DETERMINANTS OF IRON-FOLIC ACID SUPPLEMENTS USE BY PREGNANT WOMEN ATTENDING ANTENATAL CLINICS IN RUFIJI DISTRICT COUNCIL

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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 The Muhimbili University of Health and Allied Sciences

October, 2020

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled ***Determinants of Iron-Folic Acid Supplements Use by Pregnant Women Attending Antenatal Clinics in Rufiji District Council, Pwani Region,*** in (partial) fulfillment of the requirements for the degree of Master of Science (Applied Epidemiology) of Muhimbili University of Health and Allied Sciences.

.....

Dr. Germana Leyna

(Supervisor)

Date: 30/10/2020

DECLARATION AND COPYRIGHT

I, **NYAMEGI, Chacha Emmanuel** 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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ABSTRACT

Background:

Folate deficiency has long been found to be associated with severe congenital birth defects such as spina bifida, anencephaly, etc. Pregnant mothers have an increased demand for folic acid to support the growing placenta and fetus and prevent birth defects. However, despite years of promotion, folic acid supplementation in women of reproductive age is still very low in Sub Saharan Africa and Tanzania in particular.

Objectives:

The study was conducted in order to assess the determinants of Iron- Folic Acid (IFA) supplements uptake among pregnant women attending antenatal clinics in Rufiji district.

Materials and Methods:

Health facility based cross- sectional study was conducted. A total of 364 pregnant women were selected randomly from 8 facilities to participate in the study. They were interviewed using an interviewer administered questionnaire. They were asked questions from thematic areas that are considered to be potential contributors to the use of IFA supplements such as socio-demographic factors, sexual and reproductive characteristics, socio-cultural, facility based factors and knowledge on benefits and use of IFA supplements. Association between use of IFA supplements and independent variables was assessed using odds ratios through cross tabulations and significance testing was done using Chi square or Fishers's exact test. 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 use of IFA supplements and to control for potential confounders. The model was considered significant/fit when its p-value < 0.05. All statistical computations were performed on SPSS version 22.0.

Results:

A total of 363 pregnant women participated in the study. Use of IFA supplements was found to be at 63.1%, access to IFA was found to be 98.9%. Knowledge on benefits of using IFA as nutritional supplements that prevents NTDs was 20.4%. More than three

quarter 238 (86.9%) could also identify green vegetables as a potential natural source of FA. Factors that were significantly associated with IFA supplements use included: having college education, AOR=0.11(95% CI 0.012-0.910; p=0.015), having made 4 or more ANC visits, AOR= 0.18(95% CI 0.050-0.637; p=0.008), as well as having knowledge on beneficial effects of IFA supplements, AOR=3.70(95% CI 1.064-5.538; p=0.003).

Conclusion and recommendations

About 6 out of 10 women seeking ANC services in Rufiji district use IFA supplements. Predictors of use of IFA include socio-demographic and facility based characteristics. Efforts to increase compliance to IFA supplementation must focus on promoting formal education to women, creating awareness on its benefits and encouraging women to attend ANC at least four times during pregnancy.

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ABBREVIATIONS

ANC	Ante-Natal Care
BDs	Birth Defects
BMI	Body Mass Index
CDC	Centers for Disease Control
FA	Folic Acid
ICBDSR	International Committee for Birth Defects Surveillance and Research
IDSR	Integrated Disease Surveillance and Response
IFA	Iron and Folic Acid
LMICs	Lower and Middle-Income Countries
MMWR	Morbidity and Mortality Weekly Report
MUHAS	Muhimbili University of Health and Allied Sciences
NBS	National Bureau of Statistics
NTDs	Neural tube defects
OPD	Out Patient Department
RMO	Regional Medical Officer
TC	Town Council
TFELTP	Tanzania Field Epidemiology and Laboratory Training Program
WHO	World Health Organization
WRA	Women of Reproductive Age

DEFINITIONS AND OPERATIONAL TERMS

Folic acid: Any form of folic acid including folic acid single tablets and multivitamin containing folic acid

Iron-Folic Acid (IFA): A multivitamin tablet containing both iron and Folic acid supplements

Use of IFA*:* Uptake of IFA tablets from the first trimester and current frequency of at least four days per week.

Women of reproductive age (WRA): Women who are in their active reproductive years. In this case considered to be 15-49 years

Knowledge on benefits of using Folic Acid*:* Knowing that Folic Acid prevents Birth Defects and the correct time to start taking folic acid is before becoming pregnant

Accessibility to IFA*:* IFA tablets are freely available to pregnant mothers at Antenatal Clinics

Knowledge on foods rich in Folic Acid: Correctly identifying at least one food source of FA

CHAPTER ONE

1.0 INTRODUCTION

1.1. Background

Neural tube defects (NTDs) affect an average of 1 in every 1000 established pregnancies world wide(1), although variations in NTD prevalence have been reported from 0.2-10 per 1000 in specific geographical locations. Higher numbers occur in miscarriage material(2). NTDs rank amongst the commonest of birth defects, alongside congenital heart anomalies and genito-urinary defects(3). NTDs have a long history: reports of fetuses and infants with spina bifida, anencephaly, myelomeningocele, and craniorachischisis extend back to Ancient Egyptian times(4).

NTDs arise when the neural tube, the embryonic precursor of the brain and spinal cord, fails to close during neurulation. The cranial region (anencephaly) or the low spine (open spina bifida; myelo-meningocele) are most commonly affected, although, in the severe form of NTD craniorachischisis, almost the entire neural tube remains open, from the midbrain to low spine. Most individuals who survive with NTDs have a multiple system handicap and a limited life expectancy(5). The majority of these malformations appear to result from a combination of genetic and environmental factors. A strong genetic component is indicated by the high recurrence risk for siblings of affected individuals(6,7).

The clinical severity of NTDs varies greatly. Open lesions affecting the brain (anencephaly, craniorachischisis) are always lethal before or at birth. Encephalocele can also be lethal depending on the extent of brain damage during herniation. Open spina bifida is generally compatible with postnatal survival, although the resulting neurological impairment below the level of the lesion can lead to lack of sensation, inability to walk and incontinence. Associated conditions include hydrocephalus, which often requires cerebrospinal fluid shunting, vertebral deformities, and genitourinary and gastrointestinal disorders. Closed spinal lesions are generally less severe and can be asymptomatic, as with spina bifida occulta which is considered a variant of normal(8).

The association between maternal diet, particularly a lack of folate and the occurrence of neural tube defects (NTDs) was first suggested in 1965 by Hibbard and Smithells(9) Since then, extensive research has been conducted and the efficacy of folic acid in the prevention of NTDs has been demonstrated. In 1980, Smithells demonstrated a reduction in the risk of recurrence of NTDs in women who had a previous NTD birth from 5 percent to 0.6 percent following vitamin supplementation (an 86 percent reduction in risk)(10)

Despite of highlighting folate deficiency, other documented causes of NTDs are organic solvents, pesticides, In Vitro Fertilization(IVF), maternal diabetes mellitus, maternal hyperthermia, advanced maternal age, low social economic status, maternal cigarette smoking, obesity and medications such as antiepileptics, anticoagulants, rifampicin, methotrexate, and azathioprine(11–14) Based on current evidence, it is recommended that all women of childbearing age receive 0.4mg (400 μg) of folic acid daily peri conceptionally (1 month before and 2 months after). Women at high risk for NTDs, that is, women with previous NTDs affected pregnancy, obesity (BMI > 30), diabetes, and epilepsy should receive 4 to 5mg of folic acid daily before conception, starting at least one month before conception and continuing throughout the first trimester of pregnancy (15,16). The recommended dose of 4mg/d was chosen for a Medical Research Council trial that resulted in a 72% reduction in NTDs recurrence (17,18).

Further evidence for the preventive effect of folic acid can be gathered from the study which tried to evaluate a large scale public health campaign in northern China that provided folic acid supplements to women planning for marriage. The rate of NTDs among newborns or infants of compliant women decreased by between 40% to 85% compared with pre-supplementation rates (13)

Similarly, (De-Regil et al. 2010) summarized the protective effect of peri-conception use of folic acid against both first-time occurrence and recurrence of NTDs by review of meta-analyses of trials of periconceptional folic acid supplementation. This review found that between 50–70% of NTD could be prevented by maternal ingestion of folic acid before and during early pregnancy (19).

Various researches have reported that the extent of potential nutrient deficiency during pregnancy may vary by demographic characteristics, such as younger maternal age and lower-income and education(8,20). One of the underlying causes of dietary deficiency is an increased requirement of folate during pregnancy due to changes in physiology and homeostatic control (21). Although the increased requirement of folate should preferably be met through food sources, even within the developed world, it may be unlikely that pregnant and childbearing age women meet their needs for folate and other micronutrients, such as iron and calcium, through foods alone (21,22). In order to develop targeted strategies to improve adequate preconception folic acid use in the future, knowledge about other sociodemographic and lifestyle determinants might be very important.

1.2 Problem Statement

Neural tube defects (NTDs) are a group of severe congenital disorders associated with substantial mortality, morbidity, long term disability, psychological and economic costs. The neural tube normally closes at the end of the fourth week following conception and develops into the central nervous system(brain and spinal cord). Failure of any part of the neural tube to close results in a neural tube defect characterized by disorganization of the central nervous system and abnormal development of the adjacent bones and other tisues(13,23). The most widely known cause of BDs and NTDs, in particular, is folate deficiency during the first weeks of pregnancy. Folate deficiency was first suggested as a contributor to NTDs 50 years ago and tested in a series of observational studies over the next two decades. Though there are some other causes still the primary cause of NTDs agreed among nutrition and medical experts is folate deficiency. Pre conceptional supplementation with folic acid has been shown to dramatically reduce the risk of pregnancies complicated with NTDs worldwide.

