

Knowledge and practice (KP) of Folic acid intake during conceptive period in Omdurman maternity hospital (OMH)

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Abstract

The objective of this study was to assess the knowledge and use of folic acid among pregnant women in Omdurman Maternity Hospital, Sudan. The study is a descriptive cross-sectional hospital-based study.

One thousand pregnant women were interviewed, where a structured questionnaire was developed for the study. Results of the survey indicated that 91.2% of the women knew about folic acid, 16.2% knew that it prevents birth defects, 86.9% knew that it prevents anemia. The majority (88.6%) of women was taking the supplement, 51.3% were taking it regularly, but only 4.7% took it before getting pregnant. Knowledge and use were significantly influenced by age, education level, employment and family income. Preconception use of the supplement was lowest among illiterate and least educated women 7.02%.

It was concluded that a high level of knowledge of folic acid was not reflected in regard to successful use of the folic acid supplement. Thus, it is justifiable for the prevention of all those affected by low levels of FA intake to introduce the policy of food fortification as is practiced in many developed countries.

Abbreviations:

FA Folic acid
MR Metabolic rate
DNA Deoxyribonucleic acid
CM Congenital malformation
NTD Neural tube defect
OMH Omdurman Maternity Hospital
HCP Health Care Provider
RDI Recommended Dietary Intake
RNA Ribonucleic Acid

NHMRC National Health Medical Research Committee
IVF In vitro fertilization
SLE Systemic Lupus Erythematosus
SBU Swedish Council on Technology assessment in Health Care

Introduction

No one could differ with the important role of vitamins in metabolism. As the metabolic rate (MR) increases during the active period of life, youth and adulthood, and for that reason in females, the conceptive period of “15 – 49 years” is the period of increasing MR. Additionally, during this period many studies emphasize good and healthy nutrition to satisfy the bodily need of important vitamins, and in particular folic acid (FA) is of great importance as it's shown to work in DNA and protein synthesis. Furthermore, Folic acid or vitamin B9 is a water soluble vitamin and it plays a major role in preventing many Congenital Malformations (CM) (especially Neural tube defect (NTD)). To prevent such complications of CM, it is wise to extend the knowledge about FA. Hence, this study was conducted to evaluate the knowledge and practice of FA intake during the conceptional period in Omdurman Maternity Hospital (OMH). Omdurman Maternity Hospital was established in 1956 by the west side of the river Nile in Omdurman locality south Hush Al-Khalifa, East Almorada Street. The hospital has the highest delivery rate in Sudan, and it offers health services to people with different traditions and costumes reflecting the culture of their roots. Moreover, the study evaluates the factors which are taken as variables to affect the knowledge and practice of FA intake, where these variables are to be used in an open and closed questionnaire. The interviews were guided by doctors and trained midwives working in the hospital. The variables taken were age, residence, tribe, state of education, occupation, parity, number of congenital malformed conceptions, mode of deliveries, distance of the Health Care provider (HCP) of the health service, source of knowledge of FA, husband age, occupation, state of education and other information concerning the practice of taking FA and the basic knowledge about it.

Folates (derivatives of FA) play a key role in the synthesis, repair, and methylation of DNA. Therefore, it is not surprising that a deficiency in this essential B vitamin has been implicated in: Alzheimer's disease, atherosclerosis, heart attack, stroke, osteoporosis, depression, dementia, cleft lip and palate, hearing loss, Raynaud's phenomenon, and of course, neural tube defects (1). A high blood level of homocysteine (a sulfur-containing amino acid derived from methionine) has been associated with the development of atherosclerosis. High homocysteine levels can be reduced by supplementation with FA. Researchers at the University Hospital Vrije Universiteit report evidence that supplementation with FA and vitamin B6 is associated with a decreased occurrence of abnormal exercise electrocardiographs - important markers for - atherosclerosis (2).

