

**KNOWLEDGE AND USE OF FOLIC ACID AMONG FEMALE  
STUDENTS OF REPRODUCTIVE AGE IN LEAD CITY UNIVERSITY,  
IBADAN, OYO STATE**

**BY**

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## DEDICATION

This project is dedicated to God Almighty. May all glory and honour be unto Him.

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## ABSTRACT

Folic acid (FA) is one of the micronutrients required by women of reproductive age (WRA) and its deficiency is associated with an increased risk of a woman having a child with Neural Tube Defects (NTDs). Evidence has shown that many WRA have insufficient information and are unaware of the importance of FA to the health of their unborn children. Therefore, this study was designed to assess knowledge and use of FA among female students of reproductive age in Lead City University Ibadan (LCU), Oyo State.

A descriptive cross-sectional study was conducted in a purposively selected higher institution (LCU), Ibadan. Using a three-stage random sampling technique 418 female students were proportionally selected from different departments. A semi-structured, self-administered questionnaire was used to elicit information on respondents' socio-demographic characteristics, use of FA, perception and factors influencing its use. Scores were categorised using the mean as cut-off. Knowledge of FA was measured on a 19-point scale; scores  $<11$  and  $\geq 11$  were categorised as poor and good, respectively. Perception was measured on a 16-point scale; scores  $<10$  and  $\geq 10$  were categorised as negative and positive. Quantitative data were analysed using descriptive statistics, logistic regression and Chi-square tests at  $p=0.05$ .

Respondents' age was  $22.0 \pm 3.6$  years and 93.6% were single. Respondents' mean knowledge score was  $10.0 \pm 2.3$  and 66.3% had poor knowledge. About seven per cent correctly defined FA and 78.5% reported that folate could be obtained from balanced diets that include fruits and vegetables. About 87.0% did not know the best time to take FA and less than half (41%) reported that one benefit of taking FA before pregnancy is to prevent NTDs. All respondents perceived that FA is important for their health and proper development of their future children while 67.2% stated that using FA was one way to prevent anaemia in pregnancy. Only 42 (10.0%) of the respondents use FA daily and 20 (48.0%) of these received prescription from a medical professional. Over half (56.2%) indicated that they had not received prior information regarding FA use, but would be motivated to use it if they receive information on its benefits. The proportion using FA was significantly lower among single respondents (5.4%) than those

that are married (80.8%). Logistic regression showed that respondents who were single were less likely to use FA than those who were married (OR =0.011; CI = 0.01-0.04).

This study has shown that knowledge and use of folic acid were poor among respondents. Appropriate health education intervention such as organising routine health seminars about importance of folic acid use among female students of reproductive age is recommended.

**Keywords:** Folic acid, Women of reproductive age, Female students, Private Tertiary institution

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**Hope Omokhoshe AIYEJINA**

## CERTIFICATION

I certify that this work was carried out by Hope Omokhoshe AIYEJINA in the Department of Health Promotion and Education, Faculty of Public Health, College of Medicine, University of Ibadan, Nigeria under my supervision.



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## CHAPTER ONE

### INTRODUCTION

#### 1.0 Background of the study

In the past 20 years, Micronutrients have assumed significant public health importance. Micronutrients are nutrients required by humans throughout life in small quantities to orchestrate a range of physiological functions (Canadian UNICEF Committee 2006). Micronutrients are found naturally in a variety of plant- and animal-based foods. Although they can now be synthesized in the laboratory, a varied diet typically provides all of the vitamins and minerals necessary for human health. No single food contains all the vitamins and minerals, therefore a balanced and varied diet is necessary for proper organ and tissue development. Proper intake of vitamins and minerals can mean the difference between a healthy, productive life, and a life fraught with illness, because micronutrients play crucial roles in the development and expression of immune responses, selected micronutrient deficiencies can cause immunosuppression and thus increased susceptibility to infection and disease.

Micronutrient deficiencies, which affect over two billion people around the globe today, are the leading cause of mental retardation, preventable blindness, and death during childbirth (Project Healthy Children 2012). According to the findings of Project Healthy Children they are responsible for neural tube defects – the second most prevalent class of birth defects in the world and play a significant role in reducing the most common form of birth defects.

Nutritional deficiencies have become more prevalent following economic stress and food insecurities faced by populations in developing countries. Most at-risk groups include children less than 5 years of age, adolescents, women of childbearing age, particularly the pregnant and lactating, refugees and victims of famine (Dairo and Ige, 2009). The benefits of medicine and micronutrient nutritional supplement before and during pregnancy are not restricted to the recovery of maternal health but also result in some advantages for the foetus

as well, because the maternal well-being is important for the optimal development of the foetus (Marta, Anra, Peter, Muller and Tomas, 2008).

According to the Centres for Disease Control and Prevention (CDC), all women capable of becoming pregnant should receive 400 mcg of folic acid daily to reduce the incidence of neural tube defects (CDC, 1992). The recommendation highlighted three ways that women can get folic acid: diet, vitamin supplements, and flour fortification. Experts agreed that getting 400 mcg of folic acid from naturally-occurring food sources alone was impractical as women would have to eat a lot of folate-rich foods which are expensive and not readily available in many communities.

However, even after the mandated fortification of food products in 1998, it has been estimated that women consuming a healthy, balanced diet may only receive 25% of the recommended daily amount of folic acid through food alone (Werler, Louik, and Mitchell, 1999), and fewer than 10% of all women received the recommended amount of daily folic acid through their chosen diet (Yang, Carter, Mulinare, Berry and Friedman, 2007).

The bioavailability of naturally occurring folate in foods is very low, so achieving this level of consumption is difficult without supplementation. Because the neural tube develops during days 22-28 of pregnancy, before most women realize that they are pregnant, health ministries in many countries recommend all women of reproductive age consume at least 400 mcg of supplemental synthetic folic acid daily, in addition to a folate rich diet. If continuous supplementation is not possible, experts suggest that women begin folate supplementation at least one month before becoming pregnant.

## 1.1 Statement of problem

Folate deficiency is a problem in some parts of Western Africa, India and Burma (Sloan, Jordan and Winifoff, 1992). In a Kenyan study, 6–8% of anaemia in pregnancy was related to folate deficiency among the 48% of pregnant women found to be anaemic (Calloway, 1988). There have been efforts over the years to encourage women of reproductive age to use folic acid supplements to prevent birth defects; research shows that supplementation is still underutilized by non-pregnant women (Chan, 2001).

According to the centre for Disease control and prevention (CDC), all women capable of becoming pregnant should receive 400mcg of folic daily to reduce the incidence of neural tube defects (CDC, 1992). The recommendation highlighted three ways that women can get folic acid: diet, vitamin, supplements and flour fortification. Despite the mandatory fortification of cereal products that has been in effect in developing and developed countries, it is estimated that between 68 and 87% of women of childbearing age take less folic acid than recommended (Lewis and Nash, 1997).

In 1995, CDC reported that approximately 52% of reproductive-age women were aware of the term folic acid, and this increased to 80% in 2002 (March of Dimes, 2002). However, just 20% of women participating in a 2002 March of Dimes survey knew that folic acid could prevent certain birth defects, and the proportion who stated that they took a vitamin supplement containing folic acid daily increased from 25% in 1995 to only 31% in 2002 (March of Dimes, 2002). These findings indicate that educational efforts directed at women of reproductive age might have had an impact on knowledge and to a lesser extent on behaviour.

The US based March of Dimes estimates that more than 300,000 neural tube defects happen every year worldwide, including an estimated 12,695 in Nigeria. Based on this estimate, the prevalence of neural tube defects in Nigeria is 27/10,000 births (Flour Fortification initiative, 2012). Neural tube defects are the largest group of anomalies of the central nervous system and are a major cause of morbidity and mortality in infants, worldwide (Molloy, 2005). In Nigeria, preconception care by women who are planning to get pregnant is virtually non-

existence as prescription of Folic acid is centred at women with high risk of NTDs (Anzaku, 2013).

## 1.2 Justification of the study

Health behaviours of individuals are influenced by knowledge and perceptions. There are various predisposing factors that influence such health related behaviours. Although there has been a general increase in recent years in the rate of folic acid supplementation by women of all ages, there is still low overall awareness and usage in younger age groups.

According to polls taken by multiple groups, including the March of Dimes (March of Dimes, 2002), women of reproductive age state that the recommendation of a physician or other health-care provider would positively influence their decision to take folic acid-containing dietary supplements. However, only a minority of women who are currently using a supplement identify their physician as a source of information. In a time when many women aged 18-24 have both intended and unintended pregnancies it is clear that new approaches are needed to educate young women and make educational information available, comprehensive and easily understood by everyone (Hilton, 2007).

According to a study of non-pregnant women conducted by the March of Dimes Foundation and reported by the CDC, 18- to 24-year-olds have not only the lowest reported daily folic acid use (30% vs. 47% of women ages 25-34 years and 40% of women ages 35-45 years but the younger women also have the least amount of knowledge regarding the importance of supplementation (CDC, 2007).

Hilton, (2007) found that even women in this young age group who are seeking a higher level of education at colleges and universities are unaware of the importance of folic acid, and are therefore not using adequate amounts. Because women aged 18-24 years have the highest rate of unplanned pregnancies (Finer and Henshaw, 2006), they should be encouraged to use daily folic acid supplements regardless of their pregnancy intent.



Data collected by the CDC (2006) suggested that young women in the 18-24 years age bracket were not planning a pregnancy in the near future and were therefore 'non-contemplators'. During teen years, young women may experience difficulty in understanding consequences of their actions and difficulty in making decisions (Berk, 2001) because of the developmental limitations identified by both Erikson and Piaget young women aged 18-24 years may not possess the cognitive ability to understand the consequences of unsafe sex, the importance of FA and the consequences of inadequate FA intake in pregnancy.

Although the CDC's report calls attention to the need for increasing awareness in younger women of childbearing age, it does not address possible reasons why women aged 18-24 years are less likely not only to use folic acid, but also to have any knowledge regarding the health benefits of folic acid supplementation. A lack of knowledge regarding the importance of folic acid may lead to poor pregnancy outcomes.

In Nigeria, previous studies have focused on pregnant women; there is dearth of information on knowledge and use of Folic acid intake among young and non-pregnant women because it is often associated with only women who are pregnant. This is a pointer for public health sector to increase enlightenment of the general populace especially women about the peri-conceptual importance of folic acid intake among women of reproductive age so as to effect a positive attitudinal change among them (Anzaku, 2013).

Therefore, this study would provide information as regards the folic acid knowledge, consumption practices and beliefs among women of reproductive age in a tertiary institution.

### **1.3 Research Questions**

A number of research questions were framed to guide the design and conduct of this study. They are as follow:

1. What is the knowledge of female students of reproductive age on the importance of folic acid intake during preconception?
2. What is the pattern of use of folic acid among the reproductive age female students?
3. What factors influence the use of folic acid among the reproductive age female students?
4. What are the perceived benefits associated with intake of folic acid among female students of reproductive age?

### **1.4 General Objective**

To investigate the understanding of importance of folic acid intake among a sample of female students of reproductive age in Lead City University, Ibadan, Oyo State.

### **1.5 Specific Objectives**

The specific objectives were to:

1. To assess the knowledge of female students of reproductive age on pre-conceptual importance of intake of folic acid
2. To determine the pattern of use of folic acid among female students of reproductive age.
3. To identify the factors that influence use of folic acid among female students of reproductive age
4. To assess perceived benefits associated with intake of folic acid among female students of reproductive age.

### **1.7 Research Hypotheses**

The formulated hypotheses were as follows:

1. There is no significant relationship between marital status and use of folic acid supplement.
2. There is no significant relationship between level of study and knowledge of folic acid.
3. There is no significant relationship between economic status and use of folic acid.

## CHAPTER TWO

### LITERATURE REVIEW

Despite efforts over the years to encourage women of reproductive age to use folic acid supplements to prevent birth defects, research shows that folic acid supplementation is underutilized by non-pregnant women (Chan, 2011). Nowadays, folic acid deficiency is one of the most common vitamin deficiencies among women. Women who consume a low level of folic acid during pregnancy are at risk for poor pregnancy outcomes, such as neural tube defects. Definitive evidence that supplementing with folic acid can prevent neural tube defects (NTDs) comes from the results of randomized controlled trials. There is an inverse dose-response relationship between folate status and risk of NTDs (Wald, 2004).