Every year spina bifida and anencephaly, the two most common forms of neural tube defects, occur in 1 in 1000 pregnancies in the United States, and an estimated 300,000 or more newborns worldwide (23). Blencowe et al. conducted six studies in sub-Saharan Africa and estimated the prevalence of NTDs at 15 in 10,000 live births(24). There is limited data from Tanzania that quantifies the burden of NTDs; two studies both done at

Muhimbili National Hospital (neonatal unit) in 2002 and in 2011- 2012 documented the prevalence of NTDs at 30 and 9.9 per 10,000 live births respectively (25,26). Factors such as being Muslim, illiterate, increased parity, poorest wealth quantile, non-exposure to mass media, not living in a joint family and absence of the husband during ANC have shown to be associated with poor uptake of IFA while provision of health education and counseling during ANC facilitates use of IFA.(27–31) It is suggested that there may be variations in the prevalence of NTDs across regions in Tanzania. For example Kilombero, Ulanga, Ifakara, Malinyi, Rufiji and Kahama councils in Tanzania have been identified as hotspots for birth defects including NTDs (32). From 2016 three councils namely Kilombero, Ifakara and Kahama are implementing a facility-based surveillance system for birth defects (BDs). WHO, CDC and the International Committee for Birth Defects Surveillance and Research(ICBDSR) are major partners in capacity building and running of this program (32).

However, despite years of promotion, folic acid supplementation in women of reproductive age is still very low in Tanzania. A study conducted at KCMC, a tertiary and referral zonal hospital in northern Tanzania in 2012 estimated the prenatal intake of Folic Acid by pregnant women to be 17.2% .(29,33). Other studies done in East Africa such as Maina and colleagues (Kenya) in 2013, revealed that about 69.3% and 51.2% of pregnant women attending ANC received folic acid and iron supplements, respectively. Tanzania adopted the WHO recommendation and requires all pregnant women to consume 30-60mg of a dose of iron and 400μg of folic acid daily starting early at first antenatal visit (34–36). Despite the national guideline emphasis, adherence to iron-folic acid supplements during pregnancy is still low (34).

Therefore, our study was aimed to explore possible factors that influence the consumption of IFA supplementation in pregnant women in Tanzania.

1.3 Conceptual framework

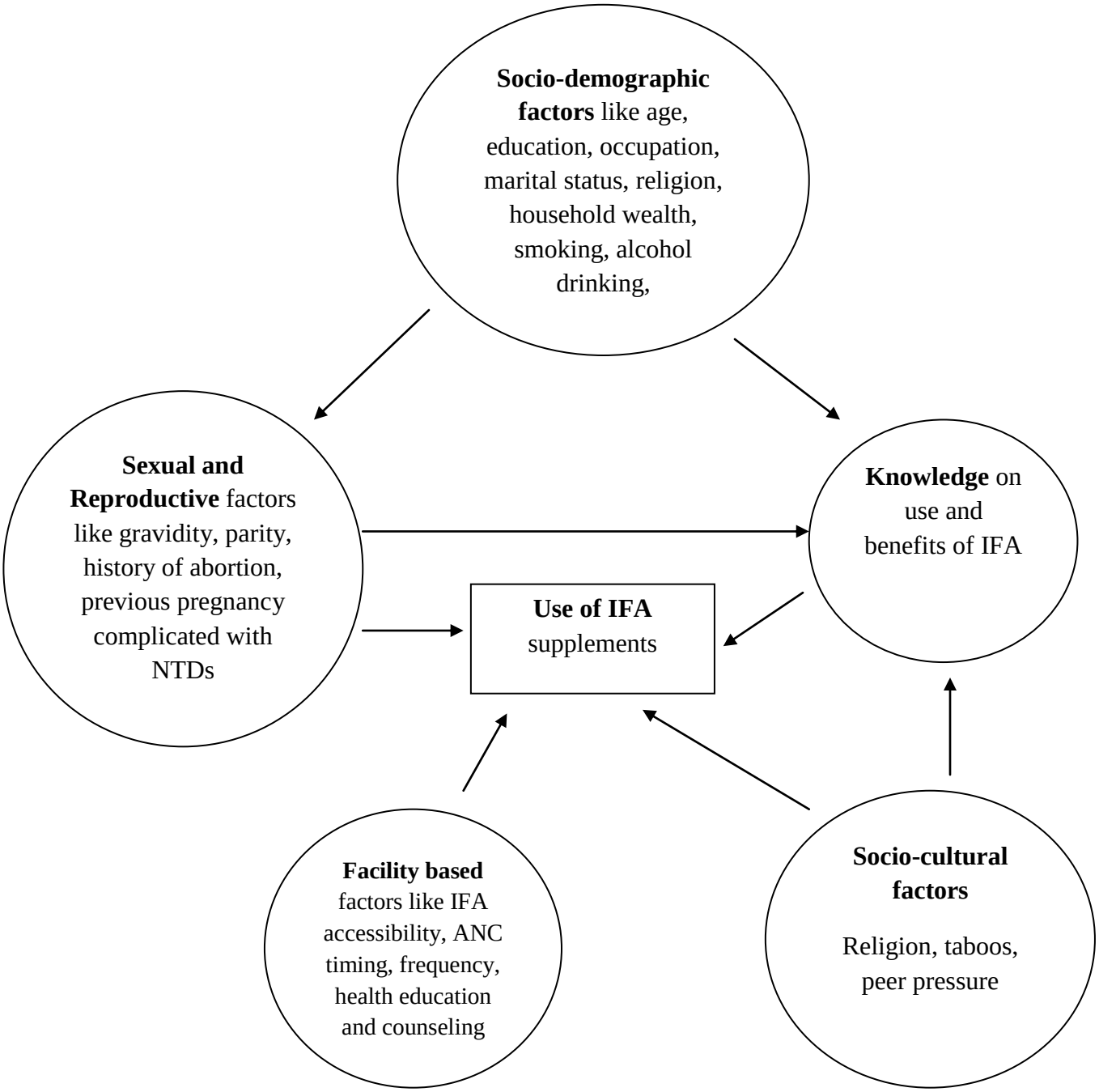


Figure 1: Conceptual framework

The framework shows the linkage that may probably exist between various factors and the use of IFA supplementation. Socio-demographic and economic factors like education and household wealth may influence their autonomy as well as health-seeking behavior and inequalities regarding universal health coverage. On the same note education may impact the knowledge gained at school or through information-seeking behavior among this group and promote the use of IFA supplementation. Increased parity is most likely associated with less education and poor socio-economic status and may reduce the consumption of IFA. Facility-based factors such as the timing of ANC initiation, frequency of visits and health education/counseling provided during the visits might increase the knowledge on benefits of IFA and in turn increase their use. History of spontaneous abortion and previous pregnancy that has been complicated with NTD might keep the pregnant mother on alert and tend to adhere to IFA use. Some local beliefs and taboos might affect the uptake of IFA supplementation. It is well documented that women's autonomy in Muslims is very poor due to various reasons like education, male dominant society, socioeconomic status, etc, and therefore this phenomenon might likely reduce the use of IFA among Muslim pregnant women.

1.4 Rationale

Although the importance of peri-conception use of folic acid among pregnant women to prevent BDs including neural tube defects is well scientifically proven, evidence shows that most of the pregnant mothers do not comply with this essential requisite when they intend to have children. This warranted a demand to assess pregnant women in Tanzania in order to make sense of the determinants that are associated with the use of folic acid supplements before and during pregnancy (37). Findings from this study will contribute to the body of knowledge at the National level and help in planning specific policies and strategies for advocating peri-conception use of IFA in women of reproductive age(WRA) in secondary schools, colleges, and RCH clinics.

1.5 Research questions

1. What are the factors that influence the use of IFA supplements among pregnant women in Tanzania?

1.5.1 Specific questions

1. What are the socio-demographic factors that influence the use of IFA supplements by pregnant women in Rufiji district?
2. Is there any difference in consumption of IFA supplements between women with knowledge on its benefits and those who do not?
3. Does having free access to IFA supplements influence its use?
4. Does use of IFA supplements by pregnant women depend on knowing the foods that are rich in its content.

1.6 Objectives

1.6.1 Broad objective

To describe the determinants of IFA supplements use among pregnant women in Tanzania

1.6.2 Specific objectives

1. To identify socio demographic factors that influence the use of IFA supplements by pregnant women in Rufiji district
2. To assess knowledge of pregnant women on the benefits of using IFA supplements before and after pregnancy
3. To assess the accessibility of IFA supplements to pregnant women in Rufiji district
4. To determine whether pregnant women in Rufiji district know the natural foods that are rich in IFA

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 What is Folate or Folic Acid

Folate (the naturally occurring form) or folic acid (the synthetic form) is a member of the water-soluble B complex vitamins. Studies have shown that, decreased maternal levels of folate are common in NTDs - affected pregnancies. The decreased levels of serum folate could be as a result of dietary deficiency, a genetic disorder in folate metabolism or both(38,39). Folic acid is used by the human body cells for the synthesis of amino acids; thymidine, adenine and guanine - three of the four nucleotides needed to assemble DNA in a cell. Besides synthesis and repair of the DNA, it also serves as a cofactor in various other biological reactions in the human body (40).