The researchers conclude that a daily dose of 400 micrograms of FA combined with vitamins B6 and B12 will normalize homocysteine levels in heart disease patients (3). Other studies show that supplementing with folic acid may lead to a 4% reduction in overall risk for heart disease and a 10% reduction in stroke risk. Folic acid has many other benefits which will be elucidated.

Literature Review

Although FA has been proven to be a very important vitamin in the prevention of NTD and other serious CM for half of the last century, the majority of people do not acknowledge its use, and Among those who know, very few respond to the message of FA usage.

Folic acid is a water-soluble B vitamin which serves as a co-factor in many enzymatic reactions related to growth and development, neuronal function, and blood cell production. The dietary intakes of many individuals, particularly alcoholics, are known to be less than the Recommended Dietary Intake (RDI). Folic acid is an important nutrient which may be useful in the prevention of atherosclerosis and neural tube birth defects (4).

Pharmacology:

In humans, FA is converted to its biologically active form, 5-methyltetrahydrofolate. Folic acid participates in methylation reactions, such as the conversion of homocysteine to methionine. Elevated homocysteine is a risk factor for accelerated atherosclerosis. Folic acid is also required for the synthesis of amino acids and the precursors to protein synthesis. In addition, folate is necessary for the synthesis of both DNA and RNA. For this reason, it is essential for cellular growth and division. It is required for the formation of all new cells and is an important factor in the production of red blood cells, hair, and skin. Besides, it is required for proper functioning of the neuronal cells, as well as being necessary for closure of the neural tube during pregnancy (5).

Toxicity, warnings, and interactions:

The risk of toxicity from FA intake from supplements and/or fortified foods is relatively low. There is some evidence that high levels of folic acid or high dose supplements can provoke seizures in patients taking anti-convulsing medications. Anyone taking such medications should have a consultation before taking FA supplements. Large doses can mask symptoms of vitamin B12 deficiency.

Symptoms of deficiency:

Anemia, heartburn, fatigue, diarrhea, constipation, depression, frequent infections, mental confusion.

Folate deficiency:

Occurs when the need for this vitamin exceeds the daily intake as well as in those using some medication which interferes with its metabolism (6).

Medical conditions that increase the need for folate or result in increased excretion of folate include pregnancy, lactation, liver disease, dialysis, malabsorption, alcohol abuse and anemias. Classically FA deficiency occurs in older depressed patients who live alone and avoid cooking foods that contains FA, as well as in patients with malabsorption syndrome. Increased folate demands occur in patients with chronic severe hemolytic anemia and pregnancy (7).

The hematologic manifestations of folate deficiency are like those of Cyanocobalamin deficiency, but neurologic abnormalities do not occur.

Reported interactions:

There are no known adverse nutrient/nutrient interactions between FA and other nutrients. However, folic acid participates with other B vitamins in many biochemical activities and many health professionals prefer that FA to be taken along with other B vitamins. High doses of folic acid may alter the metabolism of phenytoin, phenobarbital, or primidone; and may decrease the efficacy of methotrexate, pyrimethamine; cholestyramine, and colestipol.

Drugs which can cause depletion of folic acid:

Oral contraceptives, potassium-sparing diuretics (triamterene), bile acid sequestrants, anticonvulsants (barbiturates, phenytoin, carbamazepine, primidone, valproate), corticosteroids (prednisone), Non-steroidal anti-inflammatory drugs, sulfasalazine, methotrexate, trimethoprim-containing antibiotics (co-trimoxazole), H₂-receptor antagonists, aspirin, antacids, alcohol, cyclosporine pyrimethamine, antibiotics, biguanides, salicylates.

Dosage - oral:

Recommended Dietary Intake (RDI): 400 mcg/day. National Institute of Health recommends 600 mcg/day for pregnant, and 500mcg/day for lactating women.

Active forms:

The active form of Folic acid is 5-methyltetrahydrofolate (5-MTHF).

Stability of vitamin B9 or FA:

Heat sensitivity: Non aqueous form of folic acid is highly stable till temperature < 120 C; however, it is easily affected by heat under aqueous conditions.

Water bleaching: The total folate content of the cooking water is usually equivalent to the total content from boiled vegetables (8).