Folate status throughout pregnancy has important implications for maternal, fetal and neonatal health. Folate responsive megaloblastic anaemia has been reported in 2.5–5% of un-supplemented pregnancies in the developed world and in 24% in parts of Asia, Africa and Southern and Central America. Low folate status is associated with low birth weight, (McNulty, H, Cuskelly G, and Ward, M 2000), and with a variety of other birth defects (Buttruss, 2004). This knowledge has led governments around the world to recommend folic acid supplementation for women of childbearing age, particularly those considering pregnancy. The crucial message is the need for periconceptional folic acid, as once a pregnancy has been confirmed it is probably too late for folic acid to be protective (Wald, 2004).

Pregnancy is associated with increased nutritional needs due to the physiologic changes of the woman and the metabolic demands of the embryo/fetus. Proper maternal nutrition during pregnancy is thus imperative for the health of both the woman and the offspring. Maternal malnutrition during pregnancy has been associated with adverse outcomes, including increased risk of maternal and infant mortality, as well as low birth weight newborns (<2,500 grams) — a measure that accounts for preterm birth and intrauterine growth restriction of the fetus (Kramer, 2003).

Some nutrient deficiencies have also been linked to congenital anomalies and birth defects. In addition, gestational under-nutrition has been implicated in increasing the offspring's susceptibility to chronic disease (i.e., type 2 diabetes, hypertension, coronary artery disease, and stroke) in adulthood, a phenomenon sometimes called Barker's hypothesis, the thrifty phenotype hypothesis, or the foetal origin of adult disease hypothesis (Kanaka, 2010).

Maternal under-nutrition often refers to malnutrition caused by insufficient energy intake from macronutrients (carbohydrates, protein, and lipids) during pregnancy, but micronutrient deficiencies are also a form of under-nutrition. Multiple micronutrient deficiencies commonly co-exist in pregnant women, especially in less developed nations (Christian, 2010).

### 2.1 What is Folic Acid?

Folic acid is the term used to describe the synthesized form of folate that is added to fortified foods and supplements. Folate is a water-soluble vitamin that is involved in the transfer of one-carbon unit required for amino acid metabolism, and other important reactions. Folate is a term used to describe naturally occurring folate which is found in foods (Bailey, Moyers and Gregory, 2001).

Folic acid (FA) a member of the vitamin B complex is a water soluble B vitamin with no known toxicity. Initially, when first discovered in 1930, folic acid was called 'Wills Factor'. Later this substance was isolated from spinach leaves and named folic acid derived from the Latin folium meaning leaf. Folic acid was first synthesized in 1945 (Czeizel, 1995), the synthesized compound used in dietary supplements and fortified foods. Its counterpart folate however occurs naturally in some foods such as oranges, dark green leafy vegetables, and liver (Hilton, 2007). Humans cannot synthesize folic acid and must depend on secondary sources for adequate amounts (Locksmith and Duff 1998; Tinkle and Sterling, 1997).

Folate is required for DNA synthesis and cell division, red blood cell formation, some metabolic reactions involving lipids (fats) and amino acids (proteins), and it functions as a coenzyme. Folic acid is absorbed in the proximal part of the small intestine and stored in the liver and cerebrospinal fluid (CSF). About 4-5 microgram is excreted daily in the urine; the mean dietary intake is about 0.1-0.2mg a day (Wardlaw, 2004).

Adequate folate intake is important to maintain good health and help prevent diseases; it aids in the synthesis of deoxyribonucleic acid (DNA) and is required for the production of red and white blood cells (Mahan and Escott-Stump, 2004). Because of its role in normal cell division, folate is very important during pregnancy for the rapidly dividing embryonic cells. Consuming sufficient folate before and during early pregnancy can help prevent neural tube defects such as spina bifida and anencephaly (Wolff, Witcop, Miller and Syed, 2009).

Hibbard and Smithells first published the association between folic acid deficiency and spina bifida in 1965 (Hibbard and Smithells 1965). Since then, it has been conclusively shown that maternal folic acid supplementation during the periconceptional period significantly reduces the risk of spina bifida and other neural tube defects by 86 to 72% in high risk and in normal pregnancies. A recent systematic review of live trials, including 6,105 women, found that periconceptional folic acid supplementation, alone or with other micronutrients, was associated with a 72% lower risk of neural tube defects (De-Regil, Fernandez-Gaxiola, Dowswell and Pena-Rosas, 2010). While the optimal dose of folic acid for NTD prevention is not yet known, doses of less than 1 mg/day of folic acid; the level set as the tolerable upper intake level for adults are used to prevent NTDs in healthy women (Czeziel, 2009).

The effect of folate status on pregnancy outcomes has long been recognized (Chamarin, 1971). Studies conducted in the 1950s and 1960s led to the recognition that supplementing with folic acid reduced the prevalence of folate deficiency in pregnancy, and prenatal folic acid supplementation in the second and third trimesters became a common public health measure. In 1970, the US Food and Nutrition Board recommended folic acid supplementation (200-400 µg/d) for pregnant women, and this became a common practice in developed countries and substantially reduced pregnancy-induced severe folate deficiency, which can lead to megaloblastic anaemia. Prenatal folic acid, along with iron, supplementation reduced the prevalence of the most common pregnancy-related deficiencies such as Neural Birth Defects (NTDs).

A few other studies have shown benefits of multiple supplements in preventing cleft palate and other types of birth defects (Li, Guoti, Baker and Brody, 1995; Shaw, Schaffer and Velic, 1995; Yang, Carter, Mulinare, Berry and Friedman, 2007). Improving micronutrient status,

especially folate status, prior to pregnancy would therefore help decrease infant mortality through the reduction in these defects.

Women motivated to take a multivitamin for its benefits often end up supplementing with folic acid as a by-product. This would account in part for the similar levels of use between pregnancy intenders and non-intenders. It sheds less understanding on why both groups are far below desirable levels of use. The emphasis on increasing awareness arose from evidence such as the 1998 March of Dimes survey, which found only 68% of 2,115 women ages 18–45 had even heard of or read about folic acid (Petrini, Damus, Johnson and Mattison, 1999). A survey conducted in 2001 of 1,196 Texas women of childbearing age found that 78% had heard of folic acid, but just 28% knew that it prevents birth defects, and only 25% knew to take it before pregnancy (Canfield, Przybyla, Case, Ramadhan, Suarez and Dryer, 2006).

## 2.2 Folic Acid Deficiency

Folic acid deficiency is one of the most common vitamin deficiencies among women (Oriol, Sonia, Montserrat, Llorenc, Vicenc, 2004). Women who consume a low level of folic acid during pregnancy are at risk of poor pregnancy outcomes, such as neural tube defects (NTDs). There are many causes of folate deficiency. The condition may result from a failure to meet the increased bodily demand during pregnancy and lactation (Food Standards Agency, 2003). Folate deficiency may also be caused by a genetic condition and may result in abnormal absorption, excretion or metabolism of folate. The negative consequences of inadequate folate during pregnancy include impaired foetal growth and development, neural tube defects (NTDs) including spina bifida and anencephaly and possibly other congenital anomalies including cleft lip and palate and some heart defects (CDC, 2011).

The risk of having a baby with an NTD is higher for women with a previous pregnancy affected by NTDs. Other risk factors for NTDs are overweight and obesity, diabetes, use of some anti-seizure medications and exposure to prolonged high temperatures early in pregnancy (Kurtzweil, 1996).

## 2.3 Prevalence of Folic acid Deficiency

There is insufficient knowledge about the global prevalence (or national prevalence, for that matter, in many countries) of folate deficiency due to a lack of data. One reason for this lack

of data may be due to the fact that there are few proxy measures for folate deficiency. Unlike vitamin A, iron, and even zinc deficiency, which use a number of ecological and demographic risk factors in combination to assume deficiency, folate suffers from a lack of such proxies. This therefore, necessitates blood draws in order to determine folate status. Neural tube defect rates could, theoretically, be used as an indicator of folate deficiency; however most countries lack this data as well. Using folate intake as an indication of folate status has proven to be difficult due to the complexity of measuring the folate content of foods (Project Healthy Children 2012).

## 2.4 Folate and General Health

Folate is a water-soluble vitamin that is involved in the transfer of one-carbon units required for amino acid metabolism, and other important reactions. Folate is a term used to describe naturally occurring folate which is found in foods, while folic acid is the term used to describe the synthetic form of folate that is added to fortified foods and supplements (Bailey, Moyer and Gregory, 2003).

Adequate folate intake is important to maintain good health and help prevent some congenital diseases. Folate aids in the synthesis of deoxyribonucleic acid (DNA), provides methyl groups for the conversion of homocysteine to methionine (this also requires vitamin B12), and is required for the production of red and white blood cells (Mahan and Escott-Stump, 2004). However, a folate deficiency may lead to impaired DNA synthesis, reduced cell division and megaloblastic anemia. Symptoms of deficiency may include weakness, depression, neuropathy, skin lesions and poor growth. Folate deficiency may also lead to homocysteinemia, which is associated with occlusive vascular disease (Mahan and Escott-Stump, 2004).

High folate diets and blood folate levels have been associated with a decreased risk of certain cancers, particularly colorectal cancer. Animal studies have shown that dosage and timing of folate supplementation are important factors; high dosage supplementation after neoplasms develop may actually promote carcinogenesis, while moderate supplementation in normal yet folate deficient cells may help prevent carcinogenesis (Kim, 2003). There has been some debate as to whether the decreased risk of colorectal cancer is due mostly to high folate diets

or more attributable to higher fibre intake. Researchers have reported that while folate from food may protect against colorectal cancer, additional folate from supplements offered no added protection (Bingham, 2006).

## 2.5 Safety of Folic acid

As it is a water soluble vitamin, folic acid is considered generally safe, even at doses of about 10–20 mg/d. However, adverse effects may occur in groups being treated with drugs that interfere with folate metabolism and in individuals at risk of B12 deficiency (typically elderly people), in whom the existence of B12 deficiency can be masked by reversal of the haematological signs and symptoms by folic acid, allowing the peripheral neurological symptoms to develop unnoticed. As a consequence, the safe upper level has been set at 1000 mg/d, for guidance (Food Standards Agency 2003).

The level of fortification mandated in the USA was set at 140 mg/100 g and this was assumed to result in an increase in daily intake of 100 mg. The level was chosen so as to limit exposure to <1000 mg/d in almost everybody, i.e. the level regarded as safe. But evidence exists that the actual fortification level in grain is much higher (Rader, Weaver and Angyal, 2000), i.e. by at least 20%. Indeed some estimates referred to by Rader and colleagues suggest that typical daily intakes of total folate have gone up by as much as 200 mg/d. Hence, they suggest that many people may be exceeding the 1000 mg/d level. It should also be noted that folic acid, the synthetic form of folate (PGA), is not a natural coenzyme, and the long-term biological effects of exposure to unmodified synthetic folate need to be established (Luecock, 2004). The body metabolises PGA into methylfolate, the normal form of the vitamin transported in plasma. However, this transformation process appears to be saturable at doses of about 400 mg/d (Kelly, McPartin and Goggins, 1997). Hence, at higher doses, unmodified PGA is assumed to be transported into the bloodstream, the impact of this on long-term health needs consideration.

## 2.6 Neural Tube Defects

The term neural tube defect describes any malformation of the embryonic brain and/or spinal cord, including spina bifida, anencephaly and encephalocele. It develops early in pregnancy, specifically before the sixth week of gestation. Normally the foetus develops cephalocaudally,



with the first fusion of the neural tube actually proceeding in both cranial and caudal directions. The neural tube is essentially open at both ends and closes during the fourth week after fertilization (Lowdermilk and Perry, 2006).

Neural tube defects are among the most serious congenital factors contributing to infant mortality and serious disability, occurring in over one quarter of a million newborns per year, worldwide. The two most common types of NTDs are anencephaly and spina bifida. A child with anencephaly cannot survive, and dies before birth or shortly afterwards. A child with spina bifida can survive, but often has serious functional abnormalities, and may be mentally retarded, lower limb paralysis or poor bladder control throughout their entire life.

There is an inverse dose-response relationship between folate status and risk of NTDs (Wald, 2004). This knowledge has led governments around the world to recommend folic acid supplementation for women of childbearing age, particularly those considering pregnancy. The crucial message is the need for periconceptional folic acid, as once a pregnancy has been confirmed it is probably too late for folic acid to be protective (Wald, 2004).

The discovery that the intervention with folic acid supplementation can prevent NTDs has granted the chance of essentially eliminating these common congenital defects, if the efforts to increase intake of FA are successful. Daily consumption of a supplement containing 400 µg of folic acid prior and during the first trimester of pregnancy has been shown to be effective in preventing both the re-occurrence and occurrence of neural tube defects (MRC, 1991). However, NTDs occur during days 22 - 28 of foetal development, before most women even know that they are pregnant, hence, initiating FA supplementation after the first month of pregnancy is considered too late to prevent NTDs (de Jong-van den Berg, Hernandez-Diaz, Werler, Louik, Mitchell 2005).

