi. Super sembe xii. Mengineyo (taja)……. ***(Nenda swali la 17***)

14. Kama haupo kwenye mfuko/kifungashio cha asili, ***Muulize*** *jina la kibiashara la unga huo* ***(Zungushia jibu moja)***

    i. Kindole super sembe ii. Mzalendo super sembeiii. Mgaya super sembe iv. Super sekiv. JC super sembe vi. M.K. super sembe vii. Master super sembe viii. Mwangaza super sembe ix.MC Super sembe x. P.M super sembe xi. Super sembe xii. Sikumbuki xiii. Mengineyo (taja)……. ***(Nenda swali la 17***)

15. Je ni sababu gani zinazofanya msitumie unga wa mahindi ulioongezewa virutubisho kupika? (***Zungushia jibu zaidi ya moja)***

    i. Haupatikani ii. Ni gharama iii. Hatupendelei kutumia unga wa mahindi ulioongezewa virutubisho iv. Tunanunua chakula kilicho pikwa v.Tunasaga wenyewe/mashineni

    vi. Hatujui kama unga una virutubisho/tunanunua bila kujua vii. Mengineyo (taja)……. (Nenda swali la 17)

16. Je ni sababu gani zilizofanya usitumie vyakula vitokanavyo na unga wa mahindi uliongezewa virutubisho siku saba zilizopita? (***Zungushia jibu zaidi ya moja)***

    i. Haupatikani ii. Nigharama iii. Si/hatupendeleikutumiaungawa mahindi ulioongezewa virutubishoiv. Ni/tulinunua chakula kilicho pikwa v. Tulisaga wenyewe/mashineni vi. Umekwisha vii. Mengineyo (taja)…….

UNGA WA NGANO

17. Je katika nyumba yenu mnapika chakula kwa kutumia unga wa ngano?

    i. Ndiyo mara zote ii. Ndiyo mara kwa mara iii. Ndiyo mara chache iv. Ndiyo Mara chache sanav. Hapana, hatujawahi..... Kama **Hapana** nenda swali la 21

    vi. Sifahamu/sikumbuki.....Kama **Sifahamu/sikumbuki** nenda swali la 22

18. Je mnaupata wapi unga wa ngano? (***Zungushia jibu zaidi ya moja****)*

    i. Tunanunua ii. Tunapewa na ndugu/rafiki iii. Tunapewa msaada

    iv. Mengineyo (taja)…….

19. Kama mnanunua unga wa ngano je ni nembo/kampuni yenye jina gani mmeshawahi kununua? (***Zungushia jibu zaidi ya moja****)*

    i. Azania ii. Pembe iii. Maisha iv. Safi v. Poa vi. Taifa vii.Azam viii. Nyati

    ix. Jumbo x. Sunkist xi. Sijui/kumbuki xii. Mengineyo (taja)…….**Nenda swali la 22**

20. Je ni sababu gani zinazo fanya msitumie unga wa ngano kupika? (***Zungushia jibu zaidi yamoja****)*

    i. Haupatikani ii. Ni gharama iii. Hatupendelei kutumia unga wa ngano

    iv.Tunanunua chakula kilichopikwa v. Hatujui kama unga una virutubisho/tunanunua bila kujua vi. Mengineyo (taja)……

21. Je katika siku saba zilizopita umewahi kutumia vyakula vyovyote vitokanavyo na unga wa ngano?(*kama****vile mkate, andazi, chapati, keki n.k***)

i. Ndiyo ii. Hapana Kama **Hapana** nenda swali la la 23

22.Kama ndiyo, Je ni siku ngapi za wiki umetumia vyakula vitokanavyo na unga wa ngano?_____

23. Je ni sababu gani zilizofanya usitumie vyakula vitokanavyo na unga wa ngano siku saba zilizopita? (***Zungushia jibu zaidi ya moja****)*

    i. Haupatikani ii. Ni gharama iii.Si/hatupendelei kutumia unga wa ngano

    iv. Ni/tulinunua chakula kilichopikwa v. Umekwisha

    vi. Mengineyo (taja)…….