Reported uses:

Folic acid is highly important in preventing birth defects which affect a small number of pregnancies. It is also important in every pregnancy to help the fetus reaching a healthy birth weight. However, many women are missing the critical window of use, in the first few weeks of gestation, during which their baby really needs FA to grow and develop. The use of FA antagonists in early pregnancy increases the risk of heart defects particularly among the infants of women who did not take multivitamins which contain FA. Folic acid is essential for normal fetal cardiac development during early embryogenesis, and so periconceptual FA use may reduce the risk for congenital cardiac anomalies. Researchers have found that FA supplements taken for a year before pregnancy can reduce the risk of premature births by 70% and save thousands of lives (9). There is some evidence that the periconceptual folic acid supplementation has an effect on reducing the risk of ASD or mitigates the potentially increased risk of ASD from prenatal exposure to certain drugs and toxic chemicals, and this might be related to folic acid's role in DNA methylation (10).

The UK NHMRC estimated that fortification with folate would avert health care costs of \$2.3 million a year, based on the additional cost of raising a child with a neural tube defect to age 10. The cost of fortification with folate would be less than one tenth of this (11). Another study examined the effects of maternal folate on the multiple birth rates of (UK) women undergoing in vitro fertilization (IVF). In the UK, it is standard for two embryos to be implanted in each cycle of (IVF) to increase pregnancy rates. Twins are born in a quarter of successful (IVF) procedures for those taking FA supplementation. Moreover, in the US, flour fortification with FA, is used to avoid neural-tube abnormalities, which were affecting an 11-13% rise in multiple births after fertility treatment.

An increasing number of couples have difficulty conceiving a child. The major reason for this is the declining sperm quality in men. Dutch researchers have discovered that supplementing with a combination of folic acid and zinc can increase the sperm count in infertile men by as much as 74% (12). Researchers recommend a daily intake of 400 µg of synthetic folic acid (13). They predict that one half to three quarters of (NTD) cases can be prevented if women of child-bearing age ensure an adequate intake of folic acid at all times, as the Neural tube defects usually occur before a woman realizes that she is pregnant (14). The researchers conclude that it is misleading to advise women only to rely on the consumption of folate-rich foods as a means of maintaining an adequate folate status. The only way an adequate status can be ensured is by taking supplements or by consuming foods fortified with folic acid (15). The researchers point out that in addition to major health care cost savings, other benefits of supplementation include better quality of life, longer life, and increased productivity (16). Additionally, (FA) is used in megaloblastic anemia with the feature of Macrocytosis (mean cell volume >100), hypochromic and with hyper segmented neutrophils (17). Also in some studies, the researchers deduce that folic acid supplementation during pregnancy reduces the risk of childhood leukemia (18).

Previous studies have indicated that a low dietary folate intake increases the risk of colorectal cancer. Additionally, Folic acid and B vitamins help prevent breast cancer (19). Approximately more than 20 studies have been published regarding the association between colorectal cancer and folate status. Collectively, these studies suggest that people with a high intake of folates can reduce their risk of developing colorectal cancer by about 40 per cent compared to people with low intakes, but while considering that the person does not already have colorectal cancer.

In some studies very old people with folate deficiency may represent a risk factor for the cognitive decline associated with aging that could contribute to Alzheimer's disease as well as other aspects of dementia (20). Researchers at the University of Calgary, Canada report that elderly people with low blood levels of folic acid are more likely to suffer a stroke than people with normal to high levels. They also discovered that people with low folate levels were more likely to be depressed or demented (21).

Other studies have shown that supplementation with as little as 0.5mg /day of folic acid increases the effectiveness of fluoxetine (Prozac) (22). They explain that a folate deficiency is associated with increased atrophy of the neocortex, especially in patients with Alzheimer's disease (23). They include that high homocysteine levels are an important risk factor for (AD) and that this risk can be significantly reduced by ensuring an adequate intake of folic acid and vitamin B12 (24).