2.2 Foods rich in Folate

The Required Daily Amount (RDA) for folate during pregnancy is 600 mcg per day of dietary folate. The major natural sources of dietary folate are legumes, green leafy vegetables, citrus fruits and juices, whole wheat bread, brussel sprouts, turnip greens, potatoes, yeast, dried beans, and organ foods such as liver. Compared to naturally occurring folate in foods, the synthetic form of the vitamin (folic acid), contained in fortified foods or supplements, is almost twice as well absorbed, so that 1 mcg from these sources is equivalent to 1.7 mcg dietary folate equivalents. To prevent neural tube defects, women of childbearing age and pregnant women should consume 400 mcg per day of folic acid from fortified foods (cereals and other grains), supplements or both, in addition to consuming folate from foods in a varied diet beginning at least 1 month before conception. (20,38,40)

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,

hence pregnant women are advised to take 400mcg/kg of folic acid daily due to increased demand. 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.(15,41,42)

2.4 Knowledge of pregnant women on benefits of IFA supplements use

Since the early 1990s, international recommendations have promoted folic acid supplementation during the peri-conception period as an effective way of preventing neural tube defects (NTDs). However, the adoption of this recommendation remains insufficient. Consequently, several countries have recommended daily doses of folic acid to all women in reproductive ages. Others have recommended daily folic acid intakes only to women planning to become pregnant before conception. Despite these recommendations, rates of adequate folic acid intake remain very low. Many women do not feel concerned by campaigns disseminating information on the benefits of folic acid, while others have never been informed on this subject.(43)

One study conducted in Ibadan Nigeria revealed that, respondents in the managerial and professional socioeconomic class, knew that IFA could prevent birth defects compared to those in the intermediate class and in the working class. A total of 15 women out of 138 (10.9%) with a university degree who used IFA in pregnancy were aware of its preventive role in the aetio pathogenesis of birth defects compared to 2 of the 421 (0.5%) women with less education. Again, a higher proportion of respondents who booked for ANC in the first trimester knew that IFA could be taken to prevent birth defects than those who registered their pregnancies at a later date. There was no association between knowledge of the preventive role of IFA and; respondent's age, marital status and number of pregnancies.(44)

2.5 Factors influencing use of Iron-Folic Acid supplements

There are limited studies in Tanzania that addresses determinants of iron and folic acid supplements use. One study done in 2012, at Kilimanjaro Christian Medical Centre (KCMC) in Northern Tanzania concluded that FA and iron supplementation are low

among pregnant women in particular among women with co-morbidities before or during pregnancy. Factors found to be associated with positive intake of these supplements are advanced maternal age, unknown HIV status, a diagnosis of anemia during pregnancy and factors associated with low socioeconomic status. (45) The Generation R Study done in Netherlands in 2008 found that age below 20 years, having no partner, low education level, BMI greater than 25, smoking, alcohol drinking, multiparity and not planning pregnancy were all associated with inadequate use of IFA supplements.(31)

CHAPTER THREE

3.0 METHODOLOGY

3.1. Study site

This study was conducted in Rufiji district Council, in Pwani region. We selected Rufiji purposively owing to the fact that the area is among the hotspots for birth defects, particularly NTDs in Tanzania(46). Rufiji District Council is one of the six districts of the Pwani region of-Tanzania. It is bordered to the north by the Kisarawe and Mkuranga Districts, to the east by the Indian Ocean, to the south by the Lindi Region and to the west by the Morogoro Region. The district name originates from the Rufiji River which runs through the district (47).

The district has hot weather throughout the year and two rainy seasons; short rains (October to December) and long rains (February to May). The average annual precipitation in the district is between 800 to 1000 millimeters. A prominent feature in the District is the Rufiji River with its large flood plain and delta, the most extensive in the country. Mangrove forests flank the tributaries of the delta. The river, from which the District takes its name, divides the district geographically into approximately equal halves. The district is also a gateway to Selous Game Reserve. The reserve has a variety of wild animals such as zebras, buffaloes, hartebeest, monkeys, lions, hyenas, warthogs and elephants (47).

The council has 26 administrative wards, 94 registered villages, and 385 hamlets with a population of 217,274 people. There are 49,380 households with an average household size of 4.4 people. There are 112,423 women and an estimated total number of 48,000 WRA. The district is largely rural although the population is clustered around Utete (District headquarters), Ikwiriri, Kibiti and Bungu townships.(47–49)

Rufiji district is home to several ethnic groups. The largest group being the Ndengereko (who, according to oral tradition, are the original inhabitants of the area), other groups include the Matumbi, Nyagatwa, Ngindo, Pogoro, and Makonde. The majority of the

people are Muslims with few Christians and followers of traditional religions. In addition to local languages, Kiswahili is widely spoken; English is not a common language in the area. The majority of the people in Rufiji District are subsistence farmers. Major crops grown include cassava, maize, rice, millet, sesame, coconut and cashew nuts. Fruits such as mangoes, oranges, pineapples, papaya, and jackfruit are also grown. Some residents are involved in fishing while others in small-scale commercial activities such as selling wood products (e.g. timber, furniture, and carvings).(47)

With respect to health care services, the district is served by 22 health facilities; 18 of them with public ownership, 1 is private for-profit and 3 with faith-based ownership. Of these facilities, there is one hospital, three health centers and the rest are dispensaries.(50)

3.2 Study design

This project was a health facility-based cross-sectional study conducted from November 2019 to July 2020.

3.3 Study population

Study participants involved pregnant women who were attending RCH clinics in Rufiji district council.

3.3.1 Inclusion criteria

Pregnant women aged 15 years and above attending RCH clinics during the study duration were included in this study

3.3.2 Exclusion criteria

1. Pregnant mothers who were not able to talk or communicate
2. Pregnant women who did not consent.
3. Pregnant women diagnosed with life-threatening condition who needed immediate admission/attention such as eclampsia, placenta praevia, etc.

3.4 Sample size estimation

The following formula was used to calculate the sample size required in this study

$$n = deff \times \frac{N\hat{p}\hat{q}}{\frac{d^2}{1.96^2}(N-1) + \hat{p}\hat{q}}$$

where

n = sample size
$deff$ = design effect
N = population size
$\hat{p}$ = the estimated proportion
$\hat{q} = 1 - \hat{p}$
d = desired absolute precision or absolute level of precision

The minimum sample size with population size (N) of 48,000 WRA(49,51), a 5% maximum error, at 17.2% use of folic acid (p),(29,33) with a design effect of 1.5 and a 10% non-response rate was estimated to be around 364 pregnant women.

3.5 Sampling procedure

Simple random sampling was used to identify six (30%) public health facilities (among 18), One faith-based (among 3) and one private for-profit to make a total of 8 health facilities for recruiting study participants. The average estimated number of pregnant women attending ANC in each selected health facility for the past one month was taken. Accordingly, the calculated sample was distributed into these health facilities proportional to the size of women attending ANC in this one month time frame. At the health facility level, pregnant women attending RCH clinics were selected by using random numbers that were generated by open epi program. Participants were selected on subsequent days until the required sample size was fulfilled.

3.6 Pre-testing

Two research assistants with diploma level of education were recruited in this study for data collection. They were trained on the rationale of the study and data collection

instruments and methods. The questionnaire was pre-tested before collection of data in the field

3.7 Data collection

3.7.1 Data Collection Instruments

Data was collected using a standardized interviewer administered questionnaire that has been developed in English and then translated in Kiswahili. The interviewer schedule consisted of questions regarding demographic and socio-cultural characteristics such as age, socioeconomic status, and household wealth measurements, family/peer pressure, and taboos. Questions on sexual and reproductive history such as gravidity, parity, whether the current pregnancy was planned and history of spontaneous abortion, stillbirth or previous pregnancy complicated with NTDs. The tool also had questions relating to health facility-based services like accessibility of IFA tablets and provision of health education/counseling during ANC visits. Questions about knowledge of and use of IFA supplements were also included. Knowledge about IFA was defined as having heard it before and knowing that IFA prevents BDs. IFA use was defined as having taken IFA supplements or multivitamins containing folic acid during the first trimester and regular frequency of use (at least 4 days per week) (27,30).

3.7.2 Data collection procedures

Subjects were selected using computer generated random numbers. Study subjects were explained about the objectives of the study in Kiswahili language in clear words and then a written informed consent was sought from each of the participants. Those who did not consent were excluded from the study. Subjects were then asked to respond to questions within the interviewer's schedule. Interviews were conducted by the Principal Investigator and two trained research assistants. Attempts were made to minimize interviewer bias and maximize internal consistency by reading questions exactly as written, probing in a non-leading manner, and prompting with neutral statements.

3.7.3 Validity and Reliability of Research Tools

We pre-tested the research tool to assess face validity and reliability. However, detailed psychometric analysis of the tool was not done. Our assumption was, given the pre-test showed participants understood the questions then the generated findings are valid and reliable.

3.8 Variables

3.8.1 Dependent variables

Use of IFA supplements (binary) was defined as having taken IFA supplements during the first trimester and current regular frequency of use (at least 4 days per week)

3.8.2 Independent variables

1. Socio-demographic factors such as age(continuous), education level(ordinal), marital status(nominal), occupation(nominal), household wealth(ordinal), alcohol drinking cigarette smoking(binary) and religion(nominal).
2. Obstetric and gynecologic factors such as pregnancy planning(binary), parity(ordinal), history of abortion(binary) and a previous history of NTD delivery (binary)
3. Knowledge of the benefits of IFA in preventing NTDs(binary). Three item questions which were asked to assess general knowledge of pregnant mothers on the importance of using FA in preventing NTDs and the correct time for starting these supplements. These items were then summarized into a single dichotomous variable.
4. Access to IFA supplements at ANC(binary)

3.9 Data management

3.9.1 Data quality control

A standardized protocol and interviewer schedule was designed and tested. Research assistants were trained and constantly supervised on the standard technique of probing questions to minimize interviewer bias. At the end of the working day, questionnaires were cross-checked to identify and correct any missing values, spelling, and data entering

errors. Data were then entered into a database where it was coded and cleaned up before analysis.