The current recommended dietary allowances for pregnant women, or those planning pregnancy is 600 µg daily (Rolfes, 2009). Oakley, 2002 estimated that globally, 500,000 children are born each year with spina bifida and anencephaly, two of the most common and severe birth defects.

Folic acid supplementation appears to correct a disturbance in folate metabolism rather than a shortage of dietary folate. While it is accepted that maternal folate deficiency is not alone the underlying cause of neural tube defects, lower plasma and red cell folate concentrations have been observed in mothers carrying affected foetuses (Kirke, Molloy, Daly, Burke, Weir and Scott, 1993) and the risk of having an affected child was shown to be inversely proportional to maternal early pregnancy red cell folate concentration (Daly, Kirke, Molloy, Weir and Scott, 1995). Its intake also prevents anaemia and peripheral neuropathy including possibly preterm deliveries (Greenberg, Bell, Guan, Yu, 2011).

Neural tube defects have a multifactorial aetiology incorporating a combination of genetic and environmental factors, such as nutrition. It is now generally accepted that between 50% and 70% of affected births are preventable by maternal intake of sufficient FA before and during early pregnancy. The unequivocal evidence for this is based on a substantial number of interventional trials and case control studies during the past two decades (Molloy, 2005)

Pregnancy planning is an ideal time to adopt behaviours that could improve the health of both the mother and the foetus (Roats, Thorpe, Hurten and Elliot, 1998). However, pregnancy planning is a complex, multidimensional concept. The main goal of preconception care is to provide health promotion, screening, and interventions for women of reproductive age to reduce risk factors that might affect future pregnancies.

Educational campaigns using different channels of communication have been used to promote intake of folic acid before and during pregnancy, but their impact appears to be variable (Bailey, 2001). While many women of reproductive age worldwide may be aware of the potential benefits of folic acid during pregnancy, (Gupta and Gupta 2004) their compliance with recommendations remains low (Brackke 2003; Coll, Pisa, Palacio, Quinto and Coronch, 2003; O'Leary, Donnell and Johnson, 2001; CDC 1996).

## 2.7 Knowledge on Use of Folic Acid among Women of Reproductive age

A study conducted by Anzaku in Jos (North Central) Nigeria in 2013 reported that about 64.6% pregnant women interviewed in the study had good knowledge as regards Folic acid supplementation and its importance to both mother and child. However, only 7.4% consistently took it during the preventive period against NTDs.

Many studies have been conducted throughout the world to assess the knowledge regarding preconceptional use of folic acid among different populations. Most of these showed there was a lack of knowledge about folic acid and its uses. This lack of knowledge was dependent on place of treatment (public/private), ethnicity, socioeconomic background, educational status and previous history of fetal demise (Canfield et al., 2006).

Although education is significantly correlated with both knowledge about folic acid function and with folic acid intake, it is not associated with knowledge of correct folic acid timing. One possible explanation is that education is a proxy for many socio-demographic variables that increase general knowledge relating to healthy pregnancies and access to folic acid tablets, but details of proper folic acid use comes from specific counselling from medical professionals. If better knowledge of folic acid timing comes from more aggressive and detailed knowledge transfer from doctors, this may be an important indication for the need to encourage health workers to educate every woman of reproductive age about the function and timing of folic acid supplementation. In a study by Wu, Brat. Milla and Kim (2007) the health workers surveyed in the study counsel only half of their reproductive-aged women about folic acid function and timing (Wu et al., 2007). A paramount goal of health professionals should be conveying the need to begin folic acid supplementation at least one month before conception.

The media which has an advantage of reaching a larger populace that includes young women who intend to get married with aim of preparing them for motherhood thereby contributing to the overall correct information on use of folic acid for the primary prevention of NTDs in the country. A survey carried out among Croatia women reported that most of the respondents received information from the media (Gjergja, Stipoljev, Hafner, Tezak and Luzar- Siffler, 2006). However differences may occur in various countries may be related to differing levels of public health advertising in the media in these countries.

A study by Garden-Robinson and Beauchamp (2011) assessed changes in folic acid awareness, knowledge and behaviour among women of childbearing age which followed a

state-wide education intervention that used mass media and printed media as its method of disseminating information. They conducted pre- and post- intervention surveys and results showed an increase in folic acid knowledge and supplement intake. They also reported a reduction in perceived barriers to taking a folic acid supplement. The most commonly reported perceived barriers in their study to taking a folic acid supplement included forgetting to take it, and not knowing why they need to take it.

Watkins et al. (2004) provided free folic acid supplements at family planning clinics. An increase in knowledge occurred in their study, but there was no increase in reported consumption of supplements or increase in serum folate levels. The study did find that more knowledge of folic acid correlated to increased consumption.

Also in a study conducted by Riazi, Saed and Amin (2012), high level of knowledge was found in the group of 20-24 years old as compared to older age group. This goes to show that younger women may become more receptive to information regarding folic acid as they would want to become pregnant in the near future.

Among Thai pregnant women, some were aware of the need to take folic acid, but only few knew that folate was something important. The study also demonstrated education of mother was the strongest predictor of having taken folic acid during the correct period (Bower, Miller, Payne and Serna, 2005).

### **2.8 Use of Folic acid among Women of reproductive age**

Several studies have shown that despite average to high knowledge of Folic acid many women of reproductive age do not consume folic acid pre-conceptionally. Several studies have shown that there is poor use of folic acid among women of reproductive age. One of such studies was conducted in Turkey and it reported that only 8.9% of non- pregnant women indicated that they were taking a Folic acid (Zeynep, Ahmet, Serpil and Iskenderci, 2010).

A survey conducted between September 2004 and March 2005 of 2,002 women 18 to 45 years of age in central Pennsylvania as part of Central Pennsylvania's Women's Health Study,

found that 42% of women overall indicated they used folic acid supplements similar to national levels (Weisman, Hillemeier, Chase, Misra, Chuang and Parrott, 2006). For women 18–34 years capable of becoming pregnant, 41% of women reported use in the preconception period, compared with 48% of interconceptional, suggesting that for women who have had a child and are considering another pregnancy sometime in the future, the salience of supplementation was likely introduced during the first pregnancy rather than before the first pregnancy (Weisman et al., 2006).

In another study conducted by Simin 2011, it was reported that out of the 359 participants who used folic acid supplements, only 25.07% and 34.82% reported taking folic acid supplements periconceptionally (one month prior to the pregnancy) and during first trimester, respectively. Also, in Nigeria Rabiu, Tihamiyu and Awoyinka interviewed 200 women, none of them used Folic acid in the preconception period (Rabiu et al., 2012). In a study conducted by Bower, Miller, Payne and Sema 2000, it was recorded that Folic acid consumption rose between 12.4% and 25.3% after public health campaigns. Nevertheless, the percentage of women taking periconceptional folic acid as prescribed ranged from 13% to 57%. This suggests that >43% of women were not taking folic acid as prescribed after public health campaigns (Amitai et al., 2004).

A survey by Roy et al., 2006 indicated that only 27.6% had initiated folic acid use before pregnancy however only a few proportion of these women continued with the use of the supplement till the third trimester (Roy, Stein, Vollset, Hakon, Gjessing et al., 2006). In Australia, although 62.3% of women were aware of the correct message regarding intake of folic acid before pregnancy, only 28.5% reported taking adequate folic acid from supplements each day in the peri-conceptional period (Chan, 2001).

### **2.9 Perceived benefits of Folic acid among Women of reproductive age**

Women motivated to take a multivitamin for its benefits often end up supplementing with folic acid as a byproduct. This would account in part for the similar levels of use between pregnancy intenders and non-intenders. It sheds less understanding on why both groups are

far below desirable levels of use. Public health initiatives have organized around emphasis on a negative role model whose failure to supplement leads to negative outcomes; birth defects.

In a study conducted in China about 49.7% women of reproductive age knew the benefits of Folic acid (Huan, Duan, Shu, Zhou and Xiatan, 2011), also a survey conducted in Tabriz reported that about 54% of the participants knew that folic acid was useful for foetal health, 19.5% reported the preconception period as the most important time for folic acid effects on foetal growth and development and 33% reported the first trimester as important in this regard (Simin, 2011). Another study conducted by Cleves, Hobbs, Charlotte, Collins and Breck (2004) reported that although 61.8% of women reported to be aware of the protective effect of folic acid in preventing birth defects, only 27.1% of these women and 22.7% of all women reported taking folic acid or multivitamins daily.

Also, a study by Bener, Maadid, Al-Bast and Al-Mamri (2006) reported that 53.7% of respondents had heard of folate and only half of the subjects knew that folic acid was something important about 14% knew that folic acid can prevent hirth defects. Awareness about periconceptional folic acid and its benefit was very low (8.7%) among women of United Arab Emirates and its use was even less( In Iran, more than half of study pregnant women were aware that folic acid was beneficial for the foetus, although only 15.4% knew it could prevent NTDs. Only a fourth who used folic acid believed it was most useful when taken pre-conceptionally (Simin, 2011).

## **2.10 Factors that Influence Folic Acid use among Women of Reproductive Age.**

### **2.10.1 Level of Education**

Effective FA intake was six times higher than among less educated women (De Jong-Van den Berg et al., 2005) level of education had significant effects on the awareness of the participants about the necessity of folic acid supplementation during pregnancy and also with folic acid use. A study by Simin, Maryam and Mohammed in 2007 showed that participants with university education correctly identified the time as pre-conceptionally and the first trimester as the best time for folic acid supplementation. Vitamin and mineral supplementation have been found to be most consistent among women who are better

educated and more affluent. This finding has persisted for two decades (Block, Cox, Madans, Schreiber et al 1988; Lindsey, Carter, Prue, Flores, Valencia et al., 2007; Slesinski et al., 1995; Stewart, et al., 1985), although education alone has been insufficient to overcome the floor effect persisting in this domain (Lindsey, Petroni, Carter, Prue and Mulinare, 2005).

Bener et al 2005 study showed that awareness of folic acid among Qatari women was significantly associated with education of the mother. Also, women with higher education (from high school to university level) knew more about folic acid, and used it more often in the periconceptional and first trimester period (Bener et al., 2005). A study among Thai women also showed that the educational level was related to the intake of folic acid during the correct period (Nawapun and Phunpong, 2007).

Vitamin and mineral supplementation have been found to be most consistent among women who are better educated and more affluent. This finding has persisted for two decades (e.g., Block et al., 1988; Lindsey et al., 2007; Slesinski et al., 1995; Stewart et al., 1985), although education alone has been insufficient to overcome the floor effect persisting in this domain (Lindsey et al., 2005).

### 2.10.2 Planned Pregnancy

Pregnancy planning is an ideal time to adopt behaviours that could improve the health of both mother and foetus. However, pregnancy planning is a complex, multidimensional concept. These discoveries led to mandated folic acid food fortification in several countries. These distinctively different uses of folic acid prenatal folic acid supplementation, periconceptional folic acid supplementation, and folic acid fortification of staple foods may well be ranked among the most significant public health measures for the prevention of pregnancy related disorders.

Research indicates that 80% of pregnancies in young women aged 18-24 years are unintended. (Kost and Forest, 1995; Reynolds, 1998). Unintended pregnancy is defined as a pregnancy that is mis-timed or unwanted (Kost and Forest, 1995). These unintended pregnancies maybe attributed or linked to any number of factors; maternal socioeconomic risk factors, less than adequate prenatal and preconception care, prenatal behaviour risk factors

and developmental stage. Unintended pregnancies that result in live births have also been associated with alcohol use and smoking during pregnancy, low birth weight and obstetric complications (Fisher, Stanford, Jameson and DeWitt, 1999).

Chanarin (1971) summarized many studies on folate nutrition and metabolism in pregnancies that were performed in the 1950s and 1960s. The general conclusion drawn from these studies was that pregnancy was associated with an increased folate demand and in some cases led to overt folate deficiency. The increase in folate requirement during pregnancy is due to the growth of the foetus and uterine-placental organs. However, dietary folate intake does not always meet the increased folate needs in pregnancy. Pregnant women exhibit rapid plasma clearance of intravenously administered folic acid. Increased folate catabolism and urinary folate excretion may also contribute to increased folate needs in pregnancy, but the findings are controversial. In seemingly similar studies, folate catabolism was reported to increase or remain unchanged in pregnancy. One group reported that excretion of folate catabolites late in pregnancy was higher than in the non-pregnant state.

