ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCE

SCHOOL OF PUBLIC HEALTH

PREDICTORS OF FOLIC ACID SUPPLEMENT USAGE FOR PREVENTING NEURAL TUBE DEFECTS AMONG WOMEN FOLLOWING ANTENATAL CARE USING HEALTH BELIEF MODEL CONSTRUCTES IN MEKELLE, TIGRAY, ETHIOPIA

A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES SCHOOL OF PUBLIC HEALTH IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR DEGREE OF MASTERS OF PUBLIC HEALTH

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APPROVED BY THE BOARD OF EXAMINERS

This thesis by Asqual Gebreslassie (BSc) is accepted in its present form by the board of examiners as a----------thesis requirement for the Degree of Masters in Public Health.

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ACRONYM AND ABBREVIATIONS

NTD	Neural Tube Defects
WHO	World Health Organization
UNICEF	United Nation Children's Fund
CDC	Communicable Disease Control
SPSS	Statistical Package for Social Science
OR	Odds Ratio
ANC	Antenatal Care
HBM	Health Belief Model
EDHS	Ethiopian Demographic Health Survey
IEC	Information, Education and Communication
MOH	Ministry of Health
GH	General Hospital
RH	Referral Hospital
HC	Health Center

ABSTRACT

Background: Neural tube defects mostly happened in the first 28 days of pregnancy. In our country especially in the study area the prevalence is increasing which is 131 per 10,000 births and causes more of morbidity and mortality. But It's known that around 72% of neural tube defects are preventable by taking adequate amount of folic acid. But in our country the practice of folic acid supplementation at preconception period is very low which is 1.92%. So, it needs further improvement and identifying the factors because low utilization of folic acid supplement mainly contributes for the development of neural tube defects

Objective: To assess the factors associated with folic acid supplement usage among pregnant women following antenatal care using health belief model constructs in public health facilities of Mekelle, Tigray, Ethiopia in 2019**.**

Method: An institutional based cross-sectional study design was conducted in selected public health facilities. The total number of study participants were 727. A Pre-tested interviewer administered questioner were used to retrieve data on socio demographic factors, knowledge and the health belief model constructs from the mothers who selected by systematic sampling. Descriptive statistics, bivariate and multivariable logistic regression analysis was done to see the association between the predictor and outcome variables. Variables which had P< 0.25 were fitted to the final model and variables with P<0.05 were declared as the variables independently associated with folic acid supplement usage.

Results: The practice of folic acid supplement was 30/670 (4.5%). Only 7(15.5%) knew the timing of folic acid intake. Having history of born child with NTD (AOR=0.091;95%CI 0.16,0.499), ever talking about folic acid with doctor, nutritionist, nurse, midwife and friends (AOR=0.051; 95%CI 0.005,0.482) and perceived threat (AOR= 1.12; 95% CI 1.008,2.002) were significantly associated with folic acid supplement usage

Conclusion and recommendation: This study revealed that knowledge and practice towards folic acid is very low. Strategies that increase knowledge and awareness toward neural tube defect prevention should be developed and incorporated at different level of the health care system.

1. INTRODUCTION

1.1 Background

Folate (vitamin B9) is an essential element that is required for DNA replication and for a range of enzymatic reactions involved in amino acid synthesis and vitamin metabolism. Demands for folate increase during pregnancy because it is also required for growth and development of the fetus. Folate deficiency has been associated with abnormalities in both mothers (anemia, peripheral neuropathy) and fetuses (congenital abnormalities). Dietary intake or supplementation with folic acid around the time of conception has long been known to reduce the risk of neural tube defects (NTDs) in the offspring (1, 2).

Around 50-72% neural tube defects are preventable if women are supplemented with folic acid and have normal serum folate level during pregnancy (2), center for diseases prevention and control and WHO recommends that all pregnant mothers who have not previous history of a child born with NTD should take 400µg of folic acid supplement starting at preconception to the end first trimester of pregnancy to achieve at least 72% reduction in the probability of having a child with NTD. And it claims that around 95% of pregnancies occur from the mothers who don't have family history of NTDs. So, all mothers capable of becoming pregnant should consume 400 µg of folic acid daily for further prevention of NTDs. For the mothers who have a previous pregnancy affected by NTD should take 4000µg of folic acid supplements because the risk of getting a second pregnancy with NTD is around 2% to 3% higher than the mothers who didn't have history of pregnancy affected by NTD(3, 4), over all achieving RDA of 400µg for adults, 600µg for pregnant mother is important for capable of preventing NTDs(5).

In our country Ethiopia shows that around 74.6% of mothers have low awareness on the benefits of folic acid supplementation, 48.4% took it during pregnancy and 1.92% at preconception period (6, 7), in Ethiopian context while the government is hardly tried to have universal access of iron/folate for all pregnant mothers for preventing anemia during pregnancy low attention is given for the timing and intake of pure folic acid supplementation for preventing neural tube defects (8).

Now a day's In Ethiopia the prevalence of congenital anomalies especially neural tube defects is increasing 13 per 1000 births and mothers are poorly supplemented with folate (7, 9),if we think that they can have it from food, comparing to that of synthetic folate natural folate is only

50% bioavailable and losses during cooking (mainly for animal sources) and harvesting. In this case to get enough folate from natural foods they should have to eat in excess amount(10), as study done in Gojjam indicated that around 53% of mothers are categorized in the lowest dietary diversity score (11), in addition, as study conducted in Gambella indicates that around 42.5% of mothers are from food insecure household and their food diversity score is 6 food groups out of 14 food groups and because of those factors most of the pregnant women are undernourished which is around 28.2% (12), per the studies done Gambella and Gojjam let alone to eat in excess, they didn't even have secured food access and a good diet habit with more diversified food and foods that contain high folate in nature (8, 11, 12), as we can understand folic acid supplement intake before pregnancy is low and our goal is to increase intake so, the main aim of this study was to identify the factors associated with folic acid supplement intake for preventing neural tube defects among women following ANC using health belief model constructs in public health facilities of Mekelle, Tigray, Ethiopia.

1.2: Statement of the problem

As the research study conducted in different western countries indicates that the practice of folic acid supplement intake ranges from 16.7% to 55.5%. The minimum practice was in Norway and the maximum in Netherland(13, 14).

In Asian countries folic acid supplement intake was studied as 46.8% in Saudi Arabia, 26.5% in Korea, 24.9% in Vietnam and 14.4% in china(15-18), in African countries like Sudan, Egypt and Nigeria the practice was low compared to Asian and westerns which is 3.2%, 3.6% and 7.4% respectively(19-21), the same to that of African countries in spite of increasing neural tube defects the practice of folic acid supplement is very low compared to that of Asian, American and European countries which is 1.92% in Ethiopia also(7), in addition to that according to Ethiopian national micronutrient survey report of the 1647 pregnant women for whom RBC folate concentrations were measured; 32% of women were folate deficient according to the WHO criteria (<340 nmol/L) and they are folate insufficient for the prevention of neural tube defects. And deficiency was highest in Harari, Afar, Somali, Benishangul Gumuz and tigray regions compared to women from other regions. And from 1647 non-pregnant women whose serum folate concentrations were measured, 17.3% of women exhibited folate deficiency as per the WHO classification <6.8 nmol/l. And serum folate deficiency was higher in Somali followed by Harari and Afar region compared with women in other regions of the country(22), this low practice of folic acid is directly associated with the low serum level of folate and low serum level of folate with increasing NTDs, as it is experimentally proved that around 72% of neural tube defects are preventable if the mother takes folic acid supplement starting at least one moth of preconception time to end first trimester of pregnancy time(2), as the research study conducted in central and North West Ethiopia on the magnitude of congenital anomalies has indicated that NTD is the second cause of mortality, following orofacial, and accounts for 30.8% prevalence(23), a study done in Addis Ababa has also shown NTDs such as myelomeningocele and with meningocele type are the top diagnosed among cases that operated for neurosurgical disease(24),what is more, recent studies conducted in different region of the country indicate the prevalence and burden of NTDs have been increasing like in this paper research area, Tigray Regional State, the prevalence of NTDs was found to be 131 per 10,000 births (195 cases /14903) ranges from

(304 per 10,000 live and stillbirths) in southern to (174 per 10,000 live and stillbirths) in Eastern Zone of Tigray(9), these numbers found to be higher when we compare with the prevalence rate from systematic review of eight African countries of member states of WHO(25), and also, the overall prevalence in Tigray Regional State is higher than in Addis Ababa City; 131/10,000 and 126/10,000 births, respectively(26), the leading factor like folate deficiency, nutritional factor of the mothers like; eating low diversified foods, age, previous history of still birth, using oral contraceptives, residency, birth order greater than three and hypothermic exposure are associated with the development of NTDS(5, 11, 27-29).

Medical costs for a child born with NTD is much more compared to a child born without NTDs. When we see annual age specific costs of a baby born with NTDs and without NTDs from the literature review of 24 articles on the cost evaluation of a baby who born with NTD and evaluation on the prevention with folic acid, indicates that infants with age less than 1 year the annual treatment cost of a baby with NTD is 48810$ higher when we compare with healthy baby of the same age. For the age groups of 1-17, 18-44 and 45-64 years it is estimated that 10573 $, 10320 $and10323 $ extra cost expenses will be there if the child is born with NTDS. And as the cost benefit ratio analysis of USA, Chile and South Africa shows the economic benefit of preventing NTDs by fortification is much more than the direct cost invested for the fortification process. In other words, this article indicates that the total cost invested for prevention of NTDs by fortification is low than its cure once if it already happens. So, acting on the preventing strategies or activities is better here(30), even WHO develop guidelines on pre-pregnancy and pregnancy folic acid supplementation the practice is still low in our country compared to other western, Europe and Asian countries (42). And there are no more studies conducted to identify the factors associated with low folic acid supplement intake using health belief model as this model help as more on explaining the mothers belief towards that recommended healthy behavior (taking folic acid supplement) and their understanding on folic acid and neural tube defects by determining their level of knowledge towards folic acid and neural tube defects.

1.3: Significance

The incidence of NTDs is increased in our country. But since many organizations such as WHO, UNICEF and CDC been long time working on prevention and control of NTDs by advocating strategies in both developed and developing countries now a days there are new beginnings on the prevention strategies, Such as folic acid supplementation in Ethiopia. As study done in Adama shows that the practice of folic acid supplement intake is very low(7), and it is known that NTD is preventable by maintaining adequate serum folate level. So, it will be more helpful to know the predictors factors of folic acid supplement usage as it is important to tackle with the factors in order to achieve the desirable level of preventing NTDs by supplementing folic acid. Also, this study will be used as one input to influence the national policy makers to revise the guidelines on prevention of NTDs, by targeting to change behaviors of mothers towards folic acid supplement. In addition, since the model will help us to determine the level of knowledge towards folic acid supplement usage, neural tube defects, to identify the mother's perception of susceptibility, severity towards neural tube defects and mothers perception of benefit, barrier, cues to action and self-efficacy it will be more helpful to intervene by preparing more specific educational campaigns to raise knowledge and awareness towards NTD and folic acid.

1.4: Research question

1. Is knowledge towards folic acid supplement intake and neural tube defects increase the tendency of taking folic acid supplement at periconceptional time
2. Is perception towards folic acid supplement intake and neural tube defects increase the tendency of taking folic acid supplement at periconceptional time

2. LITERATURE REVIEW

2.1: Neural tube defects

Neural tube defects are a group of birth defects of brain, spine and spinal cord. It happens mostly in the first one month of pregnancy often before a woman knows that she is pregnant when the neural tube does not close completely. The most common types of NTDS are spinal bifida, encephalocele and anencephaly(31).

Worldwide according to WHO 2017, report more than 303,000 babies are born with NTD resulting in around 88,000 deaths and 8.6 million lifelong disabilities. As morbidity and mortality from infectious diseases are decreasing worldwide, the contribution of birth defects to under-5 morbidity and mortality are continued to increase proportionally(32).

When we come to our country Ethiopia the overall prevalence of NTD after 12 weeks of pregnancy is 126 per 10,000 births and among live birth and still birth excluding medically terminated cases it was 63.4 per 10,000 births which is greater than the median prevalence studied in 8 of African countries like Nigeria, Algeria, Ghana, South Africa, Egypt and Cameroon(25, 26).