3.9.2 Data analysis and Statistical tests

Results for descriptive data was presented in the form of frequency and percentages for categorical variables. Continuous variables was summarized by measures of central tendency and dispersion. Chi square and Fisher exact tests were used to test for bivariate association between IFA use and a potential determinant. Variables found significant ($p< 0.2$) were then included in the multivariate logistic model analysis to determine the potential contributors of IFA supplementation use. The model was considered a fit when its p-value < 0.05. All statistical computations were performed on SPSS version 22.0.

3.10 Ethical considerations

The study was of minimal risk category. At the beginning of the questionnaire, the confidentiality of the study was underlined, before asking the candidate to give her consent to participate. For individuals who were illiterate, a thumbprint were used. Issues of compensation were discussed and participants were fully informed of the freedom to withdraw at any time from the study without denial of their social needs. Data collection was kept confidential and used only for the purpose of this study. No participant name or identifier was included in data collection tools.

Questionnaires were kept enclosed in a sealed box and the Principal Investigator only accessed electronic data. Clearance was sought from Muhimbili University of Health and Allied Sciences (MUHAS) institutional review board after reviewing the study protocol. On the same basis, the team paid a courtesy visit to the District Executive Director and Medical Officer for self- introduction and asking for permission. On behalf of the District Executive Director, the District Medical Officer offered formal letters of introduction explaining the purpose of the study and to introduce the team to selected health facilities.

CHAPTER FOUR

4.0 RESULTS

4.1 Socio demographic characteristics of respondents

A total of 363 pregnant women participated in the study (response rate of 99.7%). The mean age of the study population was 26.5 years (SD: 6.85). Majority of them had primary level of education 45.7% (n=166) and 37.7% (n=137) were peasants. More than two third 84.6% (n=307) were married or cohabiting. Nearly three quarter 74.9% (n=272) were Muslim and almost all of them did not smoke or drink alcohol (Table 1)

Table 1: Socio – demographic characteristics of study participants, (N=363)

Variable	Categories	Frequency (n)	Percentage (%)
Mean age	26.5 (SD: 6.85)		
Median age	25.0 (IQR: 6)		
Age group (years)	< 20	50	13.8
	20-25	140	38.6
	26-35	133	36.6
	>35	40	11.0
Marital	Single	42	11.6
	Married	307	84.6
	Divorced	14	3.9
Parity	0-1	88	24.2
	2-3	210	57.9
	4+	65	17.9
Education	Illiterate	100	27.5
	Primary	166	45.7
	Secondary	71	19.6
	College	26	7.2
Occupation	Employed	147	40.5
	Unemployed	216	59.5
Religion	Christian	91	25.1
	Muslim	272	74.9
Relation with head of household	Head of HH	9	2.5
	Wife/partner	317	87.3
	Others	37	10.2

4.2 Influence of demographic factors in IFA use

A total of 25 women (96.2%) who had college education used IFA regularly as compared to 46(82.1%), 75(60.5%) and 27(39.7%) of secondary, primary and illiterate levels of education respectively. This difference was statistically significant ($p<0.001$).

A total of 94 (77%) of women who were employed used IFA as compared to 79(52%) of those who were categorized as unemployed. This difference was statistically significant ($p<0.001$).

Seventy three percent (n=30) of women who had one delivery or less used IFA supplements regularly as compared to 66.5% (n=115) of those with 2-3 deliveries and 46.7% (n=28) for those with four or more deliveries. This difference was statistically significant ($p = 0.008$).

Fifty six percent (n=34) of women who previously had a history of abortion used IFA supplements as compared to 31.5% (n=67) of those who had no history of abortion. This difference was statistically significant ($p = 0.001$).

Among those who had four or more ANC visits 82.1% (n=32) used IFA regularly as compared to 61.7% (n=129) for those with 2-3 visits and 46.2% (n=12) for those with one ANC visit. This difference was statistically significant ($p = 0.009$). Other socio demographic characteristics did not show significant differences.

4.3 Use of IFA supplements

A total of 173(63.1%) of women reported use of IFA supplements.

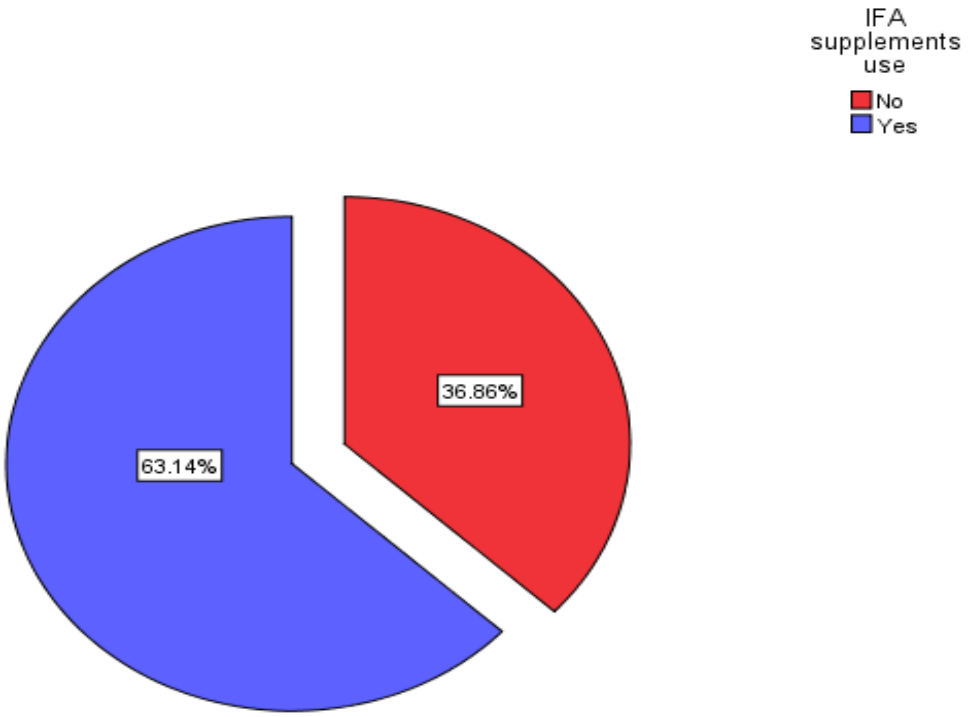


Figure 2: Pie chart showing proportions of use and non use of IFA supplements

4.4 Knowledge on beneficial effects of IFA supplements

Out of 274 respondents, only 56(20.4%) were knowledgeable on the benefits of using IFA supplements in preventing Neural Tube Defects before and during pregnancy. Among those who had knowledge of these beneficial effects, 91.1% (n=51) used these supplements compared to 56% (n=211) of those who were categorized as not knowledgeable. This difference was statistically significant ($p<0.001$).

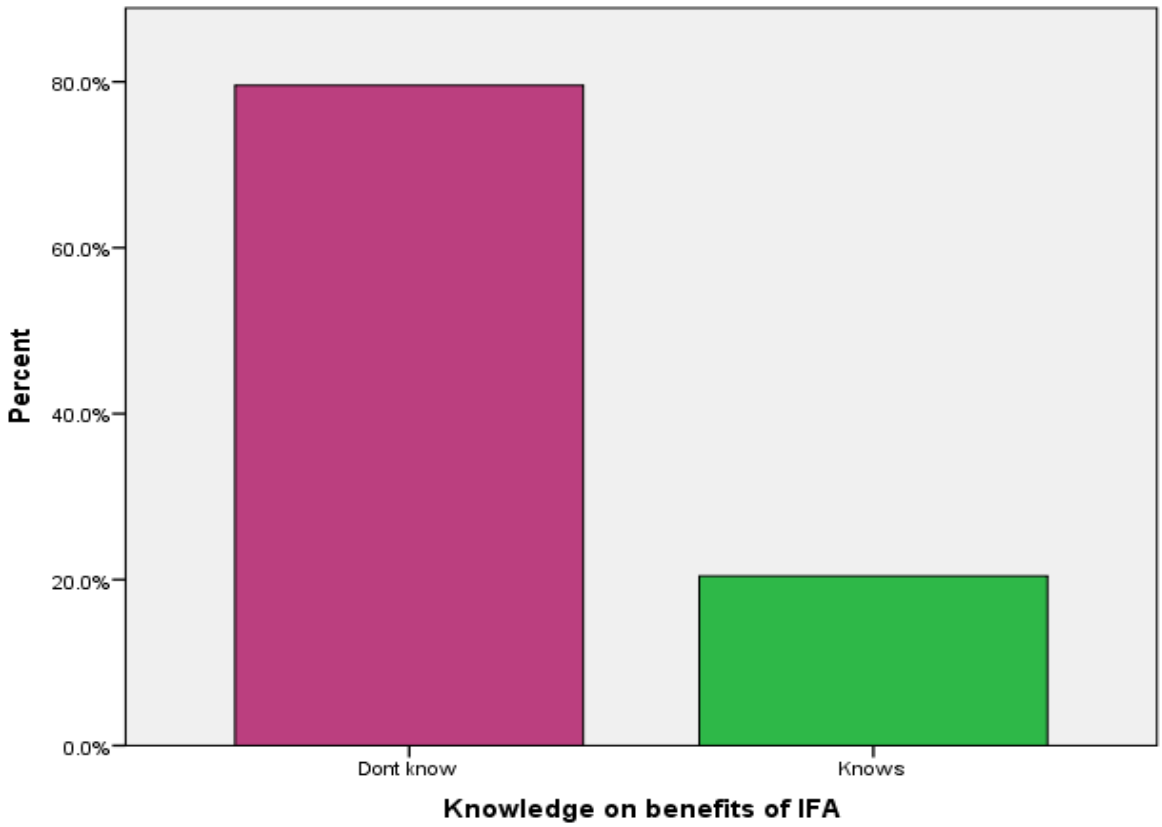


Figure 3: Bar chart showing knowledge of pregnant women on benefits of IFA

4.5 Access to IFA supplements

Out of 274 respondents, 271(98.9%) were getting supplements freely at RCH during their visits. Among those who had free access to IFA, only 63.1%(n=177) used them as compared to 66.7% (n=2) who were categorized as having no access. This difference was not statistically significant (p = 1.000).