On the other hand, folate supplementation may play a useful role in the treatment of depression, but caution that the daily dosage required has to be carefully determined as too high a dose may cause sleeping problems, irritability, and hyperactivity (25).

The researchers further advise that folic acid supplementation may prevent the incidence of pneumonia and improve swallowing function in older people (26).

People with inflammatory bowel disease (Crohn's disease and ulcerative colitis) tend to be at greater risk for thromboembolic events (blood clots) such as stroke and peripheral venous thrombosis. Researchers found that homocysteine levels were significantly higher in patients with mild to moderately active Crohn's disease and that folic acid and vitamin B12 levels were significantly lower. For this reason, patients with Crohn's disease may benefit from supplementation of folic acid (27).

Earlier research has shown that a mother who has already given birth to one child with orofacial clefts can reduce her risk of having another child with orofacial clefts by a factor of six if she takes multivitamin pills and 10 mg/day of folic acid (28).

Systemic lupus erythematosus (SLE) patients have an increased risk of suffering strokes, heart attacks, and other arterial thrombotic events such as gangrene of the fingers. It is believed that this higher risk is at least partially related to a greater propensity among (SLE) patients to develop premature atherosclerosis. And as high concentrations of homocysteine have previously been linked to an increased risk of stroke and coronary artery disease, (29) the researchers suggest that supplementation with folic acid and vitamin B-6 may help prevent thrombotic events in SLE patients (30). Folic acid is also recommended for, Cervical dysplasia (31) Gingivitis (32) Osteoporosis (33) Schizophrenia (risk reduction, by decreasing homocysteine levels) and Ulcer apthous (34).

Nutrition and Pregnancy:

Women who typically eat three meals daily consisting of several servings of vegetables, fruits, whole grains, dairy products, and a few sources of protein (e.g., meat, fish, eggs, dried peas or beans) are likely to have adequate nutrition, so nutritional counseling, nutritional assessment and recommendations are important components of preconceptional counseling. Dietary modifications should be started early to maximally benefit fetal growth and development. Folic acid supplementation to reduce the risk of neural tube defects is a preconceptional recommendation that applies to all fertile women in the

childbearing years. The neural tube closes between 18 and 26 days after conception, so folic acid supplementation after the diagnosis of pregnancy is usually too late to reduce the risk of neural tube defects. The Center for Disease Control and American College of Obstetricians and Gynecologists recommend that women of childbearing potential take a folic acid supplement of 400 micrograms per day (35, 36).

Fortification of grain with folic acid was introduced in the US in 1996, and became mandatory in 1998, and grain is fortified with 140 µg of folic acid per 100 g of grain. Previous studies had suggested that 400 µg/d of folic acid reduces the risk of giving birth to a baby with an NTD by 50-70% (37).

Folic acid from vitamin supplements and fortified foods is more readily absorbed and made available for use by the body than natural folate from food. All parts of the small intestine are capable of FA absorption, but the jejunum is the greatest area of absorption. According to data collected by the Institute of Medicine, only 50% of food folate is absorbed by the body, compared with 85% of folic acid in fortified foods and 100% of the folic acid in a vitamin supplement. Cooking and storage can destroy some of the natural folate found in foods such as orange juice, fresh leafy green vegetables and grains. It's clear that folic acid is a simple way to prevent birth defects. However, the 2005 Gallup/March of Dimes survey suggests that women of childbearing age aren't heeding the advice; in fact, only 7% of women surveyed knew that folic acid should be taken before pregnancy. Young women should be reminded to consider taking folic acid even if they're not yet ready to have children. Similarly, a March of Dimes Gallup Survey in 2007 revealed that of those aware of folic acid, only one-third had heard about it from a health provider. Another 31% read about folic acid in magazines and 23 % received the news from radio or television (38).