24. Je kwa sasa unao unga wa ngano?

i. Ndiyo ii. Hapana Kama **Hapana** nenda swali la 28

25. Kama **Ndiyo** na upo kwenye mfuko/kifungashio cha asili, ***Angalia nembo ya unga huo***.

i. Nembo ipo ii. Nembo haipo

26. Kama **Ndiyo** na upo kwenye mfuko/kifungashio cha asili, ***Angalia jina la kibiashara la unga huo*** *(Zungushia jibu moja)*

i. Azania ii. Pembe iii. Maisha iv. Safi v. Poa vi. Taifa vii.Azam viii. Nyati

ix. Jumbo x. Sunkist xi. Mengineyo (taja)……. ***(Nenda swali la 28)***

27. Kama haupo kwenye mfuko/kifungashio cha asili, ***Muulize jina la kibiashara la unga huo*** *(Zungushia jibu moja)*

i. Azania ii. Pembe iii. Maisha iv. Safi v. Poa vi. Taifa vii.Azam viii. Nyati

ix. Jumbo x. Sunkist xi.Sikumbuki xii. Mengineyo (taja)…….(***Nenda swali la 28)***

SEHEMU C: TAARIFA ZA AWALI

28. Je una umri gani kwa sasa?..... (miaka)

29. Je umefika kiwango gani cha elimu? (***Zungushia jibu moja****)*

i. Sijasoma ii. Msingi iii. Sekondari/cheti iv. Diploma v. Chuo kikuu

30. Unafanya shughuli gani ili kujiingizia kipato? (***Zungushia jibu moja****)*

i. Mwanafunzi ii. Mkulima iii. Mwajiriwa iv. Nimejiajiri/biashara

v. Sina ajira/mama wa nyumbani/mtumishi wa ndani

31. Je kwa makadirio mapato ya kaya yenu ni kiasi gani kwa mwezi?_____Tshs

32. Hali yako ya ndoa ni ipi kwa sasa? (***Zungushia jibu moja)***

i. Sijawahi kuolewa ii. Nimeolewa iii. Ninaishi na bwana iv. Mtalaka/Tumetengana

v. Mjane

33. Je kwa ujumla mko wangapi katika kaya yenu pamoja na wewe?_____

34. Je una uhusiano gani na mkuu wa kaya?

i. Mimi ndiye mkuu wa kaya ii. Mkewe/mwenza iii. Ndugu yake/mtoto iv. Mtumishi wa ndani/ siyo ndugu

35. Je umewahi kuzaa mtoto/watoto?

i. Ndiyo ii. Hapana Kama Hapana (Ishia hapa)

36. Je umezaa watoto wangapi kwa ujumla ukihesabu(kama ilitokea) na watoto waliokufa ukiwa na mimba ya miezi saba au zaidi?_____

Sasa tutazungumzia kuhusu ujauzito wako wa mwisho

37. Ulipokuwa mjamzito kwa mara ya mwisho je ulihudhuria kliniki?

i. Ndiyo ii. Hapana Kama Hapana (Nendaswali la 40)

38. Je ulianza kuhudhuria kliniki ukiwa na umri gani wa ujauzito?_____

39. Je kwa ujumla ulihudhuria kliniki mara ngapi? _____

40. Je ulipanga kuwa na ujauzito huo kwa ushauri wa mhudumu wa afya?

i. Ndiyo ii. Hapana

MWISHO

Ahsante kwa kushiriki

Appendix 1e: OBSERVATION CHECKLIST

OBSERVATION CHECKLIST:
Cluster No…….
*STREET*_____

SHOP	FORTIFIED FLOURS	Yes	No	Brand	Fortification LOGO (V)	Price/kg
1	Wheat					
	Maize					
2	Wheat					
	Maize					
3	Wheat					
	Maize					