4.6 Knowledge of foods rich in IFA

Out of 274 respondents 212 (77.4%) were knowledgeable on foods rich in IFA. Of these only 64.6% (n=137) used IFA tablets regularly as compared to 58.1% (n=36) of those who were categorized as not being knowledgeable, however this difference was not statistically significant (p = 0.346). More than three quarter 238 (86.9%) could also identify green vegetables as a potential natural source of FA (Table 2).

Table 2: Distribution of use of IFA supplements by selected demographic, maternal and facility based factors:

		IFA Use		
Variable	**Categories**	**Yes (%)**	**No (%)**	**p-value**
Mean age	26.5 (SD: 6.85)			
Median age	25.0 (IQR: 6)			
Age(years)	<20	11(55.0)	9(45.0)	0.336
	20-25	68(68.0)	32(32.0)	
	26-35	67(58.3)	48(41.7)	
	>35	27(69.2)	12(30.8)	
Education level	None	27(39.7)	41(60.3)	**< 0.001**
	Primary	75(60.5)	49(39.5)	
	Secondary	46(82.1)	10(17.9)	
	College	25(96.2)	1(3.8)	
Marital status	Single	11(64.7)	6(35.3)	0.990
	Married	155(63.0)	91(37.0)	
	Divorced	7(63.6)	4(36.4)	
Occupation	Unemployed	79(52.0)	73(48.0)	**< 0.001**
	Employed	94(77.0)	28(23.0)	
Religion	Christian	42(64.6)	23(35.4)	0.778
	Muslim	131(62.7)	78(37.3)	
Number of ANC visits	1	12(46.2)	14(53.8)	**0.009**
	2-3 visits	129(61.7)	80(38.3)	
	≥ 4 visits	32(82.1)	7(17.9)	
Parity	0-1	30(73.2)	11(26.8)	**0.008**
	2-3	115(66.5)	58(33.5)	

	4+	28(46.7)	32(53.3)	
History of Abortion	Yes	34(55.7)	27(44.3)	**0.001**
	No	67(31.5)	146 (57.1)	
Access to IFA	Yes	171(63.1)	100(36.9)	1.000
	No	2(66.7)	1(33.3)	
Knowledge on foods rich in IFA	Yes	137(64.6)	75 (35.4)	0.346
	No	36(58.1)	26(41.9)	
Knowledge on benefits of IFA supplements	Yes	51(91.1)	5(8.9)	**< 0001**
	No	122(56.0)	96(44.0)	

4.7 Independent influence of selected factors in use of IFA

Education, ANC visits and knowledge on IFA benefits showed an association with use of IFA

Pregnant women who were illiterate were 0.06 times less likely to use IFA supplements as compared to those with college education, [AOR: 0.06 (0.007- 0.582); p = 0.015]. The odds of use of IFA in women with primary education were 0.11 times less as compared to women with college education, [AOR: 0.11(0.012 - 0.910); p = 0.041]. This difference was statistically significant.

Women with one ANC visit had 0.18 times less odds of using IFA as compared to those with four visits or more, This difference was statistically significant [AOR: 0.18(0.050 - 0.637); p = 0.008]. Those with two to three ANC visits had 0.34 times less odds of using IFA as compared to women with four or more visits. This difference was statistically significant, [AOR: 0.34(0.135-0.877); p = 0.025].

The odds of using IFA were four times more likely in women who had knowledge on beneficial effects of FA in preventing NTDs as compared to those who did not know. This difference was statistically significant, [AOR: 3.7026(1.064 - 5.538); p = 0.003].

Table 3: Multivariate logistic regression model showing determinants of IFA supplements use.

Variables	Categories	Crude OR (95% CI)	p-Value	Adjusted OR (95% CI)	p-Value
Age group	< 20	0.543(0.179-1.653)	0.889	0.80(0.193-3.322)	0.759
	20-25	0.944(0.425-2.101)	0.889	0.78(0.279-2.179)	0.636
	26-35	0.620(0.286-1.346)	0.227	0.51(0.205-1.289)	0.156
	>35	1.0		1.0	
Education level	None	0.026(0.003-0.206)	0.001	0.06(0.007-0.582)	**0.015**
	Primary	0.061(0.008-0.467)	0.007	0.11(0.012-0.910)	**0.041**
	Secondary	0.184(0.022-1.522)	0.116	0.26(0.029-2.401)	0.237
	College	1.0		1.0	
Occupation	Unemployed	0.322(0.190-0.547)	<0.001	1.03(0.507-2.082)	0.940
	Employed	1.0		1.0	
Number of ANC visits	1	0.188(0.061-0.577)	0.004	0.18(0.050-0.637)	**0.008**
	2-3	0.353(0.149-0.837)	0.018	0.34(0.135-0.877)	**0.025**
	≥ 4	1.0		1.0	
Parity	0-1	3.117(1.323-7.344)	0.009	1.38(0.413-4.586)	0.604
	2-3	2.266(1.247-4.118)	0.007	1.28(0.565-2.915)	0.551
	4 +	1.0		1.0	
History of Abortion	Yes	0.364(0.204-0.652)	0.001	0.52(0.259-1.059)	0.072
	No	1.0		1.0	
Knowledge on IFA benefits	Don't know	1.0		1.0	
	Knows	8.026(3.084-20.891)	< 0.001	3.70(1.064-5.538)	**0.003**
Access to	Yes	0.855(0.77-9.549)	0.899	1.02(0.057-18.084)	0.991

IFA	No	1.0		1.0	
Knowledge on foods rich in IFA	Yes	0.567(0.058-5.521)	0.625	0.36(0.024-5.446)	0.359
	No	1.0		1.0	

CHAPTER FIVE

5.0 DISCUSSION

5.1 Summary of findings

This study was conducted to determine the predictors of uptake of IFA supplements among pregnant women attending RCH clinics in Rufiji, Pwani region. This was a reported use of IFA supplements from the first trimester and current regular use (at least 4 days per week). Factors found to determine the use of IFA supplements include education level, number of ANC visits and having knowledge on beneficial effects of using IFA supplements before and during pregnancy. Unlike findings from many other studies, religion, age and marital status were not found to influence the use of IFA supplements in this study.

5.2 Main discussion

Use of IFA: Use of IFA supplements was high in our study. A recent survey (2013-2018) done in Sub Saharan Africa(SSA) aiming at assessing adherence to IFA supplementations in pregnant women found that use of IFA varies across SSA countries ranging from 1.4% in Burundi to 73% in Senegal. The same study revealed adherence of twenty two, twenty three, eight and sixty one percents to Tanzania, Uganda, Kenya and South Africa respectively(52). The different findings in the SSA study might be attributed to the way they measured adherence as consumption of ≥ 90 IFA tablets during pregnancy of the most recent birth. Counseling to women during their child bearing years on the health benefits and possible side effects of IFA supplementation would increase its use.

5.2.1 Education Level

The odds of using IFA supplements was lower in women with no education and primary education as compared to those with college or university level and this findings was statistically significant.. Several studies have reported a reduction in IFA use with decreasing education levels as in Anzaku and colleagues (Nigeria), Hisam et al (Pakistan) and Claudine et al (Lebanon) (43,53,54). Higher education level may directly impact the knowledge gained at school or through information-seeking behavior among this group

and promote the use of IFA supplementation as seen in this study. Formal education for women should be advocated in order to maximize their overall maternal and child outcome.

5.2.2 Number of ANC visits

The present study also found that, the odds of using IFA tablets were lower in those women who made only one visit and those who had two to three visits as compared to women who attended ANC four times or more. This difference was statistically significant. These findings can be compared with one study, done by Amanda Wendt et al in rural Bihar province, in India (2015), which found that pregnant women were more likely to consume IFA regularly if they attended at least four ANC check - ups and received more ANC services (30). The increase in use of IFA with increase in ANC visits can be explained by the fact that, ANC centers in Tanzania are the primary health facilities designated for provision of IFA tabs, health services such as health education on pregnancy and planning for delivery and therefore the more the visits to ANC the more pregnant women receive health services including free refilling of these supplements. The MoHCDGEC through RCH practitioners should thrive to strengthen and improve quality of ANC services so that they become friendly and motivate pregnant mothers to utilize them frequently.