The prevalence of NTD is decreased in developed and some of developing countries like USA, Canada and china because of some interventions like flour fortification with folic acid and by increased intake of folic acid before pregnancy and at the prenatal period(33), as study done in US women showed that the risk of NTDs among all US women dropped considerably from a pre-fortification estimated 35.9 NTDs per 10 000 births to a post-fortification 14.6 NTDs per 10 000 births(34), The Same in Canada the NTD reduction was from 1.58% to 0.86%, 46% reduction in between 1998 to 2000. And a study conducted in China revealed that when there is an adequate folic acid in the mother's blood at the time of conception, the expected achievable prevention of spinal bifida and anencephaly is approximately 5 to 6 per 10,000 births(35).

In Africa because of lack of surveillance system in most of the countries the prevalence of neural tube defects is not clearly known in general to show the trend but as study done in Sudan show that still NTD is the long-life disability and morbidity of infants with prevalence of 2.8 per 1000 births(36), the same thing in Kano, north west Nigeria the prevalence is 2.75 per 1000live births and it shows that this is high prevalence compared to countries start fortification such as south Africa, and other developed countries with approximate prevalence

of 0.98 per 1000birthes(37), when we come to our country Ethiopia neural tube defects are the second most birth defects followed orofacial defects and accounts for 30.8% of all defects(26), as current study done in Addis Ababa shows the overall prevalence of neural tube defects is 126 per 10,000 births and among the cases anencephaly is the most common one followed by spinal bifida and encephalocele(23).

2.2: knowledge, practice and associated factors of folic acid supplementation

Folate is a B vitamin which is essential to the normal development and functioning of the human body. The terms folate and folic acid are often used interchangeably; however, they have important differences. Folate is the natural form found in naturally occurring foods such as green leafy vegetables, asparagus, liver and beans. Folic acid is the synthetic form of the vitamin. Folic acid is the form found in food supplements (either as folic acid alone or as part of a multi-nutrient complex) and the form added to fortified foods(38).

As many studies indicated that maintaining adequate folate blood level by consuming high folate diet either from fortified or natural foods and by supplementation of folic acid at preconception time and throughout the first 4 months of pregnancies is an effective way in preventing neural tube defects. Many experimental trial studies performed in 1991 proved that supplementation of folic acid decreased recurrence of neural tube defects by 72% with RR of 0.28(2), a case control study done In Bangladesh, Iran and Algeria shows that mothers who take folic acid at prenatal period have a low risk of the outcome(28, 29, 39).

In our country Ethiopia as the report of 2014 on women feeding practices indicate that, also diet habit of mothers do not change during pregnancy in terms of frequency, quantity and quality, and most of the pregnant mothers have not clear information on the formula of diversified food intake(40),This result is inconsistent with the study done in Malaysia where most of pregnant mothers take foods like protein, carbohydrate, vit B1, vit B2, Niacin, folate, vit B12, phosphorous and zinc, higher than RDA. Whereas, intakes of some other nutrients like fiber, magnesium, potassium were lower than RDA. But, in our country neither of them is achieved(41).

When we come to the preconception folic acid supplementation knowledge, practice and associated factors; as study done in Croatia, Europe on total sample of 603 women indicates that around 47. 6% of them are not aware on what folic acid mean is and when it should be taken(42), Awareness of mothers in this is low when we compare with the study done Carolina, USA which indicates around 77% of women are aware of folic acid benefits and timing of intake by reading, and hearing from their doctors and other health care providers(43), This study is consistent with the study done in Korea in which around 65.6% have good knowledge on folic acid benefit(16).When we come to the practice of folic acid supplement intake around 21.1% of women in Croatia, 20.3 of women in Qatar, 23.4 in New Zealand, 23.5 in Italy take folic acid at preconception time. This result is found to be lower when we compare to that of Korean and Carolina, American women in which around 26.5% and 26% took folic acid supplement respectively and found to be very lower when we compare with the study done in Netherlands and Saudi Arabia around 55.5% and 46.8% of the women took folic acid at the preconception time respectively(13, 16, 42-44).

But in African countries even the proportion of mothers who have good knowledge on folic acid is not much lower than those of developed countries, but those who take it at preconception time are very low as compared to most of European and American courtiers. As study done in Nigeria indicates that around 64.6% (351/543) reported mothers were aware of folic acid as a vitamin supplement. However, only 7.4% (26/351) consistently took the vitamin during the protective periconceptional period. The common sources of information about folic acid were health workers (68.5%) and the media (14.6%). Only 26.5% (93/351) of them could correctly identify a natural source of food rich in folic acid(21), The same to this study as study done in Sudan indicates 80% of respondents had heard of folic acid and from those College-educated women (92.2%) knew more about folic acid and used it more often in the pre-conceptual period (8.3%). Doctors were the commonest source of information on folic acid (62%). Fewer subjects (8.9%) knew that it prevented birth defects, and 33.8% of subjects knew that green leafy vegetables are a source of folic acid. Of all subjects, only 3.2% use it periconceptually (19), and the same to those above two studies as study done in Egypt indicates that (62.4%) had heard of folic acid, 39.2% knew the role of folic acid on preventing congenital anomalies and (12%) of women knew that it is important to take folic acid at preconception period. For those women who

heard about folic acid the major source of information were physicians accounted for (92%). But the practice is still low which is (8.8%)(45),when we come to our country Ethiopia as study done in Adama indicates that there are only 1.92% of women took the supplement at a protective period against neural tube defects(7).

As studies indicated factors such as age, the early timing of antenatal registration, periconceptional consult, previous unsuccessful pregnancies, level of folic acid awareness, fear of side effects, high cost, having false impression that she got balanced diet from home foods, fear of any medication to take in pregnancy time, income, parity and educational status, marital states, having chronic disease and work status were significantly associated with folic acid supplement intake(7, 13, 19, 44-46).

As it can be seen from this even in developed countries the practice of taking folic acid at preconception period is low, so, more should be done to increase the awareness and knowledge of the mothers towards folic acid benefit to effectively prevent the disease and increasing folate intake of mothers.

2. 3. The Health Belief Model (HBM)

The HBM is one of the most widely used public health theoretical frameworks. It can explain health behavior modifications and function as the foundation for health education interventions(47), social psychologists developed the HBM during the 1950s to predict why individuals did not participate in preventive health behaviors such as immunizations(48), the model assumes a value expectancy approach, postulating that behavior depends upon the expected outcomes of an action and the value an individual place on those outcomes(48, 49), The HBM has six constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self-efficacy and cues to action(50), when we go detail to the constructs

Perceived Susceptibility: Perceived susceptibility refers to beliefs about the likelihood of getting a disease or condition. For instance, a woman must believe there is a possibility of getting a pregnancy affected with neural tube defect before she goes to the health facility and check for that(48).

Perceived Severity: Feelings about the seriousness of contracting an illness or of leaving it untreated include evaluations of both medical and clinical consequences (for example, death,

disability, and pain) and possible social consequences (such as effects of the conditions on work, family life, and social relations). The combination of susceptibility and severity has been labeled as perceived threat(48).

Perceived Benefits: Even if a person perceives personal susceptibility to a serious health condition (perceived threat), whether this perception leads to behavior change will be influenced by the person's beliefs regarding perceived benefits of the various available actions for reducing the disease threat. Other non-health-related perceptions, such as the financial savings related to quitting smoking or pleasing a family member by having a mammogram, may also influence behavioral decisions. Thus, individuals exhibiting optimal beliefs in susceptibility and severity are not expected to accept any recommended health action unless they also perceive the action as potentially beneficial by reducing the threat(47).

Perceived Barriers: it is potential negative aspects of a particular health action. Perceived barrier may act as impediments to undertaking recommended behaviors. A kind of non-conscious, cost-benefit analysis occurs wherein individuals weigh the actions expected benefits with perceived barriers "It could help me, but it may be expensive, have negative side effects, be unpleasant, inconvenient, or time-consuming." Thus, "combined levels of susceptibility and severity provide the energy or force to act and the perception of benefits (minus barriers) provide a preferred path of action"(48).

Cues to Action: These factors may be internal or external but these are the reminders that can trigger the actions. For example, for this title it may be the health professional who remind the mothers to eat high folate diet always to give birth for a healthy baby. Or it may be the mother themselves by watching some Advertisement on TV regarding to that of folate diet(48).

Self-Efficacy: Self-efficacy is defined as "the conviction that one can successfully execute the behavior required to produce the outcomes". Self-efficacy and outcome expectation seem to be similar but they are different. One person can build self-efficacy by adding all the positive outcomes that he accumulates. In 1988, Rosenstock, Strecher, and Becker suggested that self-efficacy be added to the HBM as a separate construct, while including original concepts of susceptibility, severity, benefits, and barriers(48-50).

Other Variables: Diverse demographic, socio-psychological and structural variables may influence perceptions and, thus, indirectly influence health-related behavior. For example, socio-demographic factors, particularly educational attainment, are believed to have an indirect effect on behavior by influencing the perception of susceptibility, severity, benefits, and barriers. Researchers have successfully applied the model's constructs to explaining a variety of preventive health behaviors, sick-role behaviors and clinic utilization behaviors (52), however, to date; the model has not been much more applied to predict folate consumption for the prevention of NTD.

2.4. **Conceptual frame work**

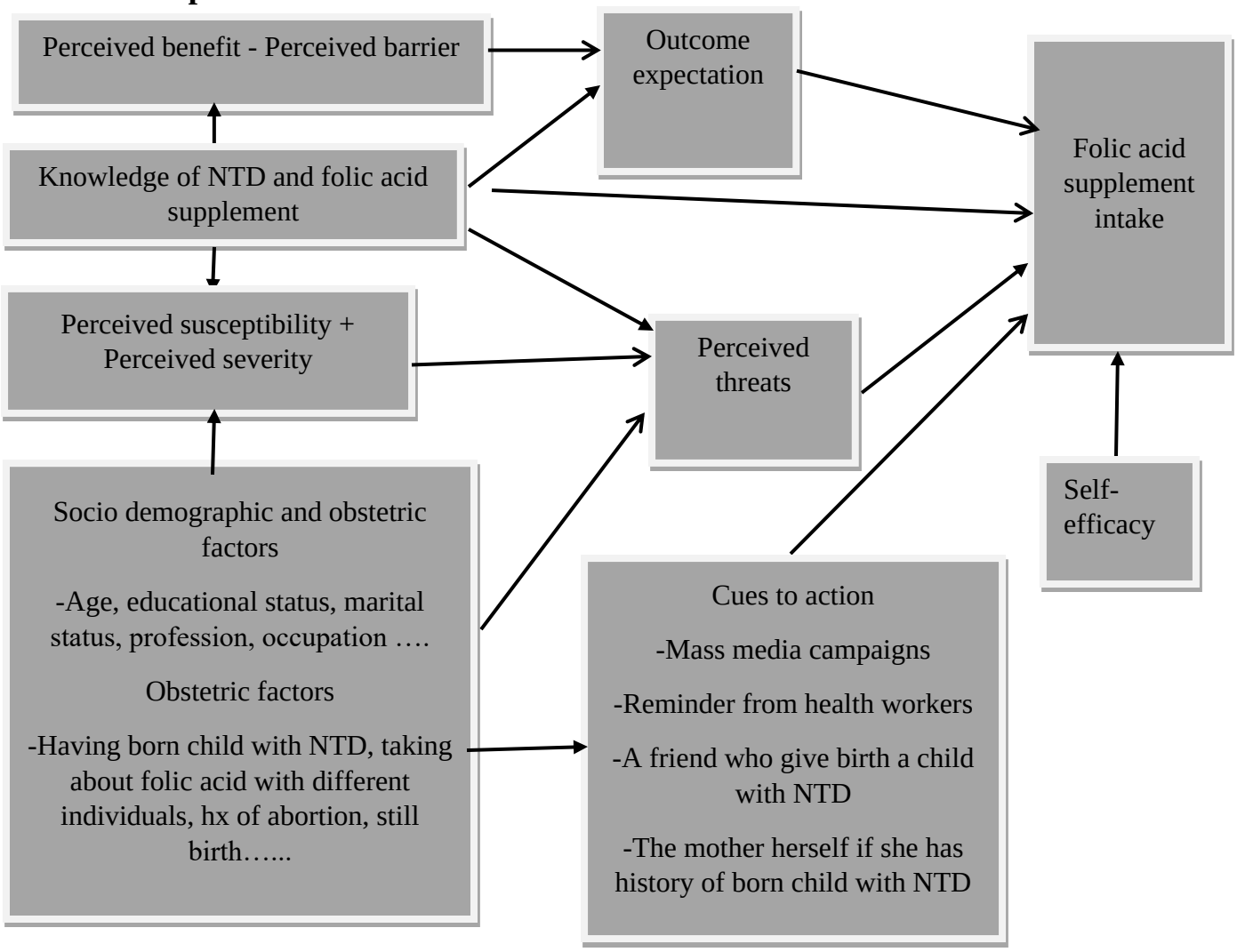

Figure 1. Conceptual frame work to assess factors associated with folic acid usage, and high folate diet among pregnant women based on the health belief model constructs developed from literatures.