A study by Pascale, Phillipe, Denise, Theophile and Helena (2002), showed that pregnancy planning was positively associated with the consumption of vitamin supplements during the preconception period. However, despite a high proportion of women being aware of folic acid and a high belief in the usefulness of supplements, only 25% of the foetuses were exposed to the recommended doses of folic acid during the critical embryonic development period. Health behaviour modifications occurred mainly after the pregnancy was confirmed. From the study it was observed that there was a significant relationship between the number of pregnancies and the participants' attitude regarding the importance of folic acid supplements for foetal growth and its use either during pre-conception period and pregnancy.

Also two studies, found out that women with an unplanned pregnancy were less likely to have used folic acid compared with other women in the study population (Sillender and Pring, 2000; Sallicrup, de la Vaga and Verdiales, 2002). However, in one study only a small proportion of women planning pregnancy took folic acid every day as opposed to no vitamin supplementation (Daltveit et al., 2004).



In 2011, World Health Organisation proposed a guideline for intermittent iron and folic acid supplementation in menstruating women. The guideline recommended that daily supplementation with iron and folic acid for a period of 3 months has been the standard approach for the prevention and treatment of iron deficiency anaemia among women of reproductive age. However despite its proven efficacy, there has been limited success with the daily regimen public health programmes, which is thought to be primarily due to low coverage rates, insufficient tablet distribution and, low adherence because of the side-effects (e.g. constipation, dark stools or metallic taste) (Gillespie, 1997).

Health promotion activities to modify personal knowledge and attitudes and behaviours related to reproductive risk factors and the use of a reproductive life plan for women and couples also was proposed. A reproductive health plan reflects a person's intentions regarding the number and timing of pregnancies in the context of their personal values and life goals. This health plan might increase the number of planned pregnancies and encourage persons to address risk behaviours before conception, reducing the risk for adverse outcomes for both the mother and the infant (Lu and Halton, 2003).

### 2.10.3 Pre-Conception Care

In 2006, Centre for Disease Control in a report recommended preconception care would improve both preconception health and preconception health care. Several of the medical conditions, personal behaviours, psychosocial risks, and environmental exposures associated with negative pregnancy outcomes can be identified and modified before conception through clinical interventions. However, better health care alone will not achieve optimal improvements in women's preconception health and reproductive outcomes.

The strong predictor of folic acid is a consultation with a health care provider before becoming pregnant. In the wake of evidence associating negative birth outcomes with the health status of women prior to conception, a shift in focus from prenatal to peri-conceptual care has contributed to efforts to increase folic acid supplementation among women of reproductive age (Brundage, 2002; Hood, Parker and Atrash, 2007).

According to studies conducted in Iran information on Folic acid the most influential factors of folic acid use were physicians and health care centres. Many women visit their obstetrician/gynaecologist regularly and receive advice on medication use. In health care centres (health houses), women receive care prior, during and after pregnancy by specially trained staff including midwives, nurse-midwives or general practitioners. The study further showed that media played a very weak role in educating our participants but since media could address a wider range of people, it is necessary to emphasize more on educational programs on radio and television and health related articles on journals and magazines. These resources could enhance awareness. Also emphasized was that the pharmacists' role as one of the most important duties of pharmacists is to provide information to the public including pregnant women. Further work is needed to heighten this important role for pharmacist and to boost the awareness of the public regarding this duty.

#### 2.10.4 Diet and Nutritional Status

A prospective study (Siega-Riz, Bodnar and Savitz, 2002) evaluated dietary intake of 2,247 women using a food frequency questionnaire of approximately 120 food items from pregnancy, infection and nutrition study. Findings indicated that 59.9% of the women consumed the recommended amount of folate. Although this study addressed the issue of FA intake from food sources the sample consisted of women in pregnancy state therefore conclusions cannot be drawn as regards non pregnant women.

One study of the dietary behaviour of college women found that 95 percent of the participants did not comply with the dietary guideline regarding the consumption of grain products, vegetables, and fruits and others found that college women had dietary folic acid/folate intakes of 156 to 248 micrograms per day, about half of the recommended amount (Kari, 2008). Women 18 to 24 years of age, whether or not they attend college, have multiple risk factors (behavioural, dietary, economic, and educational) for inadequate folic acid consumption and unintended pregnancy and, therefore, are at increased risk for having a pregnancy affected by a neural tube defect (Hilton, 2007).

According to a study conducted by March of Dimes women who were dieting were more likely to consume Folic acid than non-dieters. Dieters were 50% more likely than non-dieters to believe that folic acid is important for women of childbearing age. Women low on carbohydrates intake were 50% more likely to take folic acid daily compared to women on other diets (CDC, 2005).

#### **2.10.5 Prior Knowledge and Awareness of Folic acid**

Prior knowledge and awareness of Folic acid has been linked to whether patients use it (Sillender and Pring, 2000). One study found that participants who heard of Folic acid were more likely to believe in its benefits than those who had not. Patients' knowledge was also linked to beliefs which ultimately influenced consumption (Quillin, Silberg and Board, 2000).

The emphasis on increasing awareness arose from evidence such as the 1998 March of Dimes survey, which found only 68% of 2,115 women ages 18-45 had even heard of or read about folic acid (Petroli et al., 1999). A survey conducted in 2001 of 1,196 Texas women of childbearing age found that 78% had heard of folic acid, but just 28% knew that it prevents birth defects, and only 25% knew to take it before pregnancy (Carfield et al., 2006).

#### **2.10.6 Marital Status of Women of reproductive age**

A study conducted by McDonnell, Johnson, Doyle and Sayers (1999) reported that being married and planning a pregnancy were predictors for hearing of folic acid. Marriage and pregnancy could facilitate exposure to the folic acid message by raising awareness of issues that have a bearing on pregnancy and children.

#### **2.10.7 Socio-economic status of women of reproductive age**

Preconception folic acid was found to have increased as socio economic conditions improved (Tarnim et al., 2008) Other studies such as showed that socio-economic status, measured through several indicators such as household monthly income, maternal education, mode of payment and class of admission was associated with periconceptional folic acid supplement use (CDC 2004; Cleaves et al., 2004; Sen, Manzoor, Deviasumanthy and Newton, 2001).

## 2.11 Source of Information about Folic acid among women of reproductive age

Previous studies have shown that source of information on importance of Folic acid supplementation is health workers, print media, electronic media and family/friends. Health workers however have recorded highest percentage for dissemination of information to women of reproductive age. This may be connected to the fact that most women are multiparous and would have come in contact with health workers and were prescribed with vitamin supplement during previous pregnancies.

A study by Byrne in 2003 indicated that among a sample of Ireland women it was reported that their source of information about folic acid was a doctor or nurse by the largest group with 45.3%, from TV or radio was 24.9% and other proportions from friend/relative or word of mouth by another quarter and magazine/newspaper.

Another study conducted in Saudi Arabia by Murad et al 2013, indicated that the respondents' source of information as regards the use of Folic acid was from Doctors (80.5%).

However, studies conducted by Coll, Pisa, Palacio, Qunto and Cararach (2004) and Nawapung (2007) reported that respondents' source of information was from the media. French et al also reported that a majority of women recalled hearing about folate from their doctors (French, Barr and Levy-Milne, 2003).

## 2.12 Conceptual framework

The conceptual framework used in this study is the Health belief Model (HBM). The model propose that people's beliefs about whether or not they were susceptible to disease, and their perceptions of the benefits of trying to avoid it, influenced their readiness to act.

Factors that affect young women vitamin supplementation behaviour can be identified and explained using the Health Belief Model.

The Health Belief Model (HBM) was developed in the 1950s by a group of social psychologists in the United States Public Health Service (Rosenstock, 1974). The model attempts to explain and predict an individual's given health-related behaviour from their beliefs about the behaviour and the health problems that the behaviour was intended to prevent or control using a value expectancy approach (Glanz, Riener and Lewis, 1997). It assumes that behaviour depends upon the expected outcomes of an action and the value an individual places on those outcomes. The HBM suggests that the following factors both explain and predict a health-related behaviour: perceived susceptibility, perceived severity, perceived barriers, perceived benefits, self-efficacy and cues to action. The way a person relates themselves to each of these areas is predictive of how likely they are to engage or not engage in a certain behaviour (Strecher and Rosenstock, 1997).

Since younger women (ages 18-24) have the least awareness, knowledge and consumption of folic acid, an intervention that targets this age group may be warranted (CDC, 2008). Forming an intervention around the health belief model may be effective, especially when focusing on barriers and benefits (Janz and Becker, 1984).

Overall, findings from the few HBM studies that examined folic acid awareness, knowledge, and consumption of folic acid indicate that the HBM is a valuable guide to the exploration of folic acid supplementation behaviour and an effective tool for the development of interventions to promote folic acid supplementation (Katie and Flores, 2007).

### **2.12.1 Perceived susceptibility to Unhealthy pregnancy**

Perceived susceptibility measures an individual's perception of his or her risk for a health condition or disease while perceived severity measures feelings surrounding the seriousness of the condition and the effects of leaving it untreated (Glanz et al., 1997). The combination of perceived susceptibility and perceived severity is considered a threat or, more broadly, fear of a disease or health condition. Young women who take folic acid supplementation perceive chances of giving birth to children with birth defects and other complications that arise from unhealthy pregnancy.

### **2.12.2 Perceived benefits of Use of Folic acid**

Perceived benefits include positive consequences of adopting behaviour. Young women who take folic acid perceive that they stand to gain better chances of pregnancy outcomes and other non-reproductive benefits as a result of taking folic acid supplementation.

### **2.12.3 Perceived barriers to Use of Folic acid**

Perceived barriers include the perceived negative consequences of adopting behaviour (Janz and Becker 1984). Though these barriers and benefits can be health related, often they are not. Instead, they might be associated to a greater degree to one's environment, lifestyle, or social surroundings. In this case they represent those factors that may prevent the young women from taking folic acid supplementation.

### **2.12.4 Self efficacy to Use of Folic acid**

Self-efficacy is characterized as the overall confidence in one's own ability to adopt and successfully perform behaviour. Having a strong sense of self-efficacy is of great importance. People with high confidence in their capabilities approach difficult tasks as challenges to be mastered rather than as threats to be avoided.

Conversely, people who doubt their capabilities shy away from difficult tasks which they view as personal threats. Thus, lack of self-efficacy can be viewed as a barrier to behaviour. The ability of young women to acquire and take folic acid supplementation would lead to successful practice of such behaviour.

### 2.12.5 Cues to action to Use Folic acid

Cues to action refer to cues such as bodily events and environmental events that instigate action (Glanz et al., 1997). They are the reminders in our everyday lives that signal us to act in one way or another. The ability to receive information, encouragement, and positive feedback to support healthy habits is a critical contributor toward individual adoption and maintenance of healthy behaviours at a broad level (Berkehan, Glass, Brisette and Seeman, 2000; House, Landis and Umberson, 1998). In the absence of support, women not only behave in less healthy ways more often, they also experience more stress and greater depression (Mista, O'Campo and Strobino, 2001). Young women may require external factors such as advice from close relatives, a physician, and daily reminder such as posters, radio and television documentaries to promote use of folic acid supplementation.