5.2.3 Knowledge on benefits of IFA

The odds of using IFA supplements were almost four times likely in women who knew the benefits of IFA in preventing NTDs as compared to those who did not know. This finding was statistically significant, Two studies from Turkey and Saudi Arabia(55,56), also reported increased odds of IFA use in women who know its benefits in prevention of NTDs. This can be explained by the fact that being knowledgeable on the role of Folic acid in preventing NTDs might promote further information seeking on the availability of the supplements and therefore enhancing its use.

5.2.3 Access to IFA

Nine out of ten of women in our study obtained IFA freely at ANC. Access to IFA did not show any association at both bivariate and multivariate analysis levels although this finding should be interpreted with caution because almost all of the study participants obtained IFA freely at health facilities and therefore assessing its influence on use of IFA is not relevant. However, a study done in Senegal by Binetou C. Seck and colleagues found that providing pregnant women with IFA freely improved their compliance as compared to the group which was given a prescription to buy at a medical store pharmacy, and this difference was statistically significant(57). Contrary to our study, Rajshree J. Bhat and coallegues in Ahmedabad India found a more than fifty percent decrease in access to IFA supplements(58). The higher access rate in our study may be explained by the used definition access definition. Despite high access rate, IFA use is still lo pregnant women in Rufiji need to be emphasized on regular consumption of IFA.

5.3 Study limitations and Mitigations

Our study had a reasonable (moderate) sample size, we controlled for confounders and therefore findings obtained may be valid. Since the study was dependent on information from study participants, there may be some recall bias. This was mitigated by collecting information on frequency of uptake of IFA supplements within seven days prior to the interview. The information on independent factors and the outcome of interest had already occurred and were collected simultaneously one was not sure which came first. Some other studies measured use of IFA as consumption of at least $\geq$ 90 tablets within pregnancy which is not in line with our operational definition. The interviewer bias was another limitation in this study and was taken care by using a standard questionnaire and training of the research assistants.

CHAPTER SIX

6.0 CONCLUSION, RECOMMENDATIONS AND ORIGINALITY OF CONTRIBUTION

6.1 Conclusion

Being knowledgeable on the role of folic acid in preventing NTDs and higher educational attainment were significantly associated to IFA supplementation use, suggesting the need to focus on promoting formal education to women and improving health education provision services to pregnant women during their ANC visits.

6.2 Recommendations

1. Tanzania Government and stakeholders should advocate provision of formal education to women in order to improve their maternal and child outcome.
2. Health care providers in antenatal clinics have to emphasize pregnant women to attend clinics regularly (at least 4 visits).
3. Although access to IFA supplements is high, its use is still low, therefore it is important to continue providing education on pregnant mothers on its benefits and minimizing stock outs health facilities.

6.3 Originality of Contribution

The present study has a reasonable number of findings that can be considered as a ground for further studies. Pregnant women who had a history of abortion or those with any past delivery having been complicated with NTD would be assumed to be better consumers of IFA supplements in order to avoid similar complications in future pregnancies. This was not the case in our study. It might be due to lower level of education among the majority of the respondents. Alternatively it may have been contributed by some weakness in the health care delivery system notably on giving key information and feedback to clients regarding their morbidities including possible precautions to be taken, however these hypotheses need new studies to test them.

Similarly, being knowledgeable on the foods that are rich in FA could be taken as a promoting factor for use of IFA supplements, which is contrary to our study findings, probably by assuming that those pregnant women who know the FA rich foods might rely solely on consumption of the foods and ignore recommended IFA supplements or possibly due to some common side effects of these of IFA tablets. More studies need to be done in order to understand the underlying mechanism.

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APPENDICES

Appendix 1A: English version questionnaire

	Section A. Social demographic characteristics: I am going to ask you a few questions about yourself		
QN	**Question**	**Response**	**Code**
1	i/How old were you on your last birthday? Ii/Date of Birth: dd mm yyyy __ ___ ___	_____ Years	AGE
2	What is your current marital status?	1. Single ☐ 2. Married/cohabiting ☐ 3. Separated/divorced/widow ☐	MARIT
3	What is the highest level of education you have attended?	1. No formal education ☐ 2. Primary Education ☐ 3. Secondary Education ☐ 4. Higher Education (college, university, technical school) ☐	EDUCOT
4	What is your occupation status?	1. Employed (Government/Non-governmental) ☐ 2. Self-employed ☐ 3. Unemployed ☐ 4. Student ☐ 5. Others, ☐ _____ (Specify)	OCCUOT

5	What is your religion status? *(Please put a √ in the box corresponding to the correct answer)*	1. Muslim ☐ 2. Christian ☐ 3. Hindu ☐ 4. Budha ☐ 5. Atheist ☐ 6. Others ☐ (Specify) _____	MUSLIM CHRIST HINDU BUDHA ATHEIST OTHERS
6	Do you drink alcohol? *(Please put a √ in front of the correct answer)*	1.Yes 2.No	ALCOHO
7	Do you smoke cigarette? *(Please put a √ in front of the correct answer)*	1.Yes 2.No	CIGARET
8	How many people are living in your household?	Number _____	NUMLIV
9	What is your relationship with the head of the household?	1. Head of family ☐ 2. Parent ☐ 3. Partner/ spouse ☐ 4. Relative ☐ 5. Friend ☐ 6. Others, ☐ _____ (Specify)	RELHED

10	What is the main material used to build the roof of the house you live in?	1. No roof ☐ 2. Iron sheet ☐ 3. Wood ☐ 4. Grass ☐ 5. Others, ☐ _____ (Specify)	ROOFOT
11	What is the main material used to build the walls of the house you live in?	1. Brick/stone ☐ 2. Wood ☐ 3. Iron sheet ☐ 4. Bamboo ☐ 5. Grass ☐ 6. Others, ☐ _____ (Specify)	WALLOT
12	What is the main material used to build the floor of the house you live in?	1. Natural floor with sand ☐ 2. Bamboo/grass ☐ 3. Ceramic tile ☐ 4. Cemented floor ☐ 5. Carpet ☐ 6. Others, ☐ _____ (Specify)	FLOROT
13	Does your household own any livestock or farm animal?	1. Yes ☐ 2. No ☐	LIVSTOC
14	Does any member of your household own any agricultural land?	1. Yes ☐ 2. No ☐	LAND

15	Which of the following does your household own? *(Place a √ in the box corresponding to the correct answer)*	Item / 1.Yes / 2.No	
15.1 15.2 15.3 15.4 15.5 15.6 15.7		1. Electricity 2. Radio 3. Television 4. Refrigerator 5. Electric iron 6. Bicycle/motor cycle/Bajaj 7. Car	ELEC RADIO TV FRIDGE IRON BIKE CAR
16.	What kind of toilet facility do you use at your household?	1. Flush toilet sitting ☐ 2. Flush toilet Asian ☐ 3. Pit latrine ☐ 4. No toilet ☐ 5. Others, ☐ _____ (Specify)	TOILET
17.	How many meals does your household usually have per day?	Meals number_____	NMEAL
	Section B: Sexual and Reproductive History I am going to ask you questions about your reproductive history		

18	Have you ever given birth to a child/children? *(Please put a √ in front of the correct answer)* *If No, please skip to question no. 21*		1.Yes	2.No	BIRTH
19	How many times have you given birth to children including (if any) those who have died when seven months pregnant or more?	Number of births _____			NBIRTH
20	Have you ever given birth to a baby with NTD? *(Please put a √ in front of the correct answer)*		1.Yes	2.No	NTDBABY
21	Have you ever had a spontaneous abortion? *(Please put a √ in front of the correct answer)*		1.Yes	2.No	ABORT
22	Did you plan this pregnancy with your husband/partner/health care provider? *(Please put a √ in front of the correct answer)*		1.Yes	2.No	PLANN
	Section C: Knowledge of Folic Acid Use I am going to ask you questions about Folic Acid				
23	Have you ever heard of folic acid? *(Please put a √ in front of the correct answer)*		1.Yes	2.No	KNOWFA

24	From which source did you get the information on folic acid? *(Please put a √ in the correct box provided)*	1. TV ☐ 2. Radio ☐ 3. Newspaper ☐ 4. Magazines ☐ 5. Doctor/nurse ☐ 6. Friend ☐ 7. Brochures/Posters ☐ 8. School ☐	TV RADIO NPAPER MAG DOCTOR FRND BROCH SCHOOL
25	Do you know what folic acid is? *(Please put a √ in the correct box provided)*	1. Vitamin ☐ 2. Vaccine ☐ 3. Injection ☐ 4. Drip ☐ 5. Mineral	VITAMIN VACCIN E INJECT DRIP MIN
26	When is the best time to take folic acid supplements? *(Please put a √ in the correct box provided)*	1.Before pregnancy ☐ 2.During pregnancy ☐	BEFORE DURING
27	Which of the following disease is prevented by taking folic acid? *(Please put a √ in the correct box provided)*	Diabetes ☐ Cancer ☐ TB ☐ Neural Tube Defect ☐ Others	DM CANCER TB NTDs OTHERS