3. OBJECTIVES

3.1. General objective

To assess factors associated with folic acid supplement usage for preventing neural tube defects among pregnant women using health belief model constructs in the selected public health facilities of Mekelle, Tigray, and Ethiopian 2018/19.

3.2 . Specific objective

1. To assess the level of knowledge towards folic acid supplement usage and neural tube defects.
2. To determine the magnitude of folic acid supplementation usage.
3. To assess the level of perception towards folic acid supplement and neural tube defects
4. To identify factors associated with folic acid supplement usage for preventing neural tube defects.

4 METHODS AND MATERIALS

4.1. Study area

This study was conducted in selected 4health centers, 1general hospitals and 1referral hospital; which are found in Mekelle zone, which is the capital city of Tigray regional state, found 780 km away from Addis Ababa the capital city of Ethiopia. Administratively Mekelle zone is divided into eight subs cites named as Hawelti, Adi haqi, Ayder, kedamay weyane, Hadnet, Quiha and Semien. It hosts for 423,175 total populations among those 208,931 and 214,241 are male and females respectively. Currently it has 8 health centers named Mekelle health center, Simien health center, Kasech health center, Qhuiha health center, Aynalem health center, Hawelti health center, Felegadoadha health center and Adishimidihun health center, 2 public general hospitals (Mekelle and Qhuiha) and 1 referral hospital named Ayder comprehensive specialized hospital.

4.2. Study period

The study was conducted from September 5, 2018 to July 5, 2019 GC.

4.3. Study design

Facility based cross sectional study design was conducted.

4.4. Population

4.4.1. Target population

All mothers who follow ANC in all health facilities of Mekelle city, Tigray, Ethiopia in 2018/2019.

4.4.2. Source population

All mothers who have ANC follow up in the selected health facilities of Mekelle, Tigray, Ethiopia.

4.4.3. Study population

All pregnant mothers who are available at the time of data collection.

4.4.3 Study unit

Individual pregnant mothers.

4.5. Eligibility criteria

4.5.1. Inclusion criteria

All pregnant mothers who have willing to participate and available at the time of data collection.

4.5.2. Exclusion criteria

Critically ill mothers.

4.6. Sample size calculation

For the first objective since there is no study that address this specific objective the sample size was calculated using single population proportion formula with the assumption of: population prevalence 50%, margin of error 5%, design effect 2, and by adding 10% non-response rate 853 total sample sizes is calculated.

$n=\frac{z2\ p(1-p)}{d2}=\frac{2*1.96^2 0.5(1-0.5)}{0.05^2}$ = 768 by adding 10% non-response rate 853

Since the source population is < 10,000 by using correction formula the final total sample size is 727

$N_{final}= (n)/ (1+\frac{n}{n})$

$=853/ (1+\frac{853}{4944}) = n_{final} =727$

For the second objective: here it is also calculated using single population proportion formula using:1.92% proportion of mothers who took folic acid at preventive period for neural tube defects, 5% margin of error, 95%CI, 10% non-response rate and design effect 2. Then a total of sample size of 64 was calculated. The same to that of the first outcome after using population correction formula a total of 64 sample size is calculated. So, we took the largest sample size of the first objective which is 727 for this research to conduct.

4.7. Sampling procedure

Since there are 8 health centers, 2general hospitals and one referral hospital in Mekelle city, first we select 6 health institutions by stratified random sampling method and this health facilities named as Qhuiha health center, Ayder comprehensive specialized referral hospital, Mekelle health center, Mekelle general hospital, Kasech health center and Aynalem health center are selected. During the data collection period mothers who selected by systematic sampling technique was included until the sample allocated to each health facility is reached. The k interval is calculating by dividing total sample size to total working days we get 16, after that we divided anticipated number of mothers in each health facility per month by 16 to get the k interval for all health facilities.

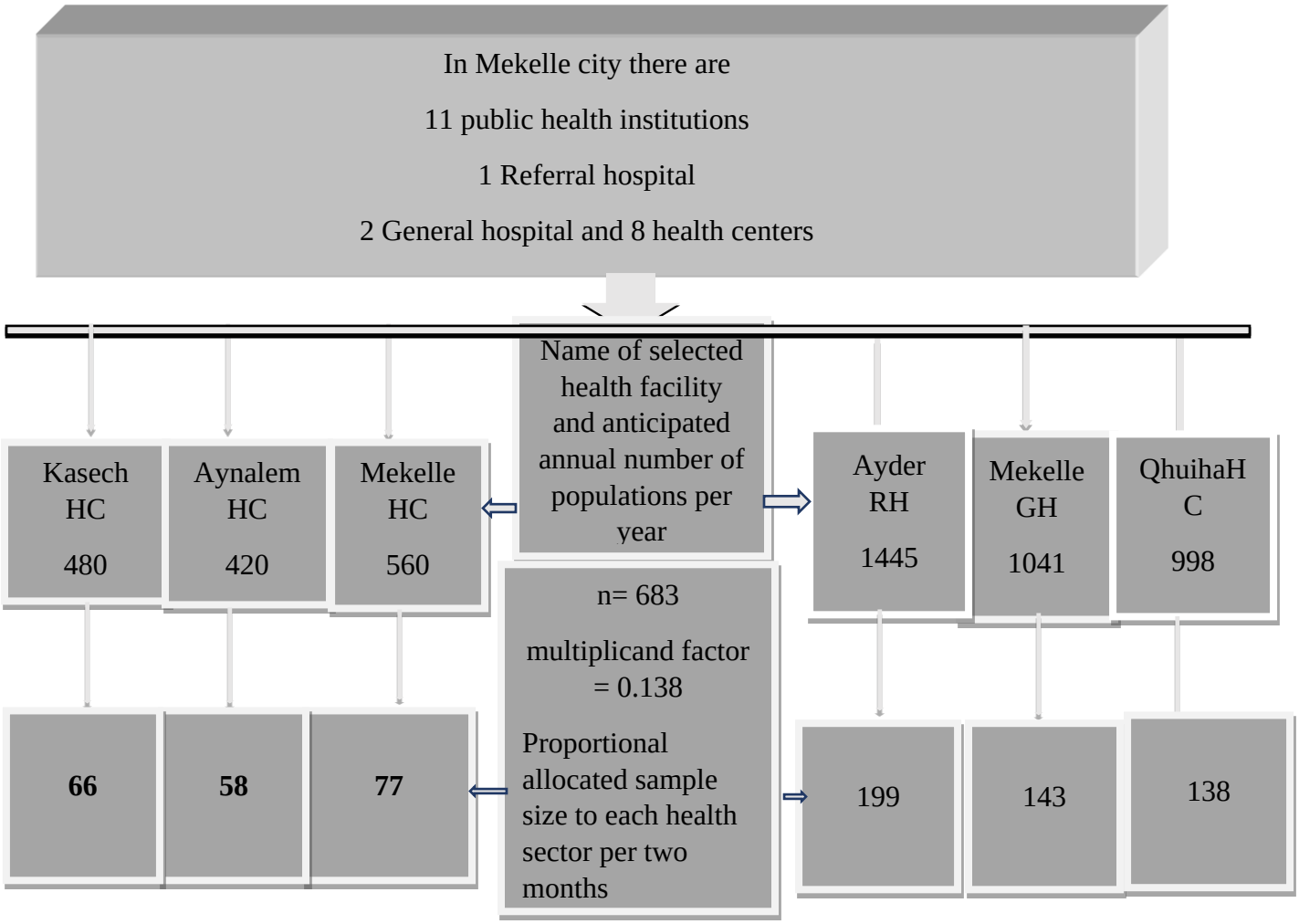

Figure 2. Schematic representation of sampling procedure of study facilities and participants in Mekelle, Tigray, Ethiopia 2019

4.8. Variables

4.8.1. Dependent variables

Folic acid supplement usage

4.8.2. Independent variables

Socio demographic characteristics like: Age**,** Marital status, History of born child with NTD educational level**,** occupation, profession, parity, history of abortion, still birth, residence, knowing someone who had a child with NTD before, ever talking about folic acid with doctor, nutritionist, midwife, nurse, and family, health facility type and Health belief model constructs; Knowledge, Perceived susceptibility, Perceived Severity, Perceived benefit, Perceived barrier, Self-efficacy and Cues to action

4.9: Data collection technique and procedures

An interviewer administered questionnaire prepared in English and Tigrigna language capturing socio-demographic characteristics, Knowledge and questions of the health belief model constructs developed from different literatures was used as data collection instrument for this study. The questionnaire consisted of 26 items of health belief model constructs and all items offered five response choices ranging from "strongly disagree (scores 1 point)" to "strongly agree (scores 5 points)" higher score indicated a positive attitude towards folic acid supplement usage. Susceptibility of neural tube defects consisted of three items scored from 3 to 15, seriousness of neural tube defects consisted of five items scored from 5 to 25, folic acid supplement usage benefit consisted of three items scored from3to15, Barriers of folic acid supplement usage consisted of three items scored from 3 to 15, Self-efficacy to take folic acid supplement usage consisted of two items scored from 2 to 10 and The cues to action internal or external factors, that trigger the action was consisted six items scored from 6 to 30. The knowledge and practice questions also consisted of 11 items with close and open-ended format. The questioner was pretested in 10% of the sample (72 in number) and in the pretest to make the questioner more practical for use with limited time the questioner was shortened from its original 62 items to 57 items considering conditions like; Reliability, acceptability and relevance of variables. The reliability coefficient for each subscale was calculated using Cronbach alpha.

The Cronbach alpha values obtained in our study before and after pretest were

1. Susceptibility to neural tube defect: 0.663 before to 0.663 after pretest
2. Severity of the disease: 0.984 before to 0.984 after pretest
3. Benefit of folic acid supplement: 0.959before to 0.959 after pretest
4. Barriers of folic acid supplement: 0.245 before to 0.596 after pretest
5. Self efficacy to take folic acid supplement: 0.926 before to 0.926 after pretest
6. Cues to action: 0.431 before to 0.781after pretest

The data was collected by midwifery health professionals who are not currently working at that specific selected health institution.

4.7. Operational definition

Practice of folic acid supplement intake: In this study in order to say one woman is taking folic acid she should have to take folic acid at least starting one month before pregnancy to the end of one month of pregnancy time and if she takes at least N-1 of the recommended pills.

Knowledge towards NTD and folic acid: For description purpose knowledge was assessed by questions focusing on the signs and prevention methods of neural tube defects and purpose, source, and timing of intake of folic acid supplement. Each response was scored 'yes' or 'no'. The scoring range of the questioner was 0 to 18. And by calculating the median of the total knowledge questions those who have scored below the median were considered to have less knowledge and those who have scored above the median considered as having more knowledge towards folic acid supplement and NTDs. But in model it is regressed as continues variable.

The HBM constructs: The perceived (susceptibility, severity, benefit, barrier), self-efficacy, cues to action were measured by items for each construct. The response was rated on a five Likert scale from strongly disagree to strongly agree. The response to the item in each construct was added to attain a composite score reflecting the level of each constructs and the Likert was dichotomize in to two level considered as agree and disagree. Based on that those who disagree were considered to have low perceived (susceptibility, severity, benefit, barrier), cues to action and self efficacy. Those who agree were considered to have high perceived (severity, susceptibility, benefit, barrier), cues to action and self efficacy. In this case also the constructs are regressed as continuous in the model.

4.10. Data quality control

Data quality was assured before, during and after data collection process.

Before start of data collection: first with the data collectors we discussed on the main aim of the study, the tool that we use for data collection and some of the consideration that we should have to take when we ask our participants for about two days. Then the questionnaire was pretested at Qhuiha general hospital and Adishumdhun health center. In the pretest we check for the reliability, acceptability, any logical sequence error, numbering, relevance of the variables, and missed or extra alternative choices if there are.

During data collection: Completeness, consistency & coding of the data was checked before proceeding to the next person to fill another questioner by the data collector themselves or by supervisor if he or she is available there.

After data collection: Non-overlapping numerical code were assigned for each question and the questioner were translated back to English then coded data was entered to EPI-DATA version 4.2. The data was cleaned using SPSS by running frequencies of each variable to check for the missing data and consistencies.

4.11 . Data Analysis procedures and management

All collected data was coded and entered to EPI-DATA version4.2 statistical software. Then it was analyzed using SPSS version 25 data analysis software. Using SPSS software descriptive, bivariate and multivariable logistic regression analysis was done.