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MODIFYNG FACTORS

LIKELIHOOD OF ACTION

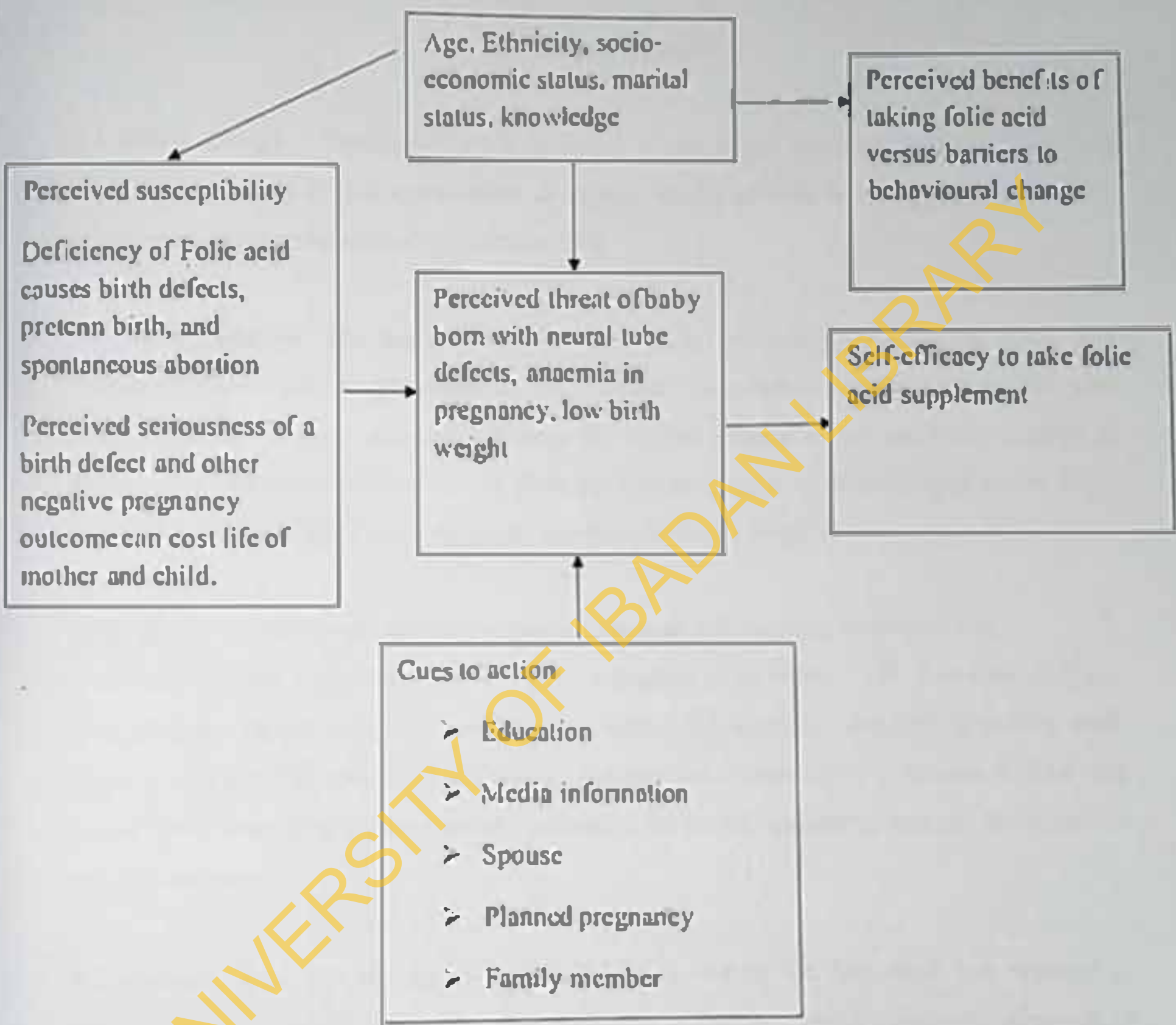


Fig.2.1 Health Belief Model

Source: Glanz, Rimer & Lewis (2002).



## CHAPTER THREE

### METHODOLOGY

3.1 Study Design: Descriptive cross-sectional study which involves collection of data including questions of past experiences as regards intake of folic acid supplements from a population (Female students) at a particular time.

3.2 Study Location: The study location is Lead City University Ibadan, Oyo State. The University submitted its application to the National Universities Commission in the year 2002. Academic programmes took off from the Jericho campus of the university located in Ibadan. The institution however moved from the Jericho campus to its permanent site in 2005. It has three (3) faculties; Faculty of social sciences, Sciences and Law.

Lead City University caters for both young adolescents and the adult working class.

The University has a population of students estimated to be about 3,500. It is also equipped with adequate human resources and a total of about 236 academic and administrative staff, physical and material resources and utilizes information technology via its own V.SAT and Local Area Network to enhance holistic education for social, economic, cultural development and self-reliance.

All students, upon first admission to the University, during the first week are required to register at the University Clinic. The purpose of this is to ensure that no student is deprived of attention when so required. The University clinic is equipped with qualified medical personnel and all appropriate medical paraphernalia to cater for students' needs. When a student has a serious medical problem, the clinic will refer the student to appropriate hospital. Students with chronic health problems such as Diabetes, Epilepsy, Heart disease or other potentially serious conditions are required to establish and maintain a regular patient relationship with the University clinic.

Lead City University was selected for this study is because majority of the female students in the institution are young women between the age group of 18-24 years. Previous findings have shown that women in this age group are less likely to engage in healthy behaviours that would promote their health, they are also not aware of the importance of folic acid and are not using adequate amount.

**3.3 Study Population:** Female students in selected level of study in Lead City University, Ibadan Oyo State.

**3.4 Sample Size:** The sample size was determined using Lwanga and Lemeshow (1991) sample size formula:

$$N = \frac{Z^2 \alpha^2 p(1-p)}{d^2}$$

Where n=Minimum sample size

Z= Confidence limit of survey at 95% (1.96)

P= Proportion of FA awareness at 45% (Knowledge and use of Folic acid amongst Honduran women; Ying et al, 2007)

d =Absolute deviation from true value (degree of accuracy) = 5%

$$n = \frac{1.96^2 \times 0.45 \times 0.55}{0.05^2}$$

$$n = 380$$

A non-response rate of 10% of 380 was added to make sample size to 418.

**3.5 Sampling Technique:** A four- stage sampling technique was adopted for this study.

**Stage I:**

The sample size was determined using Lwanga and Lemeshow (1991) sample size formula:

$$n = \frac{Z^2 \alpha^2 p(1-p)}{d^2}$$

Where n=Minimum sample size

Z=Confidence limit of survey at 95% (1.96)

P = Proportion of FA awareness at 45 % (Ying et al. 2007)

d = Absolute deviation from true value (degree of accuracy) = 5%

$$\frac{1.96^2 \times 0.45 \times 0.55}{0.05^2}$$

n = 380

A non-response rate of 10% of 380 was added to make sample size to 418

### Stage 2:

A record review was conducted in the institution to determine number of female student population.

Level	Female Population
100	123
200	200
300	259
400	366
<b>Total</b>	<b>948</b>

Source: Records Unit, Lead City University, Ibadan.

### Stage 3:

The students were stratified into four based on their level of study (100 to 400 Level). Selection was based on proportion to size. The proportion of female students to be studied at each level was calculated using the formula below:

Proportion of female students in level =

$$\frac{\text{Total number of female students in level X} \times \text{Sample size}}{\text{Total number of female students in the institution}}$$

Level of Study	Number of Registered Female students	Calculation of sample size required	Sample size required
100	123	$\frac{123 \times 418}{948}$	54
200	200	$\frac{200 \times 418}{948}$	88
300	259	$\frac{259 \times 418}{948}$	114
400	366	$\frac{366 \times 418}{948}$	164
<b>Total</b>	<b>948</b>		<b>418</b>

#### Stage 4:

The female students to be involved in the study were selected using simple random at a particular time.

**3.6 Inclusion Criteria:** Registered female students of Lead City University, Ibadan Oyo state.

**3.7 Exclusion Criteria:** Female staff, female students above reproductive age

#### **3.8 Data collection:**

Research assistants were trained on processes involved in data collection. Data for analysis was collected by the use of Quantitative method.

The Quantitative method constituted administration of a semi-structured questionnaire. Since students can read and write the questionnaire was self-administered and collected the following:

1. Socio demographic variables: age, ethnicity, marital status, religion, course of study, level of study, monthly allowance and source of stipend.

2. Knowledge on use of folic acid was defined as knowing that FA prevents NTDs as well as its correct timing as knowing that FA should be taken pre-conceptionally and through-out the first trimester of pregnancy. FA use was defined as having ever taken FA supplements or multi-vitamins source of information, supplementation dosage, food sources of folic acid, and pregnancy intentions. A 19-point score knowledge scale was answered by the respondents. Respondents who score above 11 would be categorised as having good knowledge and those who score below 11 would be termed as having poor knowledge.
3. A 9-point score practice scale was answered by the respondents, respondents who scored above 5 were categorised as having good practice and those who score below 5 were categorised as poor practice.
4. Perception towards folic acid was measured using a 16-point scale, respondents who scored above 8 were categorised as having positive perception and those who scored below 8 were categorised as having negative perception.

### 3.9 Validation of instrument:

To ensure the data was valid for the study various meticulous steps were put in place. The questionnaire was carefully designed to reflect the precise objective of the study. To ensure the validity of the instrument in terms of expected measures, content, strength and accuracy, the draft questionnaire was developed and subjected to peer and expert review. Questions asked were simple and straight forward which made it easy for respondents to comprehend and give accurate answers.

**3.10 Reliability:** In order to determine the reliability of the instrument, it was pretested amongst female students of a tertiary institution with similar characteristics as study location. Reliability coefficient of 0.7 was set as the minimum in bench mark as the acceptable level of Cronbach Alpha.

**3.11 Data analysis:** The questionnaire was edited; a coding guide was developed to code it. The data was analyzed using an appropriate statistical package; SPSS software (ver. 16) was used for analysing data. Chi-square test was used for examining the significant level

of data distribution between variables of each question. A significant level of  $p < 0.05$  was adopted for all tests.

### **3.12 Data management and analysis:**

1. The questionnaire was serially numbered for control and recall purposes.
2. The data was cleaned, sorted, edited and coded manually. There were frequent counts run to detect missing cases while data was cleaned.
3. Data collected was checked for completeness and accuracy on daily basis.
4. Inferential statistics using Chi-square and logistic regression tests at  $p=0.05$  level of significance while descriptive statistics was presented in tables and bar chart.

### **3.13 Ethical consideration:**

The study followed the ethical principles guiding the use of human participants in research. Participants were not forced or coerced to participate in the study. Participants were allowed to withdraw from the study willingly, if they desire to discontinue the study without any adverse effect. No identifier like name of respondents and address was required. Absolute confidentiality was ensured. Collected information was kept confidential and protected from access to other persons by using computers with password, and hard copies were also kept safely. This study was approved by the ethics review committee of the Oyo State Ethics Review Committee Board. A copy of the ethical approval is shown in Appendix III. Official approval was obtained from the registrar of the institution as shown in Appendix II.

## CHAPTER FOUR

### RESULTS

The findings of this study are presented in this chapter.

#### 4.1 Socio- Demographic characteristics of respondents.

A completion response rate of 100% (418 out of 418) was obtained with the self-administered questionnaire among female students of reproductive age in Lead City University, Ibadan, Oyo State. The ages of the respondents ranged from 18 to 42 years and the mean age of  $22.0 \pm 3.6$  years. The distribution of respondents by religion showed that above half of the respondents 72.7% were Christians; 27.3% were Muslims and no respondent practiced traditional religion.

The distribution of the respondents by ethnic group showed that the majority of the respondents (68.9%) were Yoruba; the remaining were Hausa (4.1%), Igbo (13.9%), and others; Edo, Urhobo, Ijaw, Eburu, (13.1%). Virtually all (93.8%) of the respondents were Single and (6.2%) were Married. Majority (31.6%) of the respondents resided in the Hostel while (68.4%) of the respondents resided off campus.

The educational qualification showed that most of the respondents, 72.2% were in faculty of Social Science, 15.3% Arts and below half 12.4% were in Faculty of Science.

The monthly allowance of the respondents showed that majority of the respondents, 165 representing 39.5% earned ₦20,000; 158 respondents representing 37.8% earned ₦30,000; 57 respondents representing 13.6% earned ₦10,000; 36 respondents representing 8.6% of the number of the respondents earned ₦40,000 and only 2 respondents representing (0.5%) earned ₦50,000 respectively.

The source of income of the respondents showed that majority (61.5%) got their incomes from both parents; (13.2%) from mother; (9.6%) from not fixed source; (8.1%) from Father; (3.6%) from Family relations; (2.6%) from self and (1.4%) from sponsors. On the consumption of folic acid, virtually all 90.0% had never consumed folic acid while on only representing 10% had ever consumed folic acid prior to the study.