Regional research:

1. A study was done in Qatar and Oman to assess knowledge and use of FA among pregnant Arabian women. Three hundred pregnant women were interviewed during their second trimester based on a questionnaire developed for the study. Results of the survey indicated that 94% of the women knew about folic acid, 41.3% knew it should be taken periconceptionally, 58.5% knew that it prevents birth defects and 34.4% were able to identify five or more food sources of folic acid. The majority (88.7%) of women were taking the supplement, 85.0% were taking it regularly and only 13.2% took it before getting pregnant. Knowledge and use were significantly influenced by ethnicity, age, education level, employment and family income. Preconception use of the supplement was lowest among younger women (4.9%) and illiterate and least educated women (5.3%). It was concluded that a high level of knowledge of folic acid was not shown, regarding successful use of the folic acid supplement (39).

2. Research was conducted to assess the prevalence and determinants of preconception folic acid supplement use among pregnant women in Lebanon. Results of the overall use of preconception folic acid supplementation

was 14% (18% in urban hospitals v. 2.7% in rural hospitals). Higher socio-economic status, lower parity and having a history of previous spontaneous abortions were significantly associated with preconception folic acid use. It was concluded that Lebanon has a low rate of preconception FA supplement use, and Intervention as awareness campaigns needs to be implemented at a national level (40).

Global research:

1. In UK the knowledge about FA was increased from 9% in 1995 to 68% in 1998, but only 38% of women surveyed in 1998 took FA around the time of conception (41).

2. The proportion of American women of childbearing age who had knowledge of the relationship between folic acid and birth defects remained unchanged at 25%. In a study conducted in the Canadian province of Quebec, 70% of pregnant women (n = 1,240) reported they were aware of the role of folic acid in prevention of NTDs but only 25% had taken the recommended dose of folate during the periconceptional period (42). Groups of Canadians, non-compliant with periconceptional folic acid supplement, are those of low educational status, younger women, immigrants and women with unplanned pregnancies. Since folic acid awareness does not necessarily translate into behavior change, and since neural tube closure occurs by the fourth week of pregnancy, a time when many women are unaware that they are pregnant, public health policy makers in Canada mandated the fortification of white flour, enriched pasta and cornmeal with folic acid by November 1998 (43). This intervention was expected to increase the average daily folic acid intake of women of childbearing age by 100 µg with almost nobody receiving more than 1 mg (44).

3. Despite numerous public affairs campaigns in the US focusing on the benefits of folic acid, in 2005 March of Dimes/Gallup survey showed that only one-third of child-bearing age women take a folic acid supplement daily. The number of women who said they had heard of folic acid reached an all-time high in the 2005 survey at 84%, up from 52% in 1995. However, folic acid use declined to 33% in 2005, down from 40% in 2004. The most common reason women gave for not taking the supplement daily is that they "forgot" (44). "Less than one quarter of women who are aware of the importance of folic acid take supplements daily in accordance with public health guidelines," said Corina Mihaela Chivu (45).

4. Also, Chivu and co-authors reviewed 31 studies conducted between 1992 and 2005 designed to increase awareness, knowledge and consumption of FA before and during pregnancy. The studies used television, Internet, brochures, counseling, posters, newspapers and magazines to provide information about folic acid to women. "The data encompassed just about 23,000 women ages 15 to 49," Chivu said. Overall, researchers found that receiving information increased awareness and knowledge: 60% of women were aware of the role of folic acid before the interventions while 72% were afterwards. However, knowledge did not necessarily translate to action: 14% took folic acid before the intervention; only 23% started taking it afterward.

5. Similarly, a March of Dimes Gallup Survey in 2007 revealed that of those aware of FA, only one-third had heard about it from a health provider. Even if seemingly low, this represents an increase from 1995, when only 13% heard about the supplement from a health provider (45). The study shows that scientific literature gives moderately strong support to the thesis that enriched flour reduces the risk for Spina bifida in fetuses. Another question that has come up for discussion is whether or not folic acid increases the occurrence of twin births, which in itself carries a slight risk for Spina bifida. (SBU) (The Swedish Council on Technology Assessment in Health Care) has found that when it comes to the effect of folic acid on twin pregnancies the research results are contradictory. A serious risk with FA enrichment could be a possible increased risk of cancer. It is biologically possible that folic acid could stimulate the transition from early stages of cancer to more active forms, as well as growth in existing tumors. There is no certain evidence that it is so, but some animal tests support the hypothesis, and some studies show a connection between high levels of folate and colon cancer. If FA really has this effect on cancer, the negative consequences could be extensive and counterbalance the benefits of fewer children affected by Spina bifida (45).