First descriptive statistical analysis was done. The continuous variables were described using mean and SD whereas the categorical variables using frequency and percentage.

In the bivariate analysis each independent factors of folic acid supplementation usage were taken to see the association and all variables with p value of less than 0.25 was included in the multivariable logistic regression analysis. To all of the analysis the data was checked reliability for the HBM subscales using Cronbach's alpha as we described before.

4.12 . Ethical consideration

Ethical clearance was obtained from the institutional review board committee of Addis Ababa University School of Public Health (AAU/SPH) and again to proceed the work letter of cooperation was obtained from Tigray Health Bureau and medical director of health facilities.

4.13 . Dissemination of results

The final report of the study was submitted to the Addis Ababa University School of Public Health. The result will be presented during thesis defense, as a partial fulfillment of the degree of master of Public Health. Moreover, the findings of the study will be disseminated through publication in local and international journal

5. RESULTS

5.1. Socio demographic characteristics of mothers following antenatal care in public health facilities of Mekelle, Tigray, Ethiopia

A total of 727 study subjects where participated in this study and 670 included in the analysis. The mean age of the study participants where 27 (±5). The minimum and maximum age was 18 and 42 years respectively. The most reputable age was 25.

Concerning the educational status majority more than third of the respondents, 239(35.7%) were attended secondary school, followed by those who were completed diploma and above 195 (29.1%), 145 (21.6) were attended primary, 60 (9%) were technique/vocational and 31(4.6) unable to read and write. Coming to marital status, more than half 582 (86.9%) of the respondents were married, 65 (9.7) single, 20 (2.9) divorced, and 3(0.4%) were widowed. Almost all 603 (90%) of the participants were orthodox, followed by Muslim 64 (9.6%), then catholic 2 (0.3%) and protestant 1 (0.1%) by religion. Around 626 (93.4%) of the participants were living in urban were as 44(6.6%) living in rural regarding to the residence and 582 (92.5%) of the 629 participants who reported as urban dwellers were living for more than five years in the urban setting. Regarding to the profession of the participants 32 (4.8%) were having a profession related to health and almost all 636 (94.9%) were having a profession not related to health. From those who have a profession related to health only 9 (28.1%) were working on health institutions, 12 (37.5%) and 11 (34.4%) were working as house wife and at non health institutions respectively.

At last concerning to the occupation: Almost half of the participants 333 (49.7%) were house wife, followed by working at non health institution, 315 (46.9%) working at health institution.

Table 1: Socio-Demographic characteristics of mothers following antenatal care in public health facilities of Mekelle, Tigray, Ethiopia March10 to May8, 2019

Category		Frequency(n)	Percent (%)
Age	15-34	573	85.5
	34-49	97	14.5
Educational status	Diploma and above	195	29.1
	Tech/vocational	60	9
	Secondary	239	35.7
	Elementary	145	21.6
	Unable to read and write	31	4.6
Marital status	Single	65	9.7
	Married	582	86.9
	Divorced	15	2.2
	Widowed	3	0.4
Religion	Orthodox	603	90
	Muslim	64	9.6
	Catholic	2	0.3
	Protestant	1	0.1
Residence	Urban	626	93.4
	Rural	44	6.6
Profession	Health professionals	32	4.8
	Non health Professionals	636	94.9
Occupation	Housewife	333	49.7
	Working on health institution	22	3.2
	Working on non health institution	315	46.9
Health facility	Health center	201	30
	General hospital	281	41.9
	Referral hospital	194	29

5.2: Obstetric history of mothers following antenatal care in selected public health facilities of Mekelle, Tigray, Ethiopia

Coming to the obstetric history of the participants around half 313 (46.7%), of the mothers were multiparous, 195 (29.1) primiparous, 116(17.3%) nulliparous and 46(6.9%) grand multiparous. From 155(23.2%) of the participants who were having history of previous abortion, 8(5.2%) of them were induced type and 147 (94.8%) spontaneous. As the mother's complaint doctor says", it is not normal pregnancy" was the main reason for the induced type of abortion. Around 37(5.5%) of the mothers were having history of a child with neural tube defects among them 6(16.2%) were having previous history of still birth at the same time. Around 18(2.7%) were having a child with congenital anomaly except to that of neural tube defects and 168(25.1%) of the participants knew someone who had a baby with neural tube defect.

Table 2: Past obstetric history of mothers following antenatal care in public health facilities of Mekelle, Tigray, Ethiopia March10 to May8 ,2019

Category		Frequency	Percent
Previous hx of a child with NTD	Yes	37	5.5
	No	633	94.5
Hx Still birth	Yes	95	14.2
	No	574	85.8
Hx Abortion	Yes	155	23.2
	No	513	76.8
Congenital anomaly except to that of NTD	Yes	18	2.7
	No	652	97.3
Parity	Nulliparous	116	17.3
	Primiparous	195	29.1
	Multiparous	313	46.7

Table2: Past obstetric history of mothers following antenatal care in public health facilities of Mekelle, Tigray, Ethiopia March10 to May8 April ,2019

Category		Frequency	Percent
Parity continued	Grand multiparous	46	69
Knew someone who had a child with NTD	Yes	168	25.1
	No	502	74.9
Talk about folic acid with doctor, nutritionist, midwife, family and friend	Yes	69	10.3
	No	601	89.7

5.3: Knowledge and source of information towards neural tube defects

From 97 (14.4%) of mothers who said yes for the question do you knew something about neural tube defects only 40(41.2%) of them correctly mentioned the sign could a child have if he/she is born with neural tube defect, all of them mentioned that neural tube defect is not transmittable disease, 24(24.7%) of them knew that neural tube defect is hereditary disease, 80(82.5%) of them mentioned that neural tube defect is not curable disease, and 22(22.6) of them mentioned there is a probability that a mother could have a child with neural tube defect for the second time. More than half 50(51.5%) were mentioned that health professionals are the main source of information while 77(79.4%), 62(63.9%) and 47(48.5%) got information from family, friends, and multiple sources respectively.

But when we see the total sum knowledge score towards NTD, around 60/97(61.9%) and 37(38%) of mothers were having less and more knowledge towards NTD respectively.

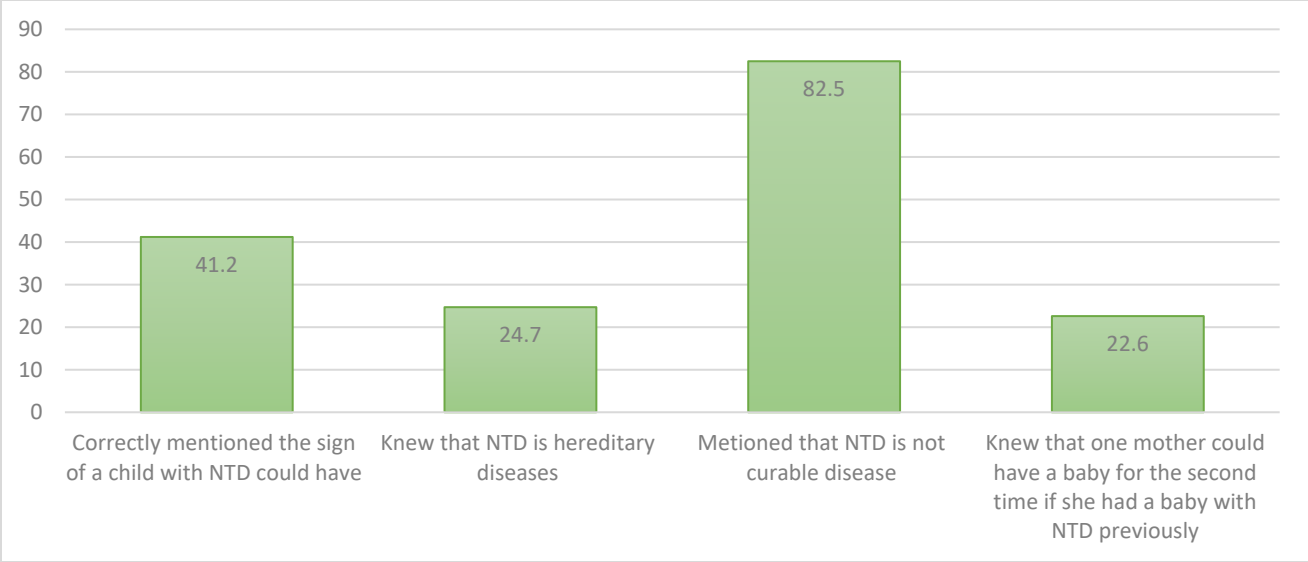

Figure 3: Mothers response to neural tube defect knowledge questions in the selected public health facilities of Mekelle, Tigray, Ethiopia March10 to May8, 2019

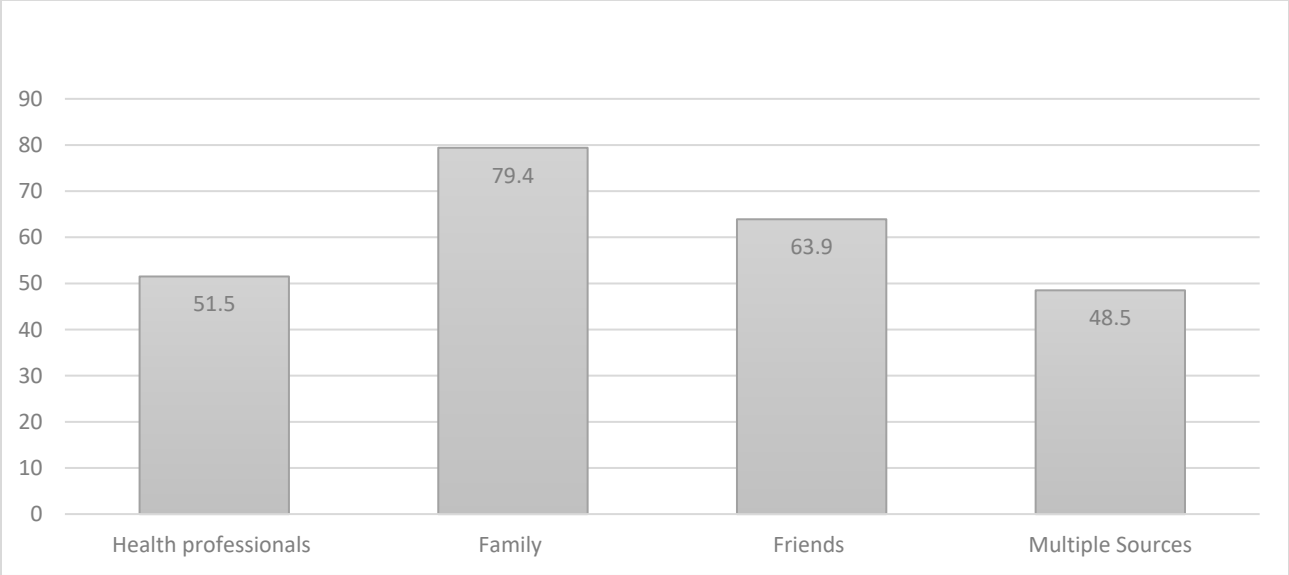

Figure 4: Mothers source of information towards neural tube defects in the selected public health facilities of Mekelle, Tigray, Ethiopia March10 to May8, 2019

5.3: Knowledge and source of information towards folic acid supplement intake

From 45(6.7%) of the mothers who said yes for the question; do you knew something about folic acid supplementation only 7(15.5%) of them knew the timing of folic acid intake, 20(44.4%) of them knew fruits and vegetables are the main source of folate, 12(26.7%) of

them knew taking foods with high folate content help to prevent neural tube defect, and 13(28.8%) of them knew health experts recommend taking folic acid supplementation to prevent birth defect.

In this case majority of them 40(88.9%) mentioned that health professionals were the main source of information, followed by family/friends 32(71.1%) and multiple sources 14(31.1%). When we come to the total knowledge score around 39(86.7%) and 6(13.3%) of mothers were having less and more knowledge towards folic acid supplement respectively.