28	Did you take a supplement containing folic acid for 1-3 months before getting pregnant? *(Please put a √ in front of the correct answer)*		1.Yes	2. No	PREPREG
29	How often did you take a supplement containing folic acid before getting pregnant? *(Please put a √ in the correct box provided)*	1.Once a week 2.Two-three times a week 3.Every day	☐ ☐ ☐		WEEKLY TWOWK DAILY
30	Did you take a supplement containing folic acid for 1-3 months of the current pregnancy? *(Please put a √ in front of the correct answer)*		1.Yes	2.No	TRIONE
31	How often did you take prenatal folic acid supplements? *(Please put a √ in the correct box provided)*	1.Once a week 2.Two-three times a week 3.Every day	☐ ☐ ☐		WEEKLY TWOWK DAILY
32	Do you know which of the following foods are rich in folic acid? *(Place a √in the box corresponding to the correct answer)*	Food	Yes	No	
32.1 32.2 32.3 32.4 32.5 32.6 32.7		1.Green vegetables 2.Vegetables in general 3.Liver			GREVEG VEG LIVER MEAT

32.8 32.9		4.Meat(excluding liver)			MILK
		5.Milk and milk products			GRAINS
		6.Grain products			LEGUME
		7.Beans and peas			
		8.Citrus fruits			CITFRUT
		9.Fruits(excluding citrus fruits)			FRUITS
Section D: Health Facility factors					
33	When did you make your first visit to the antenatal clinic for this pregnancy?	1.First-third month 2.After 3 months	☐ ☐		EARLY LATE
34	How many visits have you made to the ANC?	1.One 2.Two 3.Three 4.Four 5.More than 4	☐ ☐ ☐ ☐ ☐		ONCE TWICE THRICE FOURTH MANY
35	Did you receive the following services when you attended the antenatal clinic? *(Place a √ in the box corresponding to the correct answer)*	Service	1.Yes	2.No	
		1.Blood tested			BLOOD

		2.Weight measured			WEIG HT ABDM N HEIG HT BP EDD HEDU
		3.Abdomen measured			
		4.Height measured			
		5.Blood pressure taken			
		6.EDD given			
		7.The health talk was given			
36	Where do you get your IFA tablets and at what cost? *(Place a √ in the box corresponding to the correct answer)*	1.Free at the antenatal clinic 2.Buy at the antenatal clinic 3.Buy at the local store	☐ ☐ ☐		FREE BUYA NC BUYS TO
37	Is there any reason that makes you not to use IFA tablets? *(Place a √ in the box corresponding to the correct answer)*		Yes	No	
		Not available in our health facility			ABSE NT COST
		Sold expensive in shops			
		They are not good for health			

		They have some side effects			NGOOD SEFECT TABOOS
		Taboos/local belief			

Appendix 1B : Swahili version questionnaire

	Sehemu A. Taarifa binafsi: I am going to ask you a few questions about yourself		
QN	**Swali**	**Jibu**	**Kifupi**
1	i/ Je una umri gani kwa sasa? Ii/Tarehe ya kuzaliwa: dd mm yyyy __ ___ ___	Miaka _____	AGE
2	Hali yako ya ndoa ni ipi kwa sasa? *(Weka alama √ katika kisanduku husika)*	1. Sijawahi kuolewa ☐ 2. Nimeolewa/naishi na bwana ☐ 3. Mtalaka/tumetengana/mjane ☐	MARIT
3	Je umefikia kiwango gani cha elimu? *(Weka alama √ katika kisanduku husika)*	1. Sijasoma ☐ 2. Msingi ☐ 3. Sekondari ☐ 4. Chuo ☐	EDUCOT
4	Unafanya shughuli gani ili kujiingizia kipato? *(Weka alama √ katika kisanduku husika)*	1. Mwajiriwa ☐ 2. Nimejiajiri/biashara ☐ 3. Sina ajira/house girl ☐ 4. Mwanafunzi ☐ 5. Nyinginezo ☐ _____ (Taja)	OCCUOT

5	Dhehebu lao la dini ni lipi kwa sasa? *(Weka alama √ katika kisanduku husika)*	1. Muislamu ☐ 2. Mkristo ☐ 3. Hindu ☐ 4. Budha ☐ 5. Sina dhehebu ☐ 6. Nyinginezo ☐ (Taja) _____	MUSLIM CHRIST HINDU BUDHA ATHEIST OTHERS
6	Je unakunywa pombe? *(Weka alama √ mbele ya jibu sahihi)*	1.Ndio 2.Hapana	ALCOHO
7	Je unavuta sigara? *(Weka alama √ mbele ya jibu sahihi)*	1.Ndio 2.Hapana	CIGARET
8	Je kwa ujumla mko wangapi katika kaya yenu pamoja na wewe?	Idadi _____ ☐	NUMLIV
9	Una mahusiano gani na mkuu wa kaya? *(Weka alama √ katia kisanduku husika)*	1. Mimi ni mkuu wa kaya 2. Mzazi ☐ 3. Mume/mpenzi ☐ 4. Ndugu ☐☐ 5. Rafiki 6. Nyinginezo ☐ _____ (Taja)	RELHED

10	Je paa la nyumba unayoishi limeezekwa kwa kutumia nini? *(Weka alama √ katia kisanduku husika)*	1. Haina paa ☐ 2. Mabati ☐ 3. Mbao/miti ☐ 4. Nyasi ☐ 5. Nyinginezo, ☐ _____ (Taja)	ROOFOT
11	Je kuta za nyumba unayoishi zimejengwa kwa kutumia nini? *(Weka alama √ katika kisanduku husika)*	1. Tofali/mawe ☐ 2. Mbao ☐ 3. Mabati ☐ 4. Mianzi ☐ 5. Nyasi ☐ 6. Nyinginezo ☐ _____ (Taja)	WALLOT
12	Je sakafu ya nyumba unayoishi imetengenezwa kwa kutumia nini? *(Weka alama √ katika kisanduku husika)*	1. Udongo ☐ 2. Mianzi/nyasi ☐ 3. Vigae ☐ 4. Simenti ☐ 5. Carpet ☐ 6. Nyinginezo, ☐ _____ (Taja)	FLOROT
13	Je kaya yenu inamiliki wanyama wa kufugwa? *(Weka alama √ katika kisanduku husika)*	1. Ndio ☐ 2. Hapana ☐	LIVSTOC
14	Je kuna mwanakaya yeyote katika kaya yenu anamiliki ardhi ya kilimo? *(Weka alama √ katika kisanduku husika)*	1. Ndio ☐ 2. Hapana ☐	LAND

15	Je kaya yako ina vitu vifuatavyo? *(Weka alama √ mbele ya jibu sahihi)*	Item	1.Ndio	2.Hap	
15.1		1. Umeme			ELEC
15.2		2. Radio			RADIO
15.3		3. Television			TV
15.4		4. Jokofu			FRIDGE
15.5		5. Pasi ya umeme			IRON
15.6		6. Baiskeli/pikipiki/bajaji			BIKE
15.7		7. Gari			CAR
16.	Kaya yenu inatumia choo cha aina gani? *(Weka alama √ katika kisanduku husika)*	1. Cha kukaa na kuflush ☐ 2. Cha kuchuchumaa na kuflush ☐ 3. Cha shimo ☐ 4. Hakuna choo ☐ 5. Nyinginezo, ☐ _____ (Taja)			TOILET
17.	Je kwa kawaida, kaya yako inakula milo mingapi kwa siku?	Idadi_____			NMEAL
	Sehemu B: Taarifa za uzazi na ujauzito *Kwa sasa nitakuuliza taarifa zako za uzazi*				
18	Je umeshawahi kujifungua mtoto/watoto? *(Weka alama √ mbele ya jibu sahihi)* *Kama jibu ni hapana nenda swali no. 23*		1.Ndio	2.Hapana	BIRTH

19	Je umejifungua mara ngapi ukijumlisha na ujauzito uliotoka(kama upo) wa zaidi ya miezi saba.	Idadi _____			NBIRTH
20	Je umeshawahi kujifungua mtoto mwenye kichwa/mgongo wazi? *(Weka alama √ mbele ya jibu sahihi)*		1.Ndio	2.Hapana	NTDBABY
21	Je umeshawahi kuharibikiwa na mimba? *(Weka alama √ mbele ya jibu sahihi)*		1.Ndio	2.Hapana	ABORT
22	Je ulipanga huu ujauzito na mume/mpenzi/mhudumu wa afya? *(Weka alama √ mbele ya jibu sahihi)*		1.Ndio	2.Hapana	PLANN
Sehemu C: Uelewa kuhusu matumizi ya folic acid Kwa sasa nitakuuliza kuhusiana na matumizi ya folic acid					
23	Umeishawahi kuisikia folic acid? *(Weka alama √ mbele ya jibu sahihi)*		1.Ndio	2.Hapana	KNOWFA

24	Je ulipata wapi taarifa kuhusu folic acid? *(Weka alama √ katia kisanduku husika)*	1. TV ☐ 2. Redio ☐ 3. Gazeti ☐ 4. Majarida ☐ 5. Doctor/nurse ☐ 6. Rafiki ☐ 7. Vipeperushi ☐ 8. Shule ☐	TV RADIO NPAPER MAG DOCTOR FRND BROCH SCHOOL
25	Je unafahamu folic acid ni nini? *(Weka alama √ katia kisanduku husika)*	1. Vitamin ☐ 2. 2.Chanjo ☐ 3. 3.Sindano ☐ 4. Drip ☐ 5. Madini	VITAMIN VACCINE INJECT DRIP MIN
26	Unadhani ni wakati gani sahihi wa kuanza kutumia vidonge vya folic acid? *(Weka alama √ katia kisanduku husika)*	1. Kabla ya ujauzito ☐ 2. Wakati wa ujauzito ☐	BEFORE DURING
27	Kati ya magonjwa haya, ni upi unazuiwa kwa kutumia folic acid? *(Weka alama √ katia kisanduku husika)*	1. Kisukari ☐ 2. Cancer ☐ 3. TB ☐ 4. Kichwa/m gongo wazi ☐ 5. Mengineyo (taja)	DM CANCER TB NTDs OTHERS