6. A study in the Netherlands showed 25% of health professionals never advised women about FA (46).

Justification

The risk of FA deficiency is very serious as a cause of morbidity and mortality. Hence the cost of regular FA and other vitamin supplementation is far less than the problem of its deficiency, it is crucial therefore to have a good strategy for knowledge and practice of FA intake.

Objectives

General Objectives:

Assess the patients' knowledge and practice of folic acid intake during the conceptive period in Omdurman Maternity Hospital.

Specific Objectives:

- To determine factors' effects upon patient's knowledge and practice of folic acid intake during the conceptive period.
- To determine the tolerance of the patient on regular folic acid intake during the conceptive period.
- To study the hazards of not taking folic acid during the conceptive period.

Methodology

Study Design: Descriptive cross-sectional hospital-based study.

Study Area: Khartoum state is the capital of the Sudan located in the middle of the country between latitudes (15 - 16.5) and longitude (31 - 34).

Divided by the white, blue and the river Nile into three provinces: Khartoum, Khartoum north (bahry) and Omdurman.

Khartoum takes the political role where all ministries and embassies were built' Omdurman which lies on the west border of the White Nile and river Nile holds the important cultural places.

Omdurman was extended during the last three decades due to nomadic emigration from different areas of the country. The causes for emigration of people are war, social reasons and natural catastrophic events.

Omdurman province is formed of three localities, Karery, Ombada and Omdurman, where there are 58 Health centers, 128 NGO Health units, 32 Hospitals in total including 18 private hospitals.

Study Population: All patients who attended the ANC clinic in OMH.

Study Sample: All pregnant women who came for ANC clinic during the period of the research.

Sampling: Total coverage sample of patients who agreed to be involved in the study.

Sample Size:

It was calculated according to the standard formula.

$$N = Z * 2(PQ) * 2 D2$$

N = sample size

Z = critical value

P = proportion of the problem

D = degree of perception.

The sample size is 1,000 participants.

Data Collection:

Patients were interviewed by standardized questionnaire.

Inclusion criteria:

1. Pregnant.
2. Agreement for the interview.
3. Not seriously ill or in labor.

Exclusion criteria:

1. Not Pregnant.
2. Emergency or critical cases.
3. Patient who refuses the interview.

Data Analysis:

The data analysis was done using SPSS program.

Results

After analyzing the data collected, where one thousand pregnant women were interviewed about the knowledge and practice of FA intake during the conceptive period the findings were as follows:

Figure 1: The study shows that almost 90% of participants were of 15-45 year's age and only 10.8% were > 45 years.

Figure 2: State of education shows that 15.4% of participants were illiterate, 25.6% educated to the elementary school level, 33.6% educated to the secondary school and 25.4% were educated at university or further level.

Figure 3: Where there was a husband State of education shows that 10.4% were illiterate, 21% to the elementary school, 30% to the secondary school and 38.6% were of the university or further level.

Figure 4: shows 41.2% were of < 5 years duration of marriage, 48.8% 5-15 years and 10% of > 15 years duration.

Figure 5: shows 7.6% of participants had a history of congenital malformed conception.

Figure 6: shows 88.6% used FA and 11.4% did not use it.

Figure 7: shows 91.2% know that the colour of FA is yellow, 5.7% say that its colour is red and 3.1% say it has another colour.

Figure 8: shows 98% use one tablet, 2% use two tablets.

Figure 9: shows 86.9% use FA only during pregnancy, 4.7% use it before pregnancy, 0.7% use it after pregnancy, 6.4% use it during and before pregnancy, 0.9% uses it during and after pregnancy and 0.4% use it in another way.