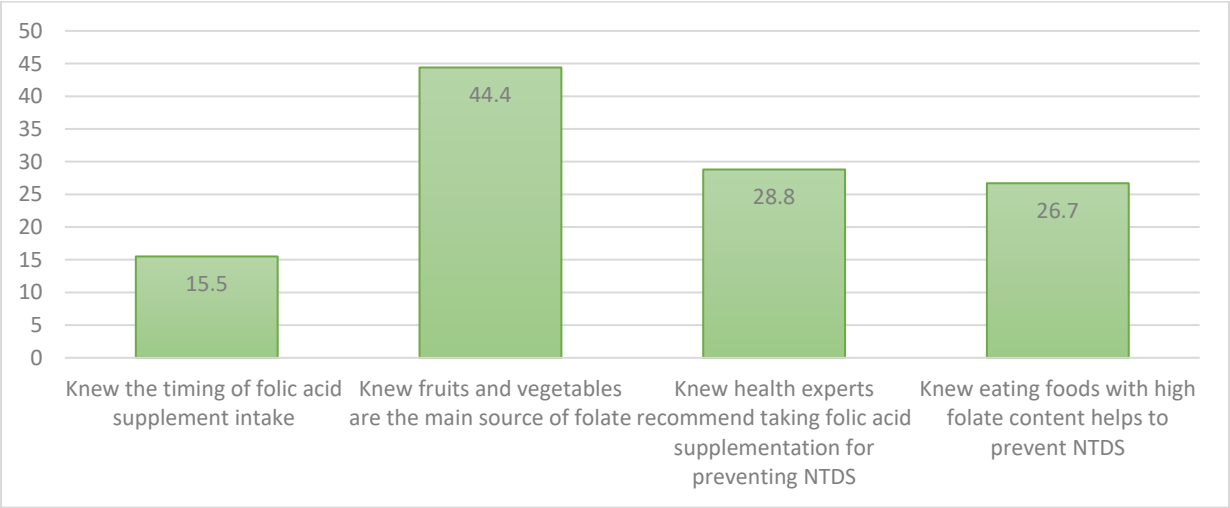

Figure 5: Mothers response to folic acid supplement knowledge questions in the selected public health facilities of Mekelle, Tigray, Ethiopia March10 to May8, 2019

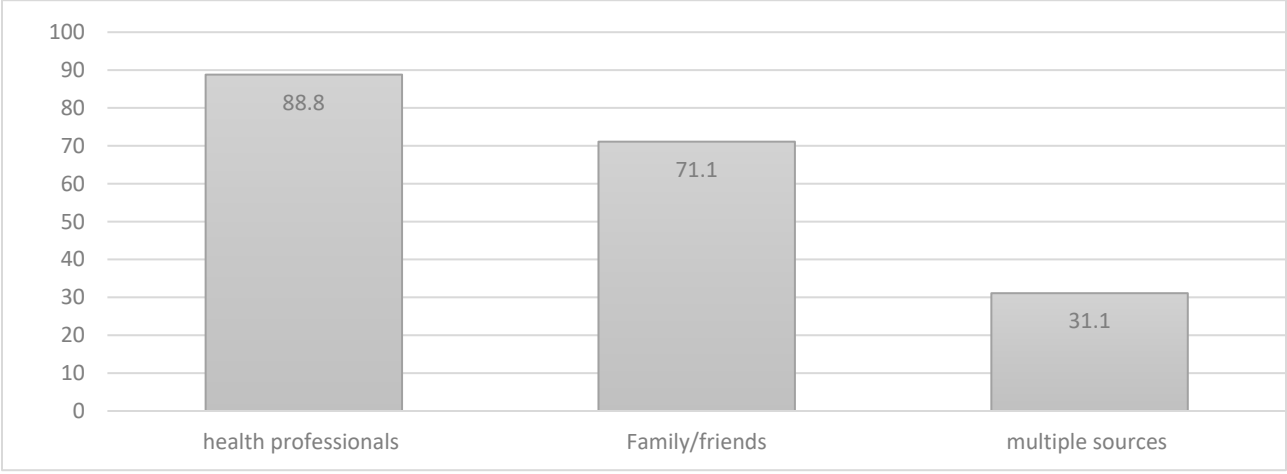

Figure 6: Mothers source of information towards folic acid supplement in the selected public health facilities of Mekelle, Tigray, Ethiopia March10 to May8, 2019

5.4: Practice of folic acid supplement intake

In this study 30(4.5%) of the mothers were ever had taken folic acid before they become pregnant and 25(67.6%) of them were taking for the current pregnancy. When we see the educational status of mothers who take folic acid at preconception time around 15/30(50%) were having diploma and above, 26/30(86.7%) were living in urban, 27/30(90) ever talk about folic acid with doctor, nutritionist, nurse, midwife and family/friends, 28/30(93.3%) knew someone who had a baby with NTD, 17/30(56.7%) were who had previous born child with NTD and 25/30(83.3%) were following their Antenatal care at referral hospital.

5.5: Perception towards neural tube defects

Majority more than half 213 (31.8%) of the participants who had ever heard of neural tube defects was strongly agree, 29(13.6%) agree, 34(16%) disagree and 70(32.9%) strongly disagree with the question said" someday I could have a baby with neural tube defects". The second perceived susceptibility question was I could get pregnant and my unborn baby could be sick without knowing it and to this question around 154(72.3%) of them were strongly agreed, 49(23. %) of them agreed 4(1.9%) disagree and 1(0.5%) disagree. For the third question" if I don't have enough folate serum level prior to my pregnancy or during pregnancy I could have a baby with NTD ", 154(72.3%) of them strongly agreed,49(23) of them agree and 5(2.3%) of them strongly disagree.194(91%) of the participants ever heard about neural tube defects strongly agreed that NTD is a very serious condition, 195(91.5%) of them strongly agreed that NTD would leave a child disabled for life complications, 134(62.9%) of them strongly agreed that NTD complications in an infant with NTD are sever and could results in death,194 (91%) of them strongly agreed that the cost of a baby with NTD is very expensive and the same number 194(91%) agreed that if they have a baby with NTD negatively affects their social, family and their ability to work. To summarize around 113/213(53.1%) of the individuals have high perception of threat to neural tube defects.

5.6: Perception towards folic acid supplement

Of the women who ever heard about folic acid 69(10.2%) of them strongly agreed with the questions said “taking folic acid per the recommendation even when I am not pregnant could reduce my risk of having a baby with NTD”, 15(21.7%) of them agreed and 1(1.4%) disagreed with the question. And with the question said “taking folic acid could make me a healthier person overall” 44(63.8) of them strongly agreed, 16(23.2%) of them agreed, 8(11.6%) of them are neutral and 1(1.4%) disagreed. With the last and third question said “taking folic acid all the time could save me money and time by keeping me from having a baby with NTD which is expensive and needs more time to care for” 44(63.8%) of them strongly agreed, 13(18.8%) of them agreed, 10(14.5%) of them was neutral, 1(1.4%) strongly disagreed and 1(1.4%) disagreed. Coming to the perception of barrier construct questions 41(59.4%) of them Strongly agreed, 22(31.9%) of them agreed, 3(4.3%) of them neutral and 3(4.3%) of them disagreed to the question said” I don’t knew when I get pregnant”, to the question said “I think taking folic acid even when I am not pregnant is hard to me” 22(31.9%) of them strongly disagreed, 13(18.8%) of them disagreed, 5(7.2%) of them neutral, 21(30.4%) of them strongly agreed and 8(11.6%) of them agreed. And lastly 27(39.1%) of them strongly agreed,1(1.4%) agreed, 9(13%) of them were neutral, 4(5.8%) of them disagree and 28(40.6%) of them strongly disagreed to the question said” folic acid is expensive “. In this also Around 32/69(46%) of them were having high perceived net benefit which means 32 of them have sum score above 18.

5.7: Cues of initiating individuals to take folic acid supplement

Around sixty four 64/69(92.8%) of the respondents strongly agreed with the question “if a health professional remind me to take folic acid when I came in for a doctor’s visit”, 15(21.7%) of them strongly agreed with the question said” hearing from a radio something about folic acid would remind me to take folic acid, 44(63.8%) of them strongly agreed with the question said “seeing something about folic acid on television would remind me to take folic acid all the time”, 56(81.2%) of them strongly agreed with the question said “if a friend or someone I knew told me about folic acid it would help me to take folic acid all the time”, and only 10(14.5%) of them strongly agreed with the question said “reading and seeing posters about folic acid would help me to remember to take the supplement all the time”. And finally, only

20(28.9%) of the participants were strongly agreed with the question said that “I am sure if I want, I can plan when will I can get pregnant” to take folic acid supplement starting at the preconception time. Finally, a total number of 60(87%) of individuals were got a sum score above 15. This means 87% of the individual mothers agreed with the cues to action questions.

5.8: Factors associated with folic acid supplement intake in bivariate analysis

From the socio demographic characteristics only age, profession and occupation were significantly associated ($P<0.05$) with folic acid intake. But the others like educational status, marital status, religion and residence are not significantly associated. From the obstetric history also only knowing someone who had a baby with NTD or lost a baby with NTD, having history of a baby with NTD, ever talking about folic acid with doctor, nutritionist, nurse, family and friend and having knowledge on NTD were significantly associated ($p<0.05$) with folic acid intake. But, history of still birth, history of abortion, parity and a baby with congenital anomaly except to that of NTD were not significantly associated.

Table 3: Factors associated with folic acid supplement intake of mothers following antenatal care in public health facilities of Mekelle, Tigray, Ethiopia March10 to May8, 2019

Variable	Category	Folic acid intake		COR; 95%CI
		Yes	No	
		N (%)	N (%)	
Educational status	Literate	28(4.38)	611(95.62)	1
	Illiterate	2 (6.45)	29(93.55)	1.505(0.342,6.625)
Marital status	Married	29(4.98)	553(95.02)	1
	Non married	1(1.136)	87(98.86)	0.213(0.029,1.630)
Religion	Christian	27(4.4)	579(95.6)	1
	Non-Christian	3(4.69)	61(95.31)	1.055(0.311,3.578)
Residence	Urban	26(4.15)	600(95.85)	1
	Rural	4(9.09)	40(99.91)	2.308(0.768,6.934)
Profession	Health professional	6(17.65)	28(82.35)	1
	Non health professionals	24(3.77)	612(96.23)	0.183(0.069,0.483)
Occupation	House wife	10(2.99)	324(97.01)	1
	Working on health institution	6(27.27)	16(72.73)	12.150(3.926,37.603)
	Working on non health institution	14(4.46)	300(95.54)	1.512(0.662,3.456)
Health facility type				
	Health center	2(0.9)	199(99.1)	1
	General hospital	5(1.78)	276(98.2)	1.8(-1.01, 2.19)

Table 3: Factors associated with folic acid supplement intake of mothers following antenatal care in public health facilities of Mekelle, Tigray, Ethiopia March10 to May8, 2019

Variable	Category	Folic acid intake		COR; 95%CI
		Yes	No	
		N (%)	N (%)	
	Referral hospital	23(11.2)	171(88)	13.4(0.99, 4.1)
Duration of urban stay***		Mean	SD	1.032(0.992,1.074)
		22.26	9.5	
Age***		Mean	SD	1.08 (1.01,1.15)
		27	5	
Parity	Nulliparous	114(98.3)	2(1.7)	1
	Primiparous	186(95.4)	9(4.6)	2.758(0.586,12.992)
	Multiparous	297(94.9)	16(5.1)	3.071(0.695,13.567)
	Grand multiparous	43(93.5)	3(6.5)	3.977(0.642,24.624)
Hx of abortion	Yes	7(4.5)	148(95.5)	1
	No	23(4.5)	490(95.5)	0.992(0.418,2.359)
Hx still birth	Yes	5(5.2)	90(94.8)	1
	No	25(4.4)	549(95.6)	0.82(0.306,2.196)
Hx of having a baby with congenital anomaly except to that of NTD	Yes	1(5.8)	17(94.2)	1
	No	29(4.4)	623(95.5)	0.791(0.102,6.152)
Do you know someone who had a baby with NTD or lost a baby with NTD	Yes	28(16.6)	140(83)	1
	No	2(0.4)	520(99.6)	0.020(0.005,0.085)
Have you ever talked about folic acid with doctor, nutritionist, nurse, family and friend	Yes	27(39)	42(62)	1

Table 3: Factors associated with folic acid supplement intake of mothers following antenatal care in public health facilities of Mekelle, Tigray, Ethiopia March10 to May8,2019 in the bivariate analysis

Variable	Category	Folic acid intake		COR; 95%CI
		Yes	No	
Have you ever talked about folic acid with doctor, nutritionist, nurse, family and friend	No	3(0.49)	598(99.5)	0.008(0.002,0.027)
Have you ever had a baby with NTD	Yes	17(45.9)	20(54)	1
	No	13(2)	620(88)	0.025(0.011,0.58)
Knowledge on NTD****	Mean	SD		1.894(1.089,3.294)
	1.2	0.6		
Knowledge on folic acid***	Mean	SD		2.061(5.73, 7.422)
	1.16	0.62		

Table 4: health belief model constructs become associated with folic acid supplement intake in the bivariate analysis

Characteristic	Mean score	B	SE	COR;95%CI
Perceived threat ***(susceptibility + severity)	35.9	0.306	0.102	1.358(1.112,1.660)
Net benefit*** (benefit-barrier)	8.3	0.169	0.107	1.184(0.960,1.459)
Cues to action ***	24.4	0.269	0.210	1.308(0.867,1.974)
Self-efficacy***	9.4	0.150	0.243	1.162(0.722,1.871)

Note: *** continuous variables

5.9: Independent predictors of folic acid intake

In the multivariable logistic regression, variables which had a p value <0.25 were entered in to the analysis and only having history of born child with NTD, talking about folic acid with doctor nutritionist, nurse, midwife, family and friend and perceived threat become associated with folic acid supplement usage. The odds of folic acid supplement intake among those who didn't have history of born child with NTD were 0.909 (90.9%) lower than those who had history of born child with NTD with (AOR= 0.091;95%CI;0.16,0.499) at P<0.006.