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**Table 4.1**      **Socio- Demographic Characteristics of the respondents**

<b>Description</b>	<b>Socio-demographic</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Age</b>	15-19 years	91	21.8
	20-24 years	236	56.5
	25-29 years	77	18.4
	30-34 years	6	1.4
	35-39 years	7	1.7
	40-44 years	1	0.2
<b>Religion</b>	Christianity	304	72.7
	Islam	114	27.3
	Traditional	0	0.0
<b>Ethnic group</b>	Yoruba	288	68.9
	Hausa	17	4.1
	Igbo	58	13.9
	Edo	44	10.5
	Urhobo	5	1.2
	Ijaw	3	0.7
	Ebira	2	0.5
	Benin republic	1	0.2
<b>Marital Status</b>	Single	392	93.8
	Married	26	6.2
<b>Residence</b>	Hostel	132	31.6
	Off campus	286	68.4
<b>Level of study</b>	100 level	54	12.9
	200 level	88	21.1
	300 level	114	27.2
	400 level	162	38.8
<b>Faculty of study</b>	Social Science	302	72.3
	Arts	64	15.3
	Science	52	12.4

#### 4.2 Knowledge of female students of reproductive age on Preconception Importance of Folic acid.

From the study respondents were asked to define Folic acid, 196 respondents representing 46.9% correctly defined folic acid as a vitamin needed for proper baby development; 165 representing 39.5% defined folic acid as a vitamin needed to improve cell growth especially in first trimester pregnancy; 29 representing 6.9% defined folic acid as a vitamin needed to stay healthy; 28 respondents representing 6.7% defined folic acid as a vitamin needed to prevent malaria. Other knowledge related questions were asked as shown in table 4.2

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**Table 4.2 Respondents' knowledge of Folic acid**  
**N=418**

<b>Knowledge related statement</b>	<b>Correct response percentage</b>
Folic acid should be taken before pregnancy	36.6%
Folate is a natural form of folic acid	17.7%
Folic acid is a synthetic form of folate	26.6%
Folic acid and folate are the same	27.3%
Folic acid is important for cell division of a baby in first trimester	31.6%
Folic acid reduces risk of premature birth	25.6%
Folic acid is most important in second trimester	5.7%
Folate can be obtained from a balanced diet of fruits and vegetables	78.5%

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**Table 4.3 Consequences of not taking folic acid in pregnancy**  
**N=418**

Variables	Frequency	Percentage
Baby is premature	381	45.6
Low birth weight	216	25.8
Birth defect	215	25.7
Malaria	24	4.2
Total	836	100

\* Multiple responses

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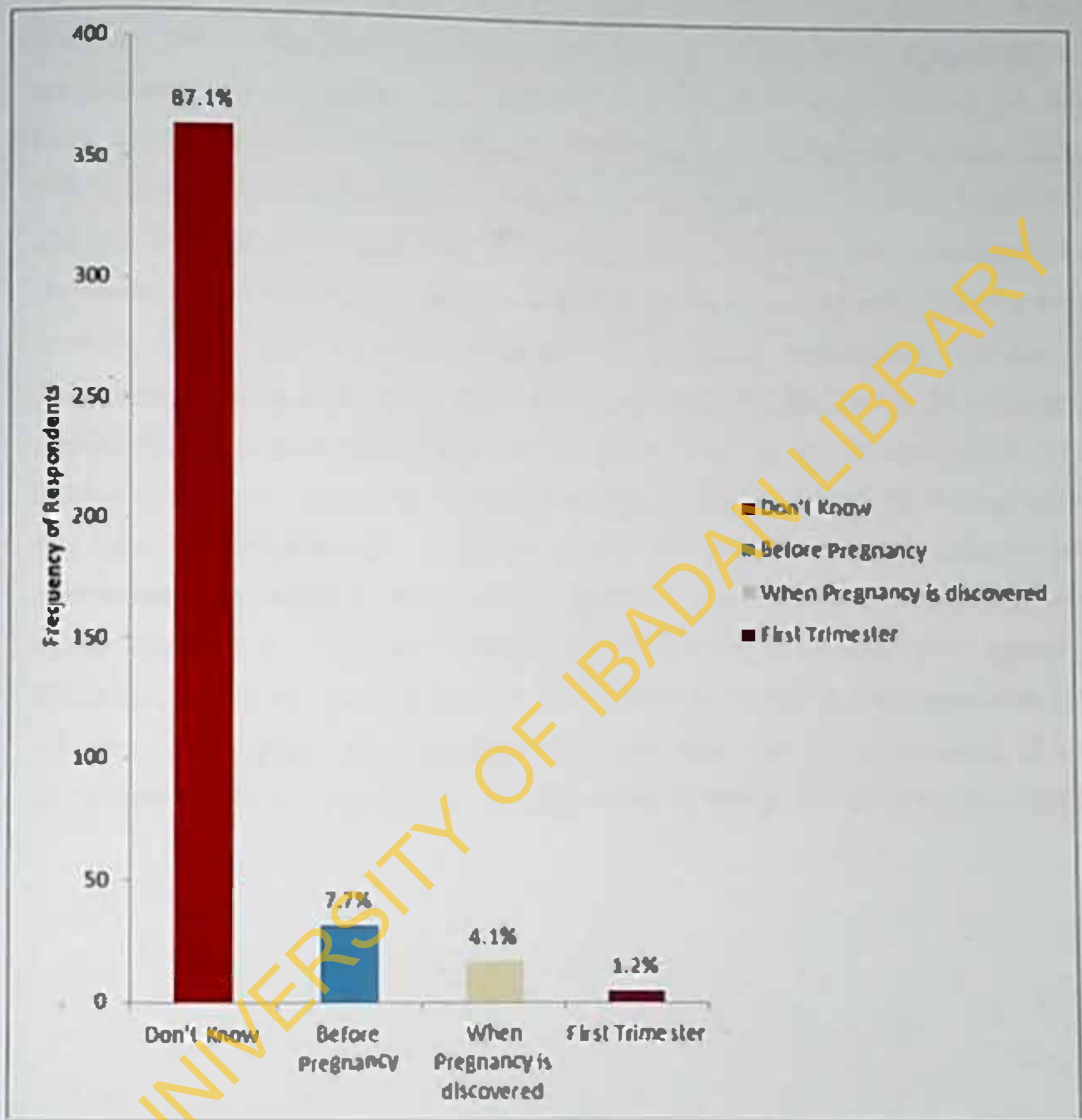


Figure 4.1 Respondents' response to correct timing on use of Folic acid

Respondents were asked to state if folate is a natural form of folic acid; 267 respondents representing 63.9% didn't know, but seventy-seven respondents 18.4% reported No to the statement and 17.7% knew that Folate is a natural form of folic acid. Respondents were asked if Folic acid is a synthetic form of folate; 278 respondents representing 66.5% didn't know, 26.6% said Yes, while the remaining 6.9% reported No. Respondents were asked if Folic acid and folate are the same; 242 respondents representing 57.9% didn't know, 27.3% said yes, while sixty-two respondents 14.8% reported No. More than half of the respondents representing 61.0% didn't know that Folic acid is important for cell division of a baby in first trimester, 31.6% said Yes and the remaining 31 respondents representing 7.4% said No. Respondents were asked whether Folic acid reduces risk of premature birth and majority 253 respondents representing 60.5% didn't know, 25.6% said yes and 58 respondents 13.9% reported No. Three hundred and seventy-nine respondents representing 90.7% reported that they didn't know whether Folic acid is most important in second trimester and 24 respondent representing 5.7% agreed that Folic acid is important in second trimester, but 15 respondents representing 3.6% did not agree. Majority 328 respondents representing 78.5% opined that Folate can be obtained from balanced diet of fruits and vegetables; ninety respondents 21.5% did not know. Majority of the respondents 52.9% were able to list two food sources of folate, 43.8% mentioned one source and only 3.3% were able to mention the three sources of folate.

**Table 4.4 Respondents' responses on food source of folate**

Variable	Frequency	Percentage
Green Vegetable**	75	12.8
Orange**	127	21.6
Beans	112	19.0
Fruits	79	13.4
Okra	22	3.7
Liver**	75	12.8
Avocado pear	10	1.7
Meat	23	3.9
Lettuce	5	0.9
Potato	7	1.2
Diary Product	2	0.3
Strawberry	5	0.9
Banana	1	0.2
Pawpaw	5	0.9
Spinach**	8	1.4
Egg	28	4.8
<b>Total</b>	<b>588</b>	<b>100</b>

\*Multiple responses

\*\*Good food source

**Table 4.5 Cumulative respondents' knowledge score**

<b>Knowledge Score</b>		<b>Frequency</b>	<b>Percentage</b>
Poor	$\leq 11$	277	66.3
Good	$> 11$	141	33.7
Total		418	100
<b>Mean Knowledge Score</b>		10.02 $\pm$ 2.3	

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### 4.3 Use of folic acid among women of reproductive age N=418

In this section, majority of the respondents 90.0% reported that they have not used any brand of folic acid in the past, 4.8% had used local/indigenous folic acid, 4.5% don't know the brand they use and the remaining 0.7% use United Kingdom (UK) brand of folic acid.

Respondents were asked if the Folic acid they used was recommended by a medical professional, 5.3% respondents stated No and 4.8% stated that it was recommended by a medical professional, while majority 90.0% reported they did not use. Respondents were asked to indicate the number of times per week they took the supplement prior to the study, 90% reported that they do not take the supplement, 23 respondents representing 5.5% took the supplement once a week, only 4.1% take the supplement twice a week, and only 0.5% respondents took the supplement four times a week.

Out of the 42 respondents who reported that they take folic acid, 29 stated that they do not check to see whether the drinks and food they buy contain folic acid, 7 reported that they check to see whether the drinks and food they buy contain folic acid, but the remaining 6 reported that sometimes they actually check to see whether the drinks and food they buy contain folic acid.

In other to determine if respondents currently buy any food products because they have folic acid added to them; 40 representing 9.6% reported No while 9.6% said they don't actually know if they currently buy any food products because they have folic acid added to them.

Respondents were asked to mention three sources of folate they consume, 226 respondents representing 54.1% mentioned two sources of folate they consumed, 35.6% mentioned one source of folate and 10.3% mentioned three sources of folate they consumed frequently.

**Table 4.6 Pattern of use of Folic acid female students of reproductive age  
N=418**

<b>Variable</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Do you use Folic acid?</b>		
Yes	42	10.0
No	376	90.0
<b>What brand of Folic acid do you use?</b>		
UK	3	0.7
Local/Indigenous	20	4.8
Don't know	19	4.5
Don't use	376	90.0
<b>Was it recommended by a medical professional?</b>		
Yes	20	4.7
No	22	5.3
Don't use	376	90.0
<b>How many times per week do you take the supplement?</b>		
Once a week	23	5.4
Twice a week	17	4.1
Four times a week	2	0.5
Don't use	376	90.0
<b>Do you currently check to see whether the drinks and food you buy contain folic acid?</b>		
Yes	7	1.7
No	6	1.4
Sometimes	29	6.9
Not applicable	376	90.0
<b>Do you currently buy food products because they have folic acid added to them?</b>		
Yes	0	0.0
No	40	9.5
Don't know	2	0.5
Not applicable	376	90.0
<b>Mention three food sources of folate you consume</b>		
One source	149	35.6
Two sources	226	54.1
Three sources	43	10.3

#### 4.4 Perceived benefits of Folic acid among women of reproductive age

All respondents 100.0% considered folic acid important for health of their future babies, majority of the respondents (83.7%) reported that they understand that folic acid replenishes what they cannot get from their diet, although 16.3% reported no to the statement. A proportion of 75.4% indicated that they expect folic acid to improve brain cells of their future babies. To deduce if the respondents think that folic acid will increase folate concentration in their body during pregnancy, 86.1% opined that folic acid will increase foliate concentration in their body during pregnancy.

About half of the respondents 244 representing 58.4 % do not perceive folic acid as an anti-malaria vitamin, however 174 representing 41.6% agreed that folic acid is an anti- malaria vitamin. Some of the respondents 68.9% do not perceive that folic acid will prevent skin rash while the remaining 31.1% agreed with the statement. Out of 418 respondents, about 281 respondents representing 67.2% did not know if intake of folic acid was one way to prevent anaemia during pregnancy. Majority of the respondents 64.1% opined that folic acid will prevent low birth weight while 35.9% did not agree with the statement.

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**Table 4.7 Perceived benefits of folic acid among female students of reproductive age**  
**N= 418**

Perceived benefits related statements	Yes		No	
	Frequency	Percentage	Frequency	Percentage
I consider folic acid important for health of my future baby	418	100.0	0.0	0.0
I expect folic acid to improve brain cells of my future baby	315	75.4	103	24.6
Folic acid will increase folate concentration in my body during pregnancy	360	86.1	58	13.9
My opinion of folic acid is that it is an anti-malarial vitamin	174**	41.6	244	58.4
Folic acid will prevent skin rash	130**	31.1	288	68.9
I consider folic acid as one way to prevent anaemia during pregnancy	281	67.2	137	32.8
Folic acid will prevent low birth weight of my future baby	268	64.1	150	35.9

• • In-correct response

**Table 4.8 Cumulative Perception score of respondents**

<b>Category</b>	<b>Frequency</b>	<b>Percentage</b>
Negative (0 – 8)	92	22.0
Positive (>8- 16)	326	78.0
<b>Total</b>	<b>418</b>	<b>100.0</b>
<b>Mean perception score :</b>	<b>10.6±2.7</b>	

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#### 4.5 Factors that can influence use of Folic acid among female students of reproductive age

Respondents indicated various factors that can influence/motivate their daily use of Folic acid. Two hundred and five respondents representing 19.95% said a doctor's prescription, 7.5% said Family members, and friends 10.6%, 13.6% opined availability. Also 9.3 % said Pregnancy intention, 7.0% said use of other supplements, and 5.4% said availability, 5.0% information from health workers, 4.4% for the health of my future baby and 3.9% said diet. More so, 1.5% said Spouse, 1.4 and 0.6 % said when government makes it free and information from mass media respectively.