Figure 10: shows 65.4% constitutes those with regular ANC, 31.2% had irregular ANC, 3.4% were without ANC.

Figure 11: shows 70.8% use other multivitamin combinations and 29.2% did not use other multivitamins.

Figure 12: Of those who did not take the tablet of FA, 28.9% said because they thought it causes heart burn, 43.4% thought it causes nausea, 1.6% thought it hurts the fetus, 17.4% have other causes and 8.7% cannot afford to buy it.

Table 1: shows 76% of participants were a housewife, 18.8% were employees, 4% were workers and 1.2% had other jobs.

Table 2: Regarding husband's occupation, 36.2% were employees, 25.8% were workers, 22% were merchants, 7.8% were businessmen and 8.2 took other jobs.

Table 3: Shows 13.4% of the participants were primigravida, 63% were multigravida and 23.6% were grand multiparous.

Table 4: shows 58% delivered by vaginal delivery, 20.8% delivered by C/S 7.8% experienced both vaginal and C/S mode of deliveries.

Table 5: shows 46.6% use FA daily, 42.4% use it, but not daily and 1.8% use it in various or irregular frequencies.

Table 6: shows 6.4% of the participants know that FA is used to prevent anemia and congenital malformed conceptions. 73.2% know that it prevents anemia, 8.4% know that it is used to prevent the risk of congenital malformed conception, 2.4% thought it prevents morning sickness and 1.2% had other thoughts about its usage.

Table 7: shows 76.8% learn about FA from doctors, 3.8% from relatives, 2.6% from medical assistant, 1.2% from television, 0.4% from the broadcast and 5.6% from other resources.

Table 8: shows 79.4% had ANC with doctors, 10.6% with the midwife, 4.4% with the health visitor and 2.2% with the medical assistant.

Table 9: Regarding the place of ANC 63.4% presents at hospital, 12.8% at a private doctor private and 20.4% at the nearest health center.

Table 10: The use of FA according to the age group, 87.7% of women between 15-30 years used FA, 89.7% of women between 30-45 years used FA, and 87.0% of women > 45 years used FA.

Table 11: shows 87.4% of housewives used FA, while 94.7% of employees, 90.0% of workers and those with other jobs 66.7%

Table 12: shows 67.5% of illiterate women used FA, 87.5% of those educated to elementary school level, 94.0% of those with secondary school level and 95.3% of those at university level.

Table 13: Regarding women who use FA, 91.7% of those whose husbands are employees use FA, of those whose husbands are workers 78.3% use FA, of those whose husbands are a Businessman 100.0% use FA, of those whose husbands are a Merchant 90.9% use FA and 90.2% of those whose husbands have another occupation use FA.

Table 14: shows 81.6% of those with a history of congenital malformed conception use FA

Table 15: shows 99.0% of women who take their knowledge from doctors use FA, 100.0% of those who take their knowledge from television use FA, 94.7% of those who take their knowledge from a relative and 92.3% of those take their knowledge from medical assistant use FA and 50% from a broadcast, while those who gain knowledge from other resources 92.9% use FA.

Table 16: shows 41.7% of those who think FA prevents morning sickness were illiterate, 8.3% were of elementary school level, 33.3% were of secondary school and 16.7% of university level. 14.2% of those who think FA prevents anemia were illiterate, 27.9% were of Elementary school level, 35.8% were of secondary school level and 22.1% of university level. 41.7% of those who think FA prevents morning sickness were illiterate, 8.3% were of elementary school level, 33.3% were of secondary school, and 16.7% of university level. 0% of those who think FA prevents the risk of congenital malformed conception were illiterate, 16.7% were of the elementary school level, and 35.7% were of the secondary school while 47.6% were of university level. 0% of those who think FA is used for prevention of anemia and prevents the risk of congenital malformed conception were illiterate, 12.5% were of the elementary school level, and 31.3% were of the secondary school and 56.3% of university level.