Concerning to the ever talking about folic acid with doctor, nutritionist, nurse, midwife, family and friend; the odds of folic acid supplement intake among those who didn't talk about folic acid supplement ever is 0.949 (94.9%) lower than those who ever talk about folic acid with different health professional ever with (AOR=0.051; 95% CI; 0.005, 0.482) at P<0.009.

From the health belief model constructs perceived threat (severity + susceptibility) were become significantly associated with folic acid supplement intake (AOR= 1.12; 95%CI; 1.008, 2.02), Which means if there is a unit increase in a total score of perceived threat the likelihood of folic acid supplement intake was increased by 1.12 times keeping all other variables constant. See table 5

Table 5: Factors independently associated with folic acid supplement intake of mother following antenatal care in public health institutions of Mekelle, Tigray, Ethiopia March, 2019

Variable	Category	COR, 95% CI	AOR, 95% CI
Had history of born child with NTD	Yes	1	1
	No	0.025(0.011,0.58)	0.091(0.16,0.499) ++
Ever talk about folic acid with doctor, nurse, nutritionist, midwife, nurse, family and friends	Yes	1	1
	No	0.008(0.002,0.027)	0.051(0.005,0.482) ++
Occupation	House wife	1	1
	Working on health institution	12.150(3.926,37.603)	8.605(0.346,32.076)
	Working on non health institution	1.512(0.662,3.456)	1.508(0.294,7.731)
Profession	Health professional	1	1
	No health professionals	0.183(0.069,0.483)	0.029(9.680)
Do you know someone who had a bay with NTD	Yes	1	1
	No	0.020(0.005,0.085)	0.800(0.062, 10,26)
Age ***		1.08 (1.01,1.15)	1.001(0.826,1.213)
Duration of urban stay***		1.032(0.992,1.074)	1.021(0.928,1.126)
Knowledge on NTD***		1.894(1.089,3.294)	0.82(0.306,3.101)
Sum of perceived threat ***		1.358(1.112,1.660)	1.12(1.008,2.02) ++

Note: *** continuous variables
++ Variables which come significant in the multivariable analysis

6. DISCUSSION

It's been long recommended that improving the nutritional status of mothers is the only way to have a healthy baby and productive new generation at all. Out of the many problems that we have the one thing that we should have to fight is creating a healthy environment to the coming children starting from the pregnancy time to their childhood period by creating suitable, accessible and affordable, health care facilities to the mothers so that decreasing the burden of the new generation. Now a day's diseases that can be preventable but once if it happens that costs a lot of our time, money and life as well are increasing. From those neural tube defects is one example that happens early in the pregnancy time. Neural tube defect is one of the preventable diseases type, and we can prevent it by taking folic acid starting at preconception time.

Taking folic acid is a remarkably effective method in decreasing neural tube defects. But an alarming finding is that in this study knowledge and practice is low among the sampled mothers who were following ANC at the selected facilities. As we can see from the results only 45/69 (65.2%) of the mothers answers yes for the question" do you knew something about folic acid", out of them only 7/45(15.5%) knew the timing of folic acid supplement intake, 20(44.4%) knew fruits and vegetables are the main source of folate and 12(26.7%) knew taking folic acid can prevent birth defects this result is inconsistent with study done in Saudi Arabia, Sudan, Nigeria and Egypt(15, 19, 21, 45) , and consistent with study done in Ethiopia, Adet, Gojjam in 2016(51). low awareness of women towards folic acid in our setup and difference in the study setting, as all studies done in tertiary hospitals where as our study includes all type of heath care settings might be the reason for the inconsistency.

The practice was 30/670 (4.5%) which is consistent with the study done in Sudan, Nigeria and Egypt, (19,21,45) but inconsistent with study done in Korea, Carolina and Croatia, Netherlands, Saudi Arabia, Qatar, Norway (Oslo), Italy and New Zealand(13-16, 42-44, 46, 52). This inconsistency might be the level of awareness towards folic acid benefit on preventing neural tube defects could be inadequate and incomplete as to that of European and American countries. Also, another potential reason for this very low practice of folic acid might be having unplanned pregnancy.

Another variable that is significantly associates with the folic acid supplement intake in the multivariable logistic regression were had history of born child with NTD. Mothers who didn't have previous born child with NTD was 90.9% less likely to take folic acid supplement at preconception time AOR= 0.091(95% CI, 0.16, 0.499). This might be because of those mothers who didn't have born child with NTD have less fear of the disease and Mothers may not initiated to take care of themselves or close follow up and consultation may not be given by the health professionals. The second variable that is significantly associated with folic acid intake in this study is ever talking about folic acid with Doctor, Nutritionist, Midwife, Nurse, family and friends with AOR= 0.051(95% CI, 0.005,0.482). Those who didn't ever talk about folic acid with Doctor, Midwife, Nurse, family and friend had 94.9% lower odds of taking folic acid intake compared to those who ever talk. A systematic review done on 31 articles to see the effect of intervention on the awareness and knowledge claims that average women's awareness increases from 60 to 72%, knowledge from 21 to 45% and periconceptional folic acid intake from 14 to 23%. This finding supports the idea that talking about folic acid with different health experts and individuals increase awareness, knowledge and practice of folic acid intake. So, the result of our finding indicates this too(53). From the health belief constructs perceived threat becomes associated with the folic acid supplement intake. As the total score of perceived threat increases by one unit the intake of folic acid supplement increases by 1.12 times with 95% CI (1.008, 2.02). This could be because of the internally driven fear towards that specific pregnancy outcome leads to initiation of folic acid supplement intake as early as possible as.

7. LIMITATION OF THE STUDY

Limitation of the study

Overestimation of parameters like knowledge and practice might be there

Generalization of the study to all pregnant mothers' lives in Mekelle city is difficult, since this study is conducted on facility level

8. CONCLUSION AND RECOMMENDATION

8.1. Conclusion

This study revealed that the practice and knowledge towards folic acid is very low.

The study also evidenced that having born child with NTD previously, ever taking about folic acid with doctor, nutritionist, midwife, nurse, family and friend and perceived threat (susceptibility + severity) were independently explained folic acid supplement usage.

8.2. Recommendations

To MOH

To develop strategies to rise the knowledge and awareness in the prevention methods of neural tube defects.

To start surveillance of neural tube defects since this will be helpful to knew nationwide magnitude of the disease.

To health professionals and health extension workers

Provide information and counseling on the prevention strategies of neural tube defects.

To the media

Promote the benefit of folic acid supplement on preventing neural tube defects by provision of effective IEC and counseling.

Researchers

An interventional study using health belief model is important to see the effect of each model constructs on behavior change of individuals towards folic acid supplement intake in the action of fear towards NTDs.

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10. ANNEXES

Annex1: Information sheet

Addis Ababa University

College of Health Science

School of Public Health

Dear mothers,

Good morning/Good afternoon, my name is_____. I am working as a data collector for a research study on the factors influencing the practice of folic acid supplement usage among pregnant mothers in the selected public health facilities of Mekelle, Tigray, Ethiopia. This study is being conducted for partial fulfillment of a master degree of a student named Asqual Gebreslassie who is a student in Addis Ababa University, School of Public Health.

Title: Predictors of folic acid supplement usage for preventing neural tube defects among pregnant women following prenatal care in Mekelle, Tigray, Ethiopia

Purpose of the study: the aim is to assess the perception of pregnant mothers and other related factors that influence the practice of folic acid supplement usage, and findings from this study can provide useful input to different governmental and non-governmental institutions who are working on preventing neural tube defects by advocating different strategies such as different campaigns and different advertisements and improving women's awareness towards neural tube defects and prevention strategies. As you are mothers you will play a great role in maintaining your health by taking necessary nutrients so that you will deliver a healthy baby, and you will help other mothers or young adults to practice healthy behavior.

Process of the study: In this study only, pregnant mothers are required to participate since the objective is to assess the practice of folic acid supplementation usage and this health facility was selected randomly from other health facilities and all the mothers who come for ANC follow up are included in this study.

Rights of the participants: your participation in this study is voluntary. You have the full right either to participate in this study or decline to participate at all. You do not have to answer any question that you don't want to answer and you may also decide not to participate in this study any time you want. But, your honest response to each question will have a major role in attaining the objective of this study.

Confidentiality of the study: You do not have to write your name in the questionnaire instead it will use codes to differentiate the responses you gave from another participant. this data will not be used for any purposes other than to achieve the objectives of this study.

Benefit of the study: By participating in this study you will not get directly benefits or get payment but as it was mentioned above your complete and honest answer will have useful input in the efforts of preventing neural tube defects among new born.

Risk of the study: Participating in this study will not have any kind of risks and the researcher is accountable that by deciding to participate in this study you will not get any harm and completing this questionnaire can take about 20 to 30 minutes of your time and we greatly appreciate your cooperation.

If you need any further information or explanation regarding to this study, you can contact the principal investigator. Here are her contact details;

Name: Asqual Gebreslassie

Phone number: +251967747373

Email address: Asqualhoho@gmail.com

Addis Ababa University, school of public health

Do I have your permission to continue?

Yes ☐ No ☐

If yes, thank her and proceed to the informed consent and to the questionnaire

If no, thank her and go to the next participant

Annex 2: Informed consent

I have understood the purpose of the study and I also understand that the research imposes no risk to me. I am assured that there will be confidentiality of my responses and collected data will be used only for the study. It has also been explained to me that I have the right to stop participating at any time.

But I understood that participating in this study is important for scientific knowledge and base for further study. Therefore, I have now consented to participate in the study by signing this form.

Informed consent Certified by:

Respondent's signature _____ Date_____

Data collector: Name_____ Signature_____

Date: _____

Questionnaire number_____

Time started_____ Time completed_____

Annex 3: English version Questionnaire

Part I: Socio demographic information

Instruction: For each of the following questions please circle the number of alternative(s) that fit for the response for the close ended questions and write you answer for the open-ended questions.

No	Question	Response category	Skip
101	What is your age in completed years?		
102	What is the highest education level you have attained?	1. College diploma and above 2. Tech./voc. Certificate 3. Secondary 4. Elementary 5. Unable to read and write	
103	What is your current marital status?	1. Single 2. Married 3. Divorced 4. Widowed	
104	If married for question number 103 What is the highest grade your husband attained?	1. College diploma and above 2. Tech./voc. Certificate 3. Secondary 4. Elementary 5. Unable to read and write	
105	What is your religion?	1. Orthodox 2. Muslim 3. Protestant 4. Catholic	
106	Where do you live	1. Urban 2. Rural	
107	If urban duration of urban stay	In number of completed years	
108	What is your profession	1. Health professional (doctor, nurse, midwife, trained midwife …). 2. Non health professional (engineer, law, accountant, ….).	

109	Occupational status	1. House wife 2. Working on health institution 3. Working on non-health institution	
Previous pregnancy history			
201	Number of pregnancies including the current		
202	Have you ever had abortion before	1.Yes 2.No	If no go to Q205
203	If yes what kind	1.Induced 2. Spontaneous	
204	If induced reason of induction		
205	Have you ever had still birth before?	1.Yes 2.No	
206	Have you ever had a baby with congenital anomaly except to that of neural tube defects?	1.yes 2.no	
207	Do you know someone who had a baby with NTD or who had lost a baby with NTD	1. Yes 2. No	
208	Have you ever talked about folic acid with doctor, nutritionist, nurse, family and friend?	1. Yes 2. No	

Part II: Source of information on neural tube defects and folic acid supplementation.