Appendix 1f: Cluster control form

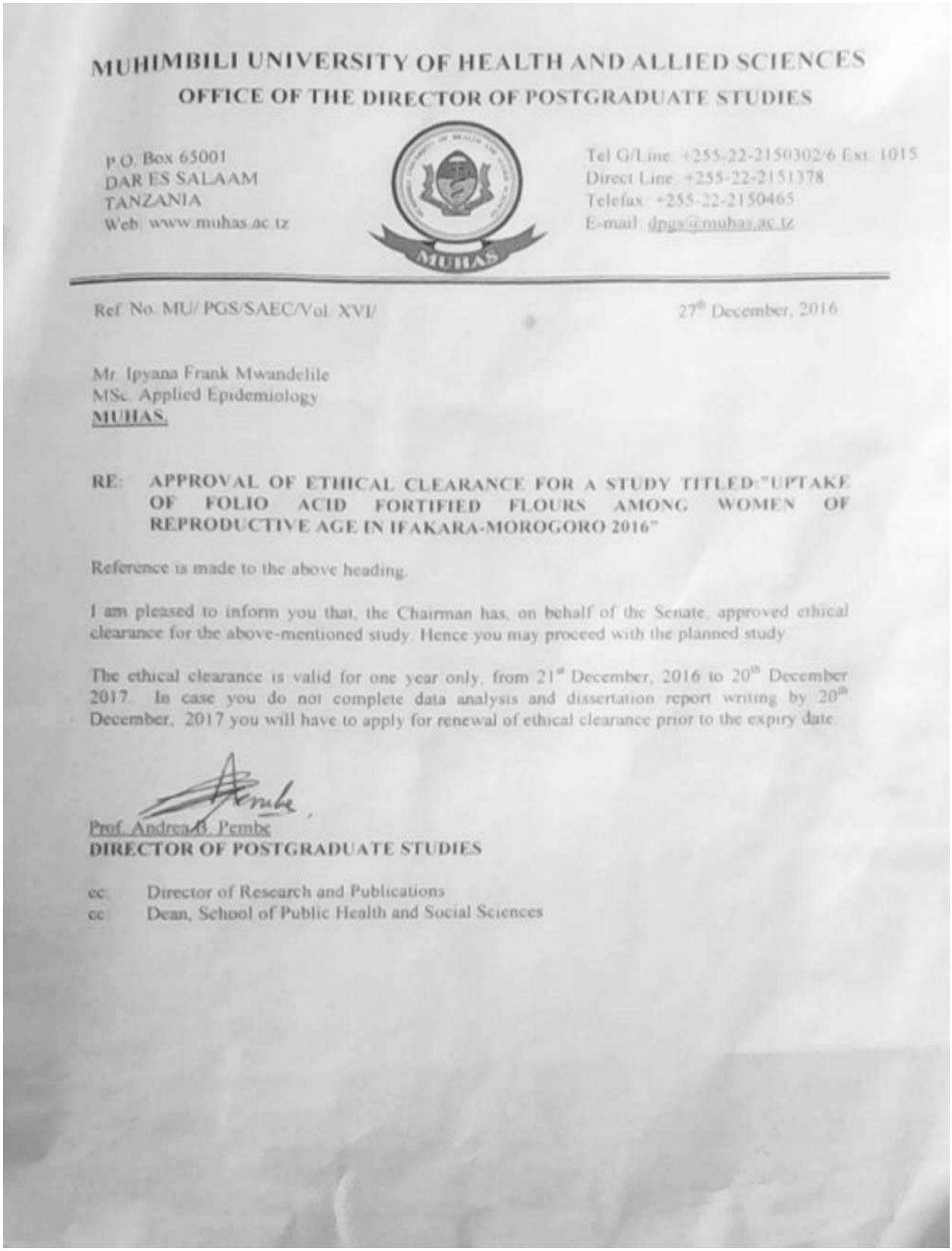
CLUSTER CONTROL FORM

District_____Village_____Cluster #___Team #___

Date of sampling_____

HH No.	Head of HH name	Visit outcome 1=completed 2=partly completed 3=refused 4=absent	No. of eligible women	No. of eligible women responded	HH needs to be revisited Yes or No	HH revisited Yes or No	Comments

sAppendix 1g: Ethical clearance



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Ref. No. MU/ PGS/SAEC/Vol. XVI/ 27th December, 2016

Mr. Ipyana Frank Mwandelile
MSc. Applied Epidemiology
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED:"UPTAKE OF FOLIO ACID FORTIFIED FLOURS AMONG WOMEN OF REPRODUCTIVE AGE IN IFAKARA-MOROGORO 2016"

Reference is made to the above heading.

I am pleased to inform you that, the Chairman has, on behalf of the Senate, approved ethical clearance for the above-mentioned study. Hence you may proceed with the planned study.

The ethical clearance is valid for one year only, from 21st December, 2016 to 20th December 2017. In case you do not complete data analysis and dissertation report writing by 20th December, 2017 you will have to apply for renewal of ethical clearance prior to the expiry date.

Prof. Andrea G. Pembe
DIRECTOR OF POSTGRADUATE STUDIES

cc: Director of Research and Publications
cc: Dean, School of Public Health and Social Sciences