28	Je ulitumia vidonge vya folic acid mwezi 1-3 kabla ya kuwa mjamzito? *(Weka alama √ mbele ya jibu sahihi)*		1.Ndio	2. Hapana	PREPREG
29	Ulikuwa unamezaje vidonge vya folic acid kabla ya kuwa mjamzito? *(Weka alama √ katia kisanduku husika)*	1. Mara moja kwa wiki 2. Mara 2-3 kwa wiki 3. Kila siku	☐ ☐ ☐		WEEKLY TWOWK DAILY
30	Je ulitumia vidonge vya folic acid kuanzia mwezi 1-3 katika huu ujauzito? *(Weka alama √ mbele ya jibu sahihi)*		1.Ndio	2.Hapana	TRIONE
31	Unamezaje vidonge vya folic acid kwa sasa? *(Weka alama √ katia kisanduku husika)*	1. Mara moja kwa wiki 2. Mara 2-3 kwa wiki 3. Kila siku	☐ ☐ ☐		WEEKLY TWOWK DAILY
32	Vyakula gani kati ya vifuatavyo vina virutubisho vya folic acid kwa wingi? *(Weka alama √ mbele ya jibu sahihi)*	Chakula	Ndio	Hapana	
32.1 32.2 32.3 32.4		1. Mboga za majani za kijani			GREVEG VEG

32.5 32.6 32.7 32.8 32.9		2. Mboga za majani kwa ujumla			LIVER MEAT MILK
		3. Maini			
		4. Nyama(isipokuwa maini)			
		5. Maziwa na mazao yake			GRAINS LEGUME
		6. Nafaka			
		7. Jamii ya mikunde kunde			CITFRUT FRUITS
		8. Matunda(jamii ya machungwa)			
		9. Matunda(isipokuwa jamii ya machungwa)			
Sehemu D: Huduma zitolewazo na kituo cha afya					
33	Je ulifanya hudhurio la kwanza kliniki ya ujauzito huu ukiwa na miezi mingapi? *(Weka alama √ katika kisanduku husika)*	1. Mwezi 1-3 ☐ 2. Baada ya miezi 3 ☐			EARLY LATE

34	Umehudhuria mara ngapi kliniki ya ujauzito hadi sasa? *(Weka alama √ katika kisanduku husika)*	1. Moja 2. Mbili 3. Tatu 4. Nne 5. Zaidi ya mara 4	☐ ☐ ☐ ☐ ☐		ONCE TWICE THRICE FOURTH MANY
35	Je umeshawahi kupata huduma hizi wakati wa kuhudhuria kwako kliniki ya ujauzito? *(Weka alama √ mbele ya jibu sahihi)*	Huduma	1.Ndio	2.Hapana	
		1. Kupimwa damu			BLOOD
		2. Kupimwa uzito			WEIGHT
		3. Kupimwa tumbo			ABDMN
		4. Kupimwa urefu			HEIGHT
		5. Kupimwa mapigo ya moyo (BP)			

		6. Kuambiwa tarehe ya matazamio ya kujifungua			BP
		7. Kupewa elimu ya afya ya uzazi na maandalizi ya kujifungua.			EDD HEDU
36	Unapata wapi vidonge vya folic acid unavyotumia na kwa gharama gani? *(Weka alama √ katika kisanduku husika)*	1. Bure kliniki ya ujauzito 2. Kununua kliniki ya ujauzito 3. Kununua duka la dawa	☐ ☐ ☐		FREE BUYA NC BUYS TO
37	Je kuna sababu yoyote inayokufanya usitumie vidonge vya folic acid? *(Weka alama √ mbele ya jibu sahihi)*		Ndio	Hapana	
		1. Havipatikani kliniki			
		2. Vinauzwa ghali dukani			ABSE NT
		3. Sio vizuri kwa ujauzito			

		4. Vina madhara/maudhi madogo madogo			COST NGOOD SEFECT TABOOS
		5. Imani yangu inakataza kuvitumia			

Appendix 2A: Informed consent - 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 Dr. Chacha Emmanuel from Muhimbili University of Health and Allied Sciences, Dar es Salaam. We are carrying out a study regarding determinants of IFA supplements use among pregnant women in Rufiji district council, Pwani - Tanzania.

Purpose of the study

The purpose of this study is to collect information on the factors that influence the use of Iron and Folic Acid supplements among pregnant women in Rufiji district. 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 interviews in order to obtain the intended information regarding uptake of iron and folic acid supplements in Rufiji district council, Pwani - Tanzania

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 pregnant women 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 your personal particulars and those regarding the use of iron and folic acid. 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 withdrawal 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 of factors that influence use of iron and folic acid in Rufiji district. Communication of the findings to policymakers in the council and ministry of health for improvement of strategies aiming to increase the use of these supplements 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 **Dr. Chacha Emmanuel,** Muhimbili University of Health and Allied Sciences, P.O.Box 65001, Dar es Salaam) Tel: 0789377433. If you ever have questions about your rights as a participant, you may call Dr. Bruno Sunguya, Director of Research and Publicatiins and Chairperson of the Senate Research and Publications Committee, P.O. Box 65001, Dar es Salaam.

Signature:

Do you agree?

Participant agrees …… The 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 _____

Appendix 2B: Informed consent, Swahili version

CHUO KIKUU CHA AFYA NA SAYANSI YA TIBA CHA MUHIMBILI KURUGENZI YA UTAFITI NA UCHAPISHAJI

FOMU YA RIDHAA ID-NO _____

Ridhaa ya Kushiriki

Hujambo? Ninaitwa Dr. Chacha Emmanuel. Ninafanya kazi ya kutafiti visababishi vinavyochangia katika matumizi ya vidonge vya folic acid kwa akina mama wajawazito katika halmashauri ya wilaya ya Rufiji, Mkoani Pwani – Tanzania.

Nini kinahitajika ili kushiriki

Ili kushiriki katika utafiti huu inabidi kukubali na kujiunga kwa kujibu maswali toka kwenye dodoso kwa ajili ya utafiti huu.

Usiri

Ninakuhakikishia kuwa taarifa zitakazokusanywa kutoka kwako kupitia dodoso hili zitakua siri na hakuna mtu yeyote ambaye hafanyi kazi kwenye utafiti huu atakayeambiwa ulichosema. Itaandaliwa tarifa ya utafiti huu ambayo haitamtaja mshiriki yeyote. Jina lako wala utambulisho mwingine wowote hautawekwa kwenye taarifa unazozitoa. Taarifa zako zitaingizwa kwenye ngamizi kwa kutumia namba za utambulisho.

Hatari

Hakuna hatari yoyote itakayotokea kwako kutokana na ushiriki wako kwenye utafiti huu

Haki ya kujitoa

Ushiriki katika utafiti huu ni hiari. Kutokushiriki au kujitoa kutoka kwenye utafiti hakutakuwa na adhabu yeyote na hutapoteza stahili zako endapo utaona ni vyema kufanya hivyo.

Faida

Kama utakubali kushiriki kwenye utafiti huu itakuwa ni vyema kwa kuwa utafiti huu una lengo la kubaini visababishi vinavyochangia kupungua kwa matumizi ya vidonge vya folic acid kwa akina mama wajawazito wilayani Rufiji. Matokeo ya utafiti huu yatawasilishwa kwa viongozi wa afya katika ngazi ya wilaya na Taifa na yatasaidia kuboresha mkakati wa kuongeza matumizi ya vidonge hivi muhimu kwa akina mama wajawazito.

Endapo utapata madhara au la

Hatutegemei utapata madhara yoyote kutokana na ushiriki wako katika utafiti huu.

Nani wa kuwasiliana nae

Kama una swali kuhusiana na utafiti huu itakubidi kuwasiliana na mtafiti mkuu Dr. Chacha Emmanuel, Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S.L.P. 65001 DSM. Simu (Tel: 0789377433). Kama una maswali zaidi unaweza kuwasiliana na Dr. Bruno Sunguya, Mkurugenzi wa Utafiti na Machapisho na Mwenyekiti wa seneti ya utafiti na kamati ya machapisho, S.L.P. 65001, Dar es Salaam.

Je, Umekubali?

Mshiriki amekubali…… Mshiriki hajakubali……

Mimi .....nimesoma maelezo ya fomu hii,

Maswali yangu yamejibiwa na nimeridhika.Nakubali kushiriki katika utafiti huu.

Sahihi ya Mshiriki……

Sahihi ya mtafiti msaidizi……

Tarehe ya kutia sahihi ya kushiriki……

Appendix 3A: Ethical clearance

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

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Ref. No. DA.287/298/01A/ 30th January, 2020

Mr. Nyamegi, Chacha Emmanuel
MSc. Applied Epidemiology,
School of Public Health and Social Sciences,
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED "DETERMINANTS OF IRON-ACID SUPPLEMENTS USE BY PREGNANT WOMEN ATTENDING ANTENATAL CLINICS IN RUFIJI DISTRICT COUNCIL."

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 **30th January, 2020 to 29th January, 2021.** In case you do not complete data analysis and dissertation report writing by **29th January, 2021,** you will have to apply for renewal of ethical clearance prior to the expiry date.

Dr. Emmanuel Balandya
ACTING: DIRECTOR OF POSTGRADUATE STUDIES

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