No	Question	Response Category	Skip
201	Have you ever heard about neural tube defects?	1. Yes 2. No	
202	If your answer to question 401 is yes, from where did you hear the information? (More than one answer is possible)	1. Television/Radio 2. Friends 3. Health professional 4. Magazines/ brochures 5. Family	
203	Have you ever heard about folic acid supplement?	1. Yes 2. No	

204	If your answeris yes to question 303, from where did you hear the information? (More than one answer is possible)	1. Television/Radio 2. Friends 3. Health professional 4. Magazines/ brochures 5. Family _____	

Part III: Mothers knowledge on neural tube defects and folic acid supplementation.

No	Question	Response category	Skip
301	Do you know something about neural tube defect?	1. Yes 2. No	If No go to 307
302	What are the signs a child could have if he/she is born with neural tube defects?	----------	
303	Is neural tube defect a transmittable disease?	1. Yes 2. No 3. I don't know	
304	Is neural tube defect hereditary disease?	1. Yes 2. No	
305	Is neural tube defect curable disease?	1. Yes 2. No 3. I don't know	
306	If you have a pregnancy affected by neural tube defect, do you think that you will have a probability of a pregnancy with neural tube defect again?	1. Yes 2. No 3. I don't know	
For folic acid supplementation			
307	Do you know something about folic acid?	1. Yes 2. No	If No go to part4
308	Some health experts recommend taking folic acid supplement for which one of the following reasons do you think?	1. To make strong bones 2. To prevent birth defects 3. To prevent high blood pressure 4. To prevent anemia 5. I don't know	If the answer is 2, go to number 509 otherwise go to next section
309	When we should take it in order to prevent neural tube defects?	----------	
3010	From the following list of food groups which one of them do you think good source of folate/folic acid?	1. Breads and cereals 2. Vegetables 3. Fruit 4. Milk and milk product 5. Legumes, nuts and seeds 6. Meat	

3011	Is taking foods with high folate help us to prevent neural tube defects?		

Part IV: practice of preconception folic acid supplement usage: Note: Since folic acid is given as the form of multivitamin, Iron/folate and as pure folic acid if the mothers are taking this kind of supplements they will be considered as they are taking.

No	Question	Response category	Skip
401	Have you ever taken folic acid supplements, before you become pregnant?	1. Yes 2. No	If No go to Q 501
402	If yes how many times per day where you take it?	----------	
403	What about for this pregnancy	1. Yes 2. No	
404	If yes how many times per day did you take it?	----------	

Part V: Perception about susceptibility to neural tube defects

Instruction: Please circle how you agree/disagree with the following statements

No	Question	Response category				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
501	If I do not have enough serum folate level prior or in the whole pregnancy time, I could have a baby with NTD	1	2	3	4	5
502	I could get pregnant and my unborn baby could be sick without even knowing it	1	2	3	4	5
503	I could have a baby with neural tube defect someday	1	2	3	4	5

Part VI: Perception about seriousness or severity neural tube defects

Instruction: Please circle how you agree/disagree with the following statements

No	Question	Response category				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
601	Having a child with NTD is a very serious condition.	1	2	3	4	5

602	Having NTD would leave a child disabled for life Complications	1	2	3	4	5
603	Complications In an infant with NTD is severe and could even result in death	1	2	3	4	5
604	Having a baby with NTD is very expensive	1	2	3	4	5
605	Having a baby with NTD would negatively affect my social life, my family life and my ability to work	1	2	3	4	5

Part VII: Perceptions on benefit of folic acid supplementation Instruction: Please circle how you agree/disagree with the following statements

No	Question	Response category				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
701	Taking folic acid supplement per the recommendation even when I am not pregnant, could prevent or reduce my risk of having a baby with NTD	1	2	3	4	5
702	Taking folic acid supplement could make me a healthier person overall	1	2	3	4	5
703	Taking folic acid supplement all the time could save me money and time by keeping me from having a baby with NTD that would be expensive and would require a lot of time to care for	1	2	3	4	5

Part VIII: Perceptions on barriers to of taking folic acid supplementation Instruction:
Please circle how you agree/disagree with the following statements

No	Question	Response category				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
801	I think it is expensive	1	2	3	4	5
802	I don't know when I get pregnant	1	2	3	4	5
803	I think taking folic acid supplement even when I am not pregnant is hard to me	1	2	3	4	5

Part IX: Perceptions on self-efficacy of taking periconceptional folic acid supplementation

Instruction: Please circle how you agree/disagree with the following statements

No	Question	Response category				
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
901	I am confident that I could be able to eat a diet high in folate if I wanted to	1	2	3	4	5
902	I am sure if I want, I can plan when will I can get pregnant to take folic acid at preconception time	1	2	3	4	5

Part X: Perception on cues to action to practice folic acid supplementation intake

No	Question	Response category				
		Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
1001	If a health professional reminded me to take folic acid when I came in for a doctor's visit, that would help me to remember	1	2	3	4	5

1002	Seeing something on television about folic acid would help remind me to take folic acid supplementation all of the time	1	2	3	4	5
1003	Hearing something about folic acid on radio would remind me to take the supplement all of the time					
1004	If a friend or someone I know told me about folic acid it would help me to be sure I can take the supplement all of the time	1	2	3	4	5
1005	Reading pamphlets or seeing posters about folic acid would help me remember to take the supplement all of the time	1	2	3	4	5

Annex 4: Tigrigna version questionnaire

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ክፍሊ ትምህርቲ ሕብረተሰብ ጥዕና

ዝተከበርክንአዴታት

መጀመርታዝኽበረሰላምታይእንደብዓሕኩስመይ_____ይበሃል።።

አነ ኣብዚ ሀዚ ሰዓት ብተምሃሪት አስኳል ገ/ስላሴ ዝስራሕ አብ ዘሎ መዕናዕቲ ከምሐበሬታ ሰብሳቢት ኮይነ እየ ዝሰርሕ ዘለኩ:: እዚ መዕናዕቲ እዚ አብ ከተማ መቐለ አብ ዝርከባ ናይ ህዝቢ ሆስፒታላትን ጥዕናጣብያታትን እዩ ዝስራሕ ዘሎ።። ናይዚነ መዕናዕቲ ቀንዲ ዓላማ ድማ አዴታት አብ ቅድሚ ሞጥናስበተለይ ድማ ቅድሚ ሰለስተ አዋርሕ አብ ዘሎ ናይ ጥንሲ ግዜያት ብዝተፈላለየ መልክዕ ብጥዕና ሰብሞያ ተአዚዙን ዝውሰድ ዘሎ ዝውሓጥ ነገር ንዘለወን አረአእያን፣ ዘይወሰዳ እንተሃልየን እውን ንከይወሰዳ ዝገብርወን ቀንዲ ምኽንያታት ንምፍላጥ እዩ።።አብዚ መዕናዕቲ እዚ ትሳተፋፍ ቃደኛጥራሕ እንተኻይንኽን እዩ።። ዘይተመቸወክን ጥያቄና ዘይምምላስ መሰል አለክን ግን ሐቅን ብጋሃደዊ ዓለም ትገብርኡ ነገር ምምላስ ነዚ መዕናዕቲ እዚ ዘይሩ እውን ንቀፃሊ ኣብዙርያ ኣዴታትን/ህፃናትን አብ ዝገበር ናይ ጥዕና ምንቅስቓሳት ወሳኒ እዩ።።

ካብዚ መዕናዕቲ እዚ ብቐጥታ ትረኽብኩ ጥቅሚ ወይ ጉድኣት የለን።። ግን ንቀፃሊ ብ ሃገር ደረጀ አብ ዙርያ አዴታትን፣ ህፃናትን አብ ዝግበር ናይ ጥዕና ምሕላው ምንቅስቃሳት ከም ሐደ ናይ ፍልፋል ሐበሬታ ኮይኑ ከገልግል እዩ:

እዚ ሐበሬታ እዚ ክውሰድ ተሎ ሰም ክንአይዕሐፍን ስለዚ ዝሀብክንኡ ሐበሬታ ናይመን ምኻኑ ስለዘይፍለጥ ብግልፂ ነዞሞ ጥያቄታት ንክትምልሳ ብትሕትና ይጥይቐ፡፡

እዚ መዕናዕቲ እዚ ናይ ትሰርሕ ዘለ ቆልዓ ኣድራሻ እንተደሊኽን በዚዝሰዕብ ምርካብ ትኽእላ

ስም፡- አስኳል ገ/ስላሴ
ስልኪቁዕሪ፡- 0967747373

ስለዚ ክቅዕል ፈቓደኛዲኽን

እወ ☐ ☐ አይፈቐደኩን

<u>ቀዳማይ ክፍል</u>

1. ማሕበራውንኢኮኖሚያውንሐበሬታታት

ተ.ቁ.	ጥያቄ	መልሲ	ዝለል
101	ዕድሜኺ ክንደይ ድዩ?		
102	ክሳብ ክንደይ ክፍሊ ተማሂርኪ ነይርኪ?	1. ኮሌጅዲፕሎማካብኩንለዕልን 2. ቴክኒክ 3. ክሳብካልአይብርኪ 4. ክሰብቀደማይብርኪ 5. ምንብብንምዕሐፍን ዘይትኽእል---	
103	ናይ ሓደር ኩነታት	1. ዘይተመርዐወት 2. ዝተመርዐወት 3. ዝፈተሐት 4. ምስሰብአያ ዘይትነብር 5. ሰብአያዝምታ	
104	ዝተመርዐወት እንተኮይና ናይ ሰብአያ ናይ ትምህርቲ ኩነታት ዕሐፍ	1. ኮሌጅንዲፕሎማንልዕሊኡን 2. ቴክኒክዝተሞሃረ 3. ካልኣይብርኪዝበፅሐ 4. ቀዳማይብርኪ ዝበፅሐ 5. ምንባብንምዕሐፍን ዘይክእል	

105	ናይ ሃይማኖት ኩነታት	1. ኦርቶዶክስ 2. ሙስሊም 3. ፕሮቴስታንት 4. ካቶሊክ	
106	አበይ ትነብሪ?	1. ገፀረ 2. ከተማ	
107	ከተማ ትነብር አንተኮይና ክንደይ ግዜ አብ ከተማ ፀኒሓ?	_____	
108	ሞያኪእንታይድዩ?	1. ናይ ጥዕና በዓልቲ ሞያ 2. አብ ካሊእ ሞያ ዝተሰማረየት	
109	ናይስራሕኩነታት	1. አብ ገዛ ትውዕል 2. ኣብ ጥዕና ትካል ተቐፂራ ትሰርሕ 3. ኣብ ካልእ ትካል ትሰርሕ	

ካልአይክፋል፡ ናይ አዴታት ዝሓለፈ ናይ ወሊድ ኩነታት

ተ ቁ	ን መበል ክንደይ ጊዘ ኢኪ ጠኒስኪ ዘለኪ?	መልሲ	ዝለል
201	ምንባል ጥንሲ አጋጢሙኪ ይፈልጥ?	1. እወ 2. አይፈልጥን	
202	አጋጢሙኪ ተነይሩ እንታይ ዓይነት	1. ባዕሉ ዝከደ 2. አብ ሕክምና ዝከደ(ምክንያት ይፀሓፍ)	
203	ዝሞተ ወሊድኪ ትፈልጢ	1. እወ 2. አይፈልጥን	
204	ናይ ርእስን ሉቐን ሕማም ዘለዎ ቆልዓ ወሊድኪ ትፈልጢ ዶ?	3. እወ 4. አይፈልጥን	
205	ብዛዕባ ፎሊክ አሲድ ምስ ዶክተር፣ ነርስ፣ ናይ ምግቢ በዓል ሞያ፣ቤተ ሰብ ወይ አዕርክትኺ አውጊዕኪ ትፈልጢ ዶ?	1. እወ 2. አይፈልጥን	

206	ብዘይካ ናይ ርእስን ሑቐን ሕማም ዘለዎ ቆልዓ አብ ካልእ አካላቱ ችግር ዘለዎ ቆልዓ ወሲድኪ ትፈልጢ?	1. እወ 2. አይፈልጥን	
207	ናይር እስን ሑቐን ሕማም ዘለዎ ቆልዓ ዝወለደት አዶ ወይ ብ ናይ ርእስን ሑቐን ሕማም ዉሉዳ ዝሰአት አዶ ትፈልጢ ዶ?	1. እወ 2. አይፈልጥን	