The respondents were asked if they had received prior information as regards the use of folic acid, majority 56.2% reported they had not received prior information as regards the use of folic acid while the remaining 43.8% said they had received prior information as regards the use of folic acid.

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**Table 1.9 Factors that influence daily use of Folic acid**

<b>Variable</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Doctors' prescription</b>	<b>205</b>	<b>19.9</b>
<b>Family members</b>	<b>180</b>	<b>17.5</b>
<b>Pregnancy intention</b>	<b>141</b>	<b>13.7</b>
<b>Availability</b>	<b>140</b>	<b>13.6</b>
<b>Friends</b>	<b>109</b>	<b>10.6</b>
<b>Use of other supplements</b>	<b>72</b>	<b>7.0</b>
<b>Affordability</b>	<b>56</b>	<b>5.4</b>
<b>Information from health workers</b>	<b>51</b>	<b>5.0</b>
<b>Diet</b>	<b>40</b>	<b>3.9</b>
<b>Information from mass media</b>	<b>6</b>	<b>0.6</b>
<b>Spouse</b>	<b>15</b>	<b>1.4</b>
<b>Free distribution</b>	<b>14</b>	<b>1.3</b>

\*Multiple Responses

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**Table 4.10 Sources of information on Folic acid by respondents**

Source of Information	Frequency	Percentage
Lecture	19	3.8
Newspaper	9	1.7
Family Member	115	22.9
Television	57	11.3
Doctors/Nurses	175	34.8
Internet	121	24.1
Radio	7	1.4

♦♦ Multiple Responses

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## 4.6 Hypotheses Testing

### Hypothesis 1

There is no significant difference between marital status and use of folic acid among women of reproductive age in Lead City University. The distribution of respondents' marital status as regards their knowledge of folic acid showed 93.8% were single and 6.2% were married. Overall, there is a significant association between marital status and use of Folic acid among women of reproductive age in Lead City University Ibadan. Therefore we reject the null hypothesis.

Table 4.11 Showing difference between marital status and use of folic acid

Marital status	Do you take folic acid?			$\chi^2$	Df	p-value
	Yes (%)	No (%)	Subtotal			
Single	21(5.4%)	371(94.6%)	392(93.8%)	1.534	1	0.001*
Married	21(80.8%)	5(19.2%)	26(6.2%)			
Total	42(10.0%)	376(90.0%)	418(100.0%)			

\*Significant N= 418

The p-value =0.001 is statistically significant. The null hypothesis is therefore rejected. This means that marital status of the respondents has influence on folic acid use. Single respondents were less like to consume folic acid compared to married respondents because they are not planning to get pregnant as opposed to the married respondents. (OR=0.011, 95% CI 0.01 – 0.04).

## Hypothesis 2

There is no significant difference between level of study and knowledge of folic acid. The distribution of respondents' level of study as regards their knowledge of folic acid showed (12.9%) were in 100 level, (21.1%) were in 200 level, (27.2%) were in 300 level and (38.8%) were in 400 level. Overall, there is no significant association between level of study and knowledge of Folic acid among women of reproductive age in Lead City University Ibadan. Therefore we accept the null hypothesis.

Table 4.12 Showing difference between Level of study and Knowledge of folic acid

Level of study	Knowledge of folic acid		Sub- total	$\chi^2$	Df	p-value
	Poor	Good				
100	42(77.8%)	12(22.2%)	54(12.9%)			
200	67(76.1%)	21(23.9%)	88(21.1%)			
300	74(64.1%)	40(35.9%)	114(27.2%)	12.052	3	0.007
400	94(58.0%)	68(42.0%)	162(38.8%)			
Total	277(66.3%)	141(33.7%)	418(100.0%)			

### Hypothesis 3

There is no significant difference between economic status and use of folic acid. The distribution of respondents' monthly stipends as regards their use of folic acid showed (13.6%) received ₦10,000, (39.5%) received ₦20,000 (37.6%) received ₦40,000 and (0.5%) received ₦50,000. Overall, there is no significant association between monthly allowance and use of Folic acid among women of reproductive age in Lead City University Ibadan. Therefore we accept the null hypothesis.

Table 4.13 Showing difference between monthly allowance and folic acid use

Monthly allowance	Use of Folic acid		Sub total	$\chi^2$	Df	p-value
	Yes	No				
₦10,000	6(10.5%)	51(89.5%)	57(13.6%)			
₦20,000	14(8.5%)	151(91.5%)	165(39.5%)			
₦30,000	18(11.4%)	140(88.6%)	158(37.6%)			
₦40,000	4(11.1%)	32(88.9%)	36(8.6%)	1.045	4	0.903
₦50,000	0(0.0%)	2(0.5%)	2(0.5%)			
Total	42(10.0%)	376(90.0%)	418(100.0%)			

## CHAPTER FIVE

### DISCUSSION, CONCLUSION AND RECOMMENDATION

#### 5.1 DISCUSSION

This chapter focuses on the findings of the study and it encompasses the socio-demographic information; knowledge of Folic acid, use of Folic acid, perceived benefits of folic acid and factors that can influence daily use. This chapter ends with conclusion and recommendation.

##### 5.1.1 Knowledge of Folic acid among female students of reproductive age

From the study it was documented that more than half of the respondents 66.3% had poor knowledge of Folic acid while a few 33.7% had good knowledge. This result is similar to a previous study by Sepidch and Malikeh (2012) where 27.6% of Iranian women interviewed had good knowledge of Folic acid during preconception period, also this present study is similar to a study conducted in Saudi Arabia among female college students (Kari, Bardisi, Beitalamal and Ageely, 2008) the study documented that (88%) of the female students did not have knowledge about folic acid. This result refutes the findings from a study among 300 women in Saudi Arabia which reported that there was increase in knowledge of Folic acid among women who had University education (Murad, Ala'a, Sunectha, Dima and Ibrahim, 2013).

This present study shows that (87.1%) did not know the most appropriate time to take Folic acid, this finding is in accordance with previous study conducted in the United Arab Emirate (UAE) (Alkaabi, Lamia, Alscnadi and Hisham, 2013) indicated that 55.1% did not know the correct timing for Folic acid, 11.2% stated before pregnancy while 33.7% stated during pregnancy. Proper timing of Folic acid supplementation is vitally important for normal development of the nervous system of the embryo. Most of the time women start Folic acid supplementation right after making their first visit to the clinic in response to a suspected pregnancy. By this time they are two to three weeks through pregnancy, consequently missing the critical period for Folic acid supplementation which is important for normal development of the neural tube.

Also, 41.7% of the respondents knew that one benefit of periconceptional Folic acid use is to prevent Neural tube defects, this finding is similar to findings from a study in UAE (Mariam et al 2013) which reported that 41.8% knew the benefits of periconceptional use of Folic acid. However, the findings from this study contradicts a study by Kscnija, Aida, Goran and Theodore (2009) among Croatian women which indicated that only (26.2%) women mentioned prevention of congenital malformation as one benefit of taking Folic acid. Another study similar to this present study conducted in China (Huan et al., 2011) reported that 49.7% knew the benefits of Folic acid.

### 5.12 Use of Folic acid among female students of reproductive age

It was deduced from this study that only (10%) of the respondents used Folic acid, virtually all respondents reported no use of Folic acid. Evidence based study has shown that young women are less likely to consume Folic acid. This is in consonance with previous study such as Nawapun and Phupong 2005 which reported that only 9.7% of 401 women of reproductive age consumed Folic acid in periconceptional period, also a study carried out in Turkey (Zeynep et al., 2010) indicated that only 10% of 912 women interviewed took a vitamin/mineral supplement that contained Folic acid.

Also a study conducted in Nigeria, a study which involved 200 Nigeria women indicated that none of them used Folic acid (Rabiu et al., 2012). Many women who are aware and have knowledge of Folic acid do not use the supplement. According to a survey by CDC women with a higher educational levels were more likely to consume a multivitamin containing greater than or equal to 400ug of folic acid per day than less educated women (some high school education), (CDC, 1996). Use of Folic acid is associated with some factors such as pregnancy planning as women who intend to get pregnant are more likely to consume folic acid. In a tertiary institution majority of the young women are not married and do not plan pregnancy therefore use of folic acid is low.

### 5.13 Perceived benefits of Folic acid use among female students of reproductive age

From this study, above half of the respondents (78.0%) had positive perception towards the peri-conceptional use of folic acid, despite low use of the supplement. This result is similar to a study conducted by Cleves et al 2004, it reported that although 61.8% of women reported to be aware of the protective effect of folic acid in preventing birth defects, only 27.1% of these women and 22.7% of all women reported taking folic acid or multivitamins daily.

A similar report to this study is a study in Nigeria by Anzaku 2013; the study reported that 84.5% of women interviewed had positive attitude towards Folic acid intake during the preconception period to prevent Neural Tube defects in future pregnancy.

### 5.14 Factors that influence use of Folic acid among female students of reproductive age

From this study respondents indicated several factors that can influence their daily use of use Folic acid. The facilitating factors for the use of Folic acid supplements recognized in this study were; Doctors' prescription, advice from family, friends, Use of other supplement, Availability, Pregnancy intention, Diet, Information from health worker, and information from mass media.

The highest proportion, (19.9%) of the respondents indicated that a Doctor's prescription would facilitate their daily use of folic acid. This is consistent with findings from previous studies that showed that younger women who are not planning a pregnancy would require more convincing by a Doctor/physician compared to older women (Cleves et al., 2004). According to the March of Dimes survey Folic acid recommendations are not being followed partly because many health care providers have not incorporated the folic acid message into their routine counselling sessions. In a March of Dimes survey 82% of women reported that they would take folic acid if advised to do so by a health care provider, although only 35% stated that their health care provider had recommended folic acid supplementation (March of Dimes, 2000).

The American Congress of Obstetricians and Gynecologists (ACOG) have joined the March of Dimes, Centre for Disease Control and Prevention and Institute of Medicine in recommending that women take 400ug of Folic acid daily. The ACOG primary care committee suggests that women be advised to take folic acid beginning with their first visit at

the age of 13. Routine Gynaecology check-up is an ideal opportunity to deliver the folic acid message. The findings in a March of Dimes study indicated that women aged 18-24 years identified schools/colleges and magazines/newspaper as their primary sources for folic acid information, so these two channels might provide important opportunities to reach this population. Research has indicated that women in this group are more likely to respond to folic acid messages that do not focus on pregnancy or infants (Lindsey et al., 2007).

Another important facilitator for use of folic acid among women of reproductive age in this study was the support from a family member. This has also been identified by other investigators. (Gulengul, Koken and Usyal, 2013; Ejidokun 2000; Beleke, Gedefaw and Alcmstschay, 2015) In the absence of support, women not only behave in less healthy ways more often, they also experience more stress and greater depression (Misra, O'Campo, and Strobino, 2001). Women of reproductive age in tertiary institutions are usually dependent on the decision of their family members particularly parents on utilizing health care services as well as taking medication. However, most of the time the decision of family members is usually dependent on their financial capacity and level of education.

Also, prior knowledge and awareness is an important facilitator to use of folic acid, the ability to receive information, encouragement, and positive feedback to support healthy habits is a critical contributor toward individual adoption and maintenance of healthy behaviours at a broad level (Berkman, Glass, Brissette, and Secman, 2000; House, Landis, and Umberson, 1998).

### 5.15 Implications of findings for Health Promotion and Education

The findings from this study have health promotion and education implications and a need for multiple interventions directed at tackling the phenomenon. The responsibility of health education focuses on the modification of people's behaviour and antecedents (WHO, 1998; Green and Kreuter, 1991). Health education is concerned with helping people developed practices that ensure the best possible well-being (WHO, 1998) which could be individual or collective. Health education principles, strategies and methods can be employed to address the negative findings identified in this study.

The study identifies low level of knowledge and use of folic acid among women of reproductive age. This suggests an absence in the in-depth understanding of the importance of folic acid in the preconception period. This finding indicates that there could be increase in Folic acid deficiency among women of reproductive age since this category of women who are in tertiary institutions do not have in-depth understanding of the role of Folic acid to their health and that of their future baby. To achieve this, women of reproductive health in higher institution of learning should be encouraged on frequent use of folic acid supplement as well as daily inclusion of fruits and vegetable that are high in folate. Health care providers and maternal child health professionals must continue to promote preconception health among women of childbearing age, and encourage them to take a vitamin containing folic acid daily.