ሳልሳይክፍል፡- ፎሊክአሲድሳፕሊመንትከምዝወሰዳ ዝጥይቁ ሕቶታት

ተ.ቁ.	ጥያቄ	መልሲ	ዝለል
301	ቅድሚ ምጥናስኪ ብመልክዕ ዝወሐጥ ዝተዘጋጀወ ፕኑሳት ወይ ንምጥናስ ንዝሐስባ ዝወሃብ ክኒን ወሲድኪ ትፈልጢ ዶ?	1. እወ 2. አይፈልጥን	
302	እንድሕር ወሲድኪ ትፈልጢ ኮይንኪ አብ ሰሙን ክንደይ ፋረ ትውሕጢ ነይርኪ?	_____	
303	ነዚ ናይ ሀዚ ፕንሲ ከወሲድኪ ነይርኪ ዶ?	1. እወ 2. አይወሰድኩን	
304	እንድሕር ወሲድኪ አብሰሙን ክንደይ ትዉሕጢ ነይርኪ?	_____	

ራብዓይክፍል፡-ፍልፍል ሐበሬታ አብርእስን ዓንዲ ሑቐን ዝፍጠሩ ናይ ቆልዓ ሕማማት፣ን ናይ ፎሊክ አሲድ ሳፕሊመንትን

ተ.ቁ.	ጥያቄ	መልሲ	ዝለል
401	ብዛዕባ ርእስን ዓንዲሑቐን ዝፍጠሩ ናይ ህፃን ሕማማት ሰሚዕኪ ትፈልጢዶ?	1. እወ 2. አይፈልጥን	አይፈለጥን ተኮይኑናብጥያቁ 405
402	ንሕቶ ቁፅሪ401 መልሲ እወ ተኮይኑ እቱ ሐበሬታ ከበይ ረኪብክዮ ነይርኪ?	1. ካብቴሌቭዥን 2. ካብአዕርክተይ 3. ካብጥዕናበዓልሙያታት 4. አብጋዜጣ 5. ካሊእእንተሃልዩግለፅ	

403	ብዛዕባ ፎሊክ አሲድሳፕሊመንት ከ ሰሚዕ ኪ ነይርኪ?	1. እወ 2. አይፈልጥን	አይፈልጥን ተኮይኑናብቀፃሊ ኪድ
404	ንቁዕሪ 403 መልስኺ እወ እንተ ኮይኑ ካበይ ሰሚዕኽዮ ነይርኪ?	6. ካብቴሌቭዥን 7. ካብአዕርክተይ 8. ካብጥዕናበዓልሙያታት 9. አብጋዜጣ 10.ካሊእእንተሃልዩግለፅ	

ሐምሻይክፍል፡-ብዛዕባ ኑራል ትዩብ ዲፌክት፣ ፎሊክ አሲድ ሳፕሊመንቴሽን ንከምዝፈልጣ ዝጥይቁ ሕቶታት

ተ.ቁ.	ጥያቄ	መልሲ	ዝለል
501	ብዝዕባ ህፃውንቲ እንትውለዱ ዝፍጠር ናይ ርእሰንዓንድሉቑን ሕማም ትፈልጥዩ ነገር አለኪ?	1. እወ 2. አይፈልጥን	
502	ከምዚ ዓይነት ችግር ዘለዎ ቆልዓ እንተተወሊዱ እንታይ ዓይነት ምልክታት የርእይ?	_____	
503	እዚ አብ ላዕሊ ዝገለፅክዎ ሕመም ካብ ሰብ ናብ ሰብ ይመሐላላፍ እዩ ኢልኪትሓስቢ ዶ?	1. እወ 2. አይሓስብን 3. አይፈልጥን	
504	ከመይ ንከላኸሎ ንኽእል?	_____	
505	ብዘርኢ ይመሐለለፍ እዩ ኪልኪ ትሐሰቢዶ?	1. እወ 2. አይሓሰሰስብን 3. አይፈልጥን	
506	እንድሕር ሕፃን ምስቲ ኣብ ላዕሊ ዝገለፅኩልኪ ሕማም ተወሊዱ ክድሕን ይክእል ዶ?	1. እወ 2. አይክእልን 3. አይፈልጥን	

507	እንድሕር ከምዚአብ ላዕሒ ዝገለፅኩልኪ ሕማም ዘለዎ ቆልዓ ወሊድኪ ንካልኣይ ግዘ ከምኡ ዓይነት ችግር ዘለዎ ቆልዓ ክወልድ እየ ኢልኪ ትሓሰቢዶ?	1. እወ 2. አይሓስብን 3. አይፈልጥን	
508	ብዛዕባ ፎሊክ አሲድ ዝበሃል ን ጥረነገር ትፈልጥዮ ነገር አለኪ?	_____	
509	ፎሊክ አሲድ እንተወሲድና እዙ ዓንተወይ ዝገለፅኩልኪ ችግር ዘለዎ ቆልዓ ንካይንወለድ ይከላኸለልና እዩ ኢልኪ ትሓሳቢ ዶ?	1. እወ 2. አይሓስብን 3. አይፈልጥን	
510	ናይ ጥዕና በዓልሙያ ንምንታይ ይመስለኪ ፎሊክ አሲድ ንክትወስድ ዝሕብር?	1. ዓፅሚንምጥንካር 2. ኑራልትዩብንመሰል ንዘለዎቑልዓንይዉለድ 3. ደምበዝሒንምንካይ 4. ደምዋሕዲከይህሊን ምግባር 5. አይፈልጠጥን	
5011	ካብ ምንታይ ዓይነት ምግብታት ንረክቦ ኢልኪ ትሓስቢ	----------	

ሻድሻይክፍል፡- አደታት አብ ናይ ርእሲንሑቑን ዝፍጠሩ ናይ ህፃናት ችግር ተገላፅት ዘለወን አረአእያ ዝጥይቑ ጥያቄታት

ተ.ቑ.	ጥያቄ	መልሲ				
601	ፎሊክ አሲድ ሳፕሊመት ቅድሚ ምጥናሰይ እንድሕር ዘይወሰድኩ ናይ ሑቑን ርእሰን ችግር ዘለዎ ቆልዓ ክወልድ ይኽእል እየ	1	2	3	4	5
602	ተይፈለጥኩ ክጠንሰን ቆልዓይ ድማ ተይፈለጥኩ ክሐምምን ይክእል እዩ	1	2	3	4	5
604	ኣብ ዝኾነ መዓልቲናይ ርእስን ሑቑን ችግር ዘለዎ ቆልዓ ክህልወኒ ይክእል እዩ	1	2	3	4	5

ሻወዓይ ክፍል፡-አደታትን ናይርእሲን ሑቑን ዝፍጠሩ ናይ ህፃናት ችግር ዝከፈአ ምኪኑ ዘለወን አረአእያ

ተ.ቁ.	ጥያቄ	መልሲ				
701	ናይ ርእሰን ሑቑን ችግር ዘለዎ ቆልዓ ምውላድ ዝኸፈአ ነገር እዩ	1	2	3	4	5
702	እንድሕር ናይ ርእሰን ሑቑን ችግር ዘለዎ ቆልዓ ተወሊዱ ናይ አካላውን ሰነአህምሮአውን ጉድኣት አብ ሂወቱ ከከትለሉ ይኽእል እዩ	1	2	3	4	5
703	እንድሕር ናይ ሑቑን ርእሰን ችግር ዘለዎ ቆልዓ ተወሊዱ ዝበፅሑ ጉድኣት ዝከፈአን ክቑትል እውን ዝኽእልን እዩ					
704	ናይ ርእሰን ሑቑን ችግር ዘለዎ ቆልዓ ብምውለደይ ቡዙሕ ናይ ገንዘብ ችግር ከጋጥመኒ ይኽእል እዩ	1	2	3	4	5
705	እንድሕር ናይ ሑቑን ርእሰን ችግር ዘለዎ ቆልዓ ወሊደ አብ ማህበራዊ ኢኮኖሚያዊ አነባብራይ ተፅዕና ክፈጥረለይ ይኽእል እዩ	1	2	3	4	5

ሸምናይ ክፍል፡- አዩታት አብ ጥቅሚ ፎሊክ አሲድ ሰፕሊመንተሽን ዘለዎን አረአእያ

ተ.ቁ.	ጥያቄ	መልሲ				
801	ፎሊክ አሲድ ሳፕሊመንት እንድሕር ወሲደ ናይ ርእሰን ሑቑን ችግር ዘለዎ ቆልዓ ኣይወልድን	1	2	3	4	5
802	ፎሊክ አሲድ ሰፕሊመንት እንድሕር ወሲደ ጥዕናይ ዝተሐለወ ንክከውን ይጠቕመኒ እዩ	1	2	3	4	5
803	ፎሊክ አሲድ ሰፕሊመንት እንድሕር ወሲደ ጥዕኑ ዝተሐለ ቆልዓ ንክወልድ ይጠቕመኒ ቐሊሉ ከዓ ምን ምን ሕክምና ንካልኦት ነገራት ዘውፅአ ነገር አይህልወንን	1	2	3	4	5

ታሽዓይ ክፍል፡-አዩታት ኩሉ ግዘ ፎሊክ አሲድ ሳፕልመንት ንከይወስዳ ዝገብርወን ነገራት ዝጥይቑ ሕቶታት

ተ.ቑ	ጥያቄ	መልሲ				
901	ፎሊክ አሲድ ሰፕሊመንት መአዝ ክወስዶ ከም ዘለኒ አይፈልጥን	1	2	3	4	5
902	ፎሊክ አሲድ ሰፕሊመንት ባፅሉ ክባር እዩ ዝመስለኒ	1	2	3	4	5
903	መአዝ ክም ዝጠንስ ስለዘይፈለጥ ፎሊክአሲድሰፕሊመን ት ምውሰድ ኩሉ ግዘ ይከብደኒ እዩ	1	2	3	4	5

ዓሰራይክፍል፤አዴታት ኩሉ ግዘ ፎሌት ዘለዎም ምግብታት ናይ ምምጋብን ፎሊክአሲድሳፕልመንት ናይ ምውሰድን ዘለወን ዓርሰ እምነት ዝምርምር ጥያቄ

ተ.ቑ.	ጥያቄ	መልሲ				
1001	ኩሉ ግዘ ፎሊክ አሲድ ክወስድ ከም ዝክእል እንርግጠኛ እየ	1	2	3	4	5
1002	እንርሕር ደልየ መአዝ ክጠንሰ ከም ዝኽእል አቂደ ፎሊክ አሲድ ሳፕሊመንት ክወስድ ይክእል እየ	1	2	3	4	5

ክፍሊ ዓሰረተ ሓደኑ አዴታት ፎሊክ አሲድ ሳፕሊመንትን ፎሌት ዘለዎም ምግብታትን ንክምገባ ዘዘኻኽርወን ነገራት

ተ.ቑ	ሕቶ	መልሲ				
1	ናብ ዶክተር አብ ዝመፃእኩሉ ግዘ ፎሊክ አሲድ ሳፕሊመንት ክወስድ ከምዘለኒእንድሕር አስታዊሱኒ ኩሉ ግዘ ክወስድ ይክእል እየ	1	2	3	4	5
2	አብ ቴሌብኧፐን ብዛዕባ ፎሊክ አሲድ ዝምልከት እንድሕር ሪአ ኩሉ ግዘፎሊክ አሲድ ሳፕሊመንት ክወስድ ይሕግዘኒ እዩ	1	2	3	4	5
3	አዕርክተይፎሊክ አሲድ ሳፕሊመንት ክወስድ ከምዘለኒ እንድሕር አስታዊሶሙኒ ኩሉ ግዘ ፎሊክ አሲድ ሳፕሊመንት ክወስድን ይክእል እየ	1	2	3	4	5
4	አብ ፖስተራትን በረርርቲ ወረቀትን ብዛዕባፎሊክ አሲድ ሳፕሊመንትን ዘዉጠንጥኑ ፅሑፋትን ምስልታትን እንተሪአፎሊክ አሲድ ሳፕሊመንት ንክወስድን የስታዉሱኒ እዩም	1	2	3	4	5
5	አብ ሬድዮ ብዛዕባ ፎሊክ አሲድ ዝምልከት እንድሕር ሰሚዐ ፎሊክ አሲድ ሳፕሊመንት ክወስድ ይሕግዘኒ እዩ	5.				

1. ብጣዕሚ አይስማዕማዕን፣ 2. አይስማዕማዕን፣ 3. ምንም 4. ይስማዕማዕ 5. ብጣዕሚ ይስማዕማዕ

ANNEX 5: Declaration

I, the under signed, declare that this thesis is my original work, has not been presented for a degree in any other university and that all resources of material used for this thesis have been fully acknowledged.

Name of the student: _____

Date. _____ Signature _____

Place: Addis Ababa University

This thesis has been submitted for examination with my approval as University Advisor.

Name of the primary advisor: _____

Date. _____ Signature _____