Also, research has indicated that women in this category are more likely to respond to folic acid messages that do not focus on pregnancy or infants. Therefore, social marketing can be used to promote use of Folic acid among this category of women. More research should be carried out to understand the target population, formative research techniques should be advocated to ascertain what moves this category of women, what they want for their health and what gets in their way. This would mean mapping the territories in which potential consumers (women of reproductive health) live their physical, cultural and media environments; how they spend their days and what messages capture their attention, when and why with what effect.

## 5.2 CONCLUSION

This study assessed the level of knowledge and pattern of use of folic acid among women of as well as perception and factors that can influence daily use of the supplement among women of reproductive age in a tertiary institution. The study revealed that some socio-demographic factors of the respondents (economic status and level of study) were not associated with knowledge and use of Folic acid. However, there was a significant difference between use of folic acid and marital status ( $p$ -value was  $< 0.05$ ). Level of knowledge was assessed and it can be concluded that the female students had poor knowledge on Folic acid as majority do not know the correct timing for use of Folic acid and only few were able to define folic acid correctly. Only a few respondents reported that they use Folic acid and most respondents



stated that they consumed at least one source of natural occurring folate. Female students' perception towards use of Folic acid is positive as they perceive that folic acid prevents occurrence of Neural tube defects in a baby, however there is poor use. They also indicated motivators that could influence their daily use of the supplement; majority indicated that they would use Folic acid if prescribed by a doctor/medical professional. Also respondents were asked if they had ever heard of Folic acid and majority indicated that they had heard about folic acid from Medical professionals and family members.

Findings from this study show that there is a need for educational and communication campaigns to increase women's knowledge and their perceptions about the importance of preconception care. Campaigns should use perceived severity and perceived susceptibility as motivational elements of health messages (e.g., neural tube defects as consequence of not employing preconception health). Some participants noted that information about preconception health from the media (e.g., internet, news sound bites) would be perceived as important and would spur them to start preconception care. Thus, mass media can be an informative tool to help facilitate knowledge and awareness of preconception health behaviours.

### 5.3 RECOMMENDATIONS

Based on the findings from this study, the following recommendations are offered:

1. Inclusion of Folic acid message into secondary and University educational programmes to ensure the message reaches women early in their sexual lives. Also, women of reproductive age in tertiary institutions should be advised and encouraged to select diets with high folate content.
2. An increase in the quantity and quality of conversations between female students and healthcare professionals in the school about folic acid and its role in the prevention of neural tube defects may increase consumption of the supplement. These conversations should be in plain language and in a way that facilitates the uptake of knowledge. Additionally, these women need to encounter trusted information about folic acid on a regular basis in order to dispel myths and increase awareness of the severity of neural tube defects and the ease with which they can be prevented. Use of health

communication materials would aid in transmitting relevant basic messages about folic acid among the female students.

3. The school authority should create an enabling environment for this category of women to understand the importance of Folic acid use. Organising of health seminars, Health education interactive sessions and drama presentations can be used to send across the Folic acid message.

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**APPENDIX 1**  
**QUESTIONNAIRE**

**KNOWLEDGE AND USE OF FOLIC ACID AMONG WOMEN OF  
REPRODUCTIVE AGE IN LEAD CITY UNIVERSITY, IBADAN, OYO STATE**

Dear respondents,

I am a graduate student in the Department of Health Promotion and Education, College of Medicine, University of Ibadan, Ibadan. This study is designed to investigate the Knowledge and use of folic acid among women of reproductive age in Lead City University Ibadan, Oyo state. Your consent to participate and to give full, honest and correct information will be appreciated.

Please be informed that this exercise is not an examination or a test. I would like to inform you that your identity, responses and opinions will be kept confidential. This means that your name is not required on this questionnaire. This way your responses or views will be impossible to be traced to you. You are free to ask questions about the study at any time during cause of interview. Participation in this study is voluntary.

Thank you for your cooperation.

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Serial Number.....
Date of interview.....

**SECTION A**

**Socio-demographic variables**

Instruction: For most of the questions in this section, please tick (✓) the appropriate alternative response(s), in some cases however simply supply the needed information in the blank spaces provided.

1. Age as at last birthday (in years) .....
2. Religion: 1. Christianity  2. Islam  3. Traditional   
4. Others (specify) .....
3. Ethnicity: 1. Yoruba  2. Igbo  3. Hausa   
4. Others (specify) .....
4. Marital status: 1. Single  2. Married
5. Residence: 1. Hostel  2. Off-campus
6. Level of study: 1. 100 Level  2. 200 Level  3. 300 Level  4. 400 Level  5. 500 level
7. Course of Study: .....
8. Monthly allowance.....
9. Source of stipends: 1. Father  2. Mother  3. Self  4. Not fixed  5. Both parents   
6. Family relation(s)
10. Do you take Folic acid? 1. Yes  2. No

## SECTION B

### Knowledge of Women of reproductive age on Periconceptional Importance of Folic Acid

11. What is folic acid? (Tick most appropriate)

i. A vitamin needed for proper baby development in pregnancy.

ii. A vitamin needed to improve cell growth especially in first trimester pregnancy

iii. A vitamin needed to stay healthy

iv. A vitamin needed to prevent malaria

S/N	Knowledge related statement	Tick (✓)		
		Yes	No	Don't know
12	Folic acid should be taken before pregnancy			

13	Folate is a natural form of folic acid			
14	Folic acid is a synthetic form of folate			
15	Folic acid and folate are the same			
16	Folic acid is important for cell division of a baby in first trimester			
17	Folic acid reduces risk of premature birth			
18	Folic acid is most important in second trimester			
19	Folate can be obtained from a balanced diet of fruits and vegetables			

20. When should a woman start taking folate?

- 1. Planning pregnancy
- 2. When they discover they are pregnant
- 3. First trimester (First 3 months)
- 4. Don't know

21. Give three(3) food sources of folate

- i \_\_\_\_\_
- ii \_\_\_\_\_
- iii \_\_\_\_\_

22. What are the two(2) benefits of folic acid in pregnancy? 1. Prevents Vomiting  2. Prevents birth defects  3. Prevents skin rash

4. Prevents low birth

23. What are the two (2) consequences of not taking folic acid in pregnancy?

1. Baby is premature  2. Low birth weight  3. Malaria  4. Birth defects

24. Score Obtained :

25. Code :

### SECTION C

Use of Folic acid among women of reproductive age (Please tick (✓) the appropriate options to the questions related to use of folic acid among women of reproductive age).

26. Are you currently taking folic acid? 1. Yes  2. No

27. What brand of folic acid do you take? 1. UK  2. Local/Indigenous   
3. Don't know  4. Don't use

28. Was it recommended by a medical professional? 1. Yes  2. No  3. Not applicable

29. How many times per week do you take the supplement? 1. Once a week

2. Twice a week  3. Four times a week  4. Every day of the week

30. Do you currently check to see whether the drinks and food you buy contain folic acid?

1. Yes  2. Sometimes  3. No, I don't check

31. Do you currently buy any food products because they have folic acid added to them?

1. Yes  2. No  3. Don't know

32. Mention three (3) food sources of folate you consume?

i \_\_\_\_\_

ii \_\_\_\_\_

iii \_\_\_\_\_

### SECTION D

Perceived benefits of Folic acid among women of reproductive age

Please tick (✓) the appropriate options to the questions related to perceived benefits of the use of folic acid.

S/N	Perceived benefits related statements	Yes	No



33	I consider folic acid important for health of my future baby		
34	I understand that folic acid replenishes what I cannot get from my diet		
35	I expect folic acid to improve brain cells of my future baby		
36	I think folic acid will increase folate concentration in my body during pregnancy		
37	My opinion of folic acid is that it is an anti-malaria vitamin		
38	I think folic acid will prevent skin rash		
39	I consider folic acid as one way to prevent anaemia during pregnancy		
40	I believe that folic acid will prevent low birth weight of my future baby		

41	Score obtained	
42	Code	

**SECTION E**

Factors that influence use of folic acid among women of reproductive age

43. What factors can influence your daily use of folic acid?

- i.....
- ii.....
- iii.....
- iv.....

44. As an undergraduate have you received prior information as regards use of folic acid?

1. Yes  2. No

45. If Yes tick appropriate source of information (You can tick more than one option)

1. Family member

2. Newspaper

3. Television

4. Doctor/Nurse

5. Internet

6. Others (Please specify).....

Thank you.

UNIVERSITY OF IBADAN LIBRARY

APPENDIX II



# Lead City University (LCU)

Motto: Knowledge for Self-reliance

Administrative Building, Lagos - Ibadan Express Way, Tall Gate Area, P. O. Box 30671, Secretariat,  
Ibadan, Oyo State Nigeria. Tel: 01-7510681,  
E-mail: leadcity@lcvu.edu.ng

Registrar

Dr. (Mrs.) Oyejola Ayeni  
B Ed, M Ed, Ph D (Public Health), MHAIG

Office of the Registrar

[www.lcu.edu.ng](http://www.lcu.edu.ng)

LCU/REG/EX.C/10/14

6<sup>th</sup> February, 2014

Aiyejina Omokhoshe Hope  
Department of Health, Promotion  
And Education  
University of Ibadan  
Ibadan

Dear Hope,

Re: Aiyejina Omokhoshe Hope

I acknowledge the receipt of your letter dated 5<sup>th</sup> February, 2014 on the above subject matter.

Please be informed that your request to carry out research in the areas listed below is hereby approved.

1. Female Population (Students)
2. Female Students Population in Each Department

Thank you.

Dr. (Mrs) Oyejola Ayeni  
Registrar

APPENDIX III

TELEGRAMS.....

TELEPHONE.....



**MINISTRY OF HEALTH**  
DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION  
PRIVATE MAIL BAG NO. 5027, OYO STATE OF NIGERIA

Your Ref. No. ....

All correspondence should be addressed to

the Honorable ~~Commissioner~~

Our Ref No AD 13/479/ES3

March, 2015

The Principal Investigator,  
Department of Health Promotion and Education,  
Faculty of Public Health,  
College of Medicine,  
University of Ibadan,  
Ibadan.

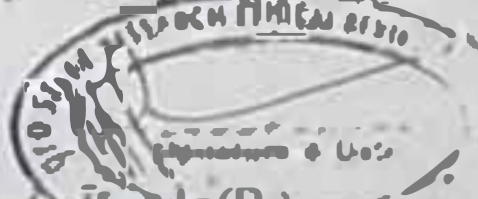
Attention : Aiyelina Omokhohe  
Ethical Approval for the Implementation of your Research Proposal in Oyo State

This acknowledges the receipt of the corrected version of your Research Proposal titled:  
"Knowledge and Use of Folic Acid among Women of Reproductive Age in Lead City  
University, Ibadan, Oyo State."

2. The committee has noted your compliance with all the ethical concerns raised in the initial review of the proposal. In the light of this, I am pleased to convey to you the approval of committee for the implementation of the Research Proposal in Oyo State, Nigeria.

3. Please note that the committee will monitor closely and follow up the implementation of the research study. However, the Ministry of Health would like to have a copy of the results and conclusions of the findings as this will help in policy making in the health sector.

4. *Wishing you all the best.*



Sola Akande (Dr)  
Director, ~~Planning~~ Research & Statistics  
Secretary, Oyo State, Research Ethical Review Committee

TELEGRAMS.....

TELEPHONE.....



**MINISTRY OF HEALTH**  
DEPARTMENT OF PLANNING, RESEARCH & STATISTICS DIVISION  
PRIVATE MAIL BAG NO. 5037, OYO STATE, OF NIGERIA

Your Ref. No. ....

All communications should be addressed to

the Honorable Commissioner General

Our Ref. No. AD 13/ 479/8 33

March, 2015

The Principal Investigator,  
Department of Health Promotion and Education,  
Faculty of Public Health,  
College of Medicine,  
University of Ibadan,  
Ibadan.

Attention : Ayegun Omukhase

Ethical Approval for the Implementation of your Research Proposal in Oyo State

This acknowledges the receipt of the corrected version of your Research Proposal titled:  
"Knowledge and Use of Folic Acid among Women of Reproductive Age in Lead City  
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4. Wishing you all the best.



Sola Akande (Dr)  
Director, Planning, Research & Statistics  
Secretary, Oyo State, Research Ethical Review Committee