Figure 1: Shows the distribution of the population of the study according to their age

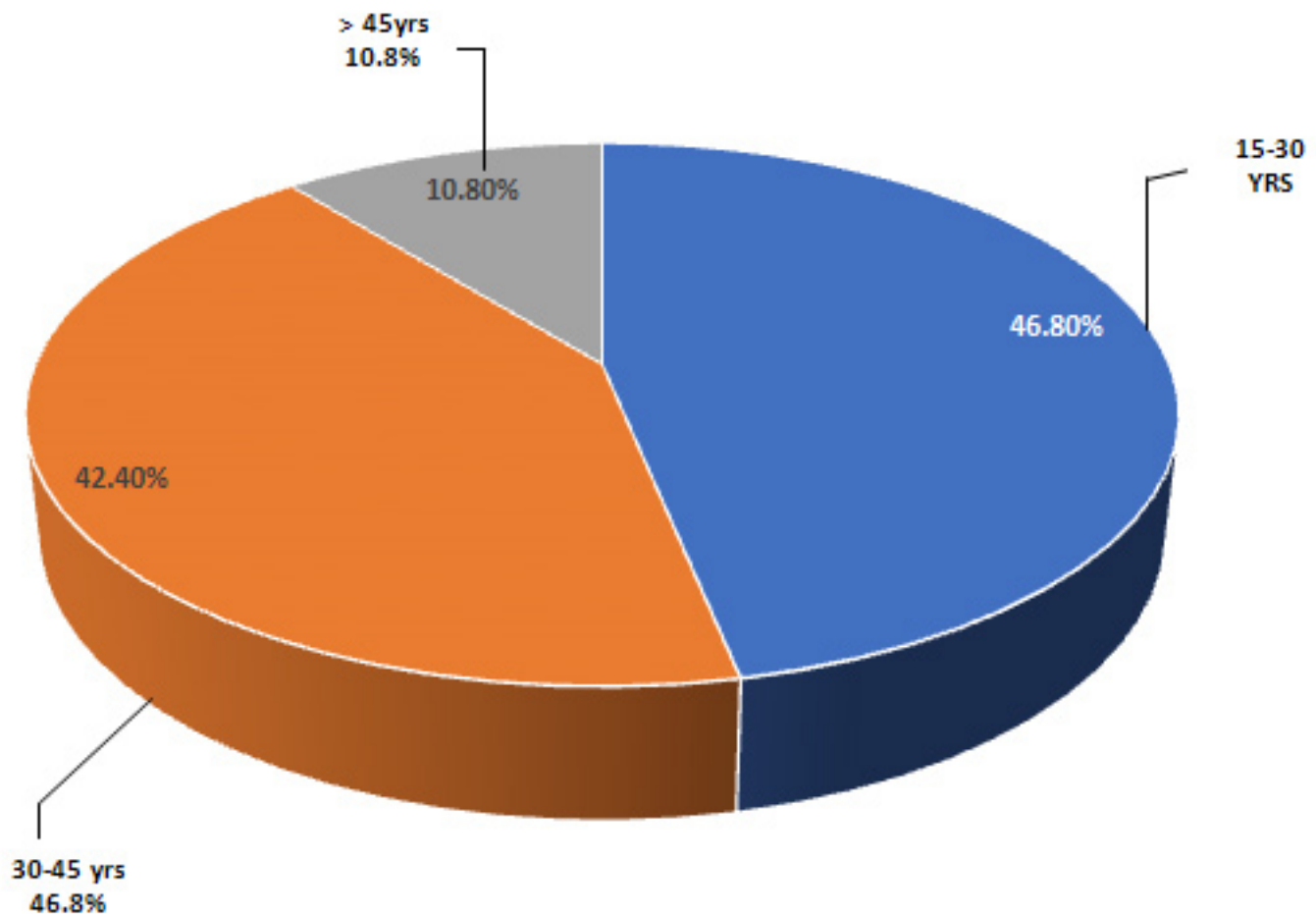


Figure 2: Shows the distribution of the population of the study according to the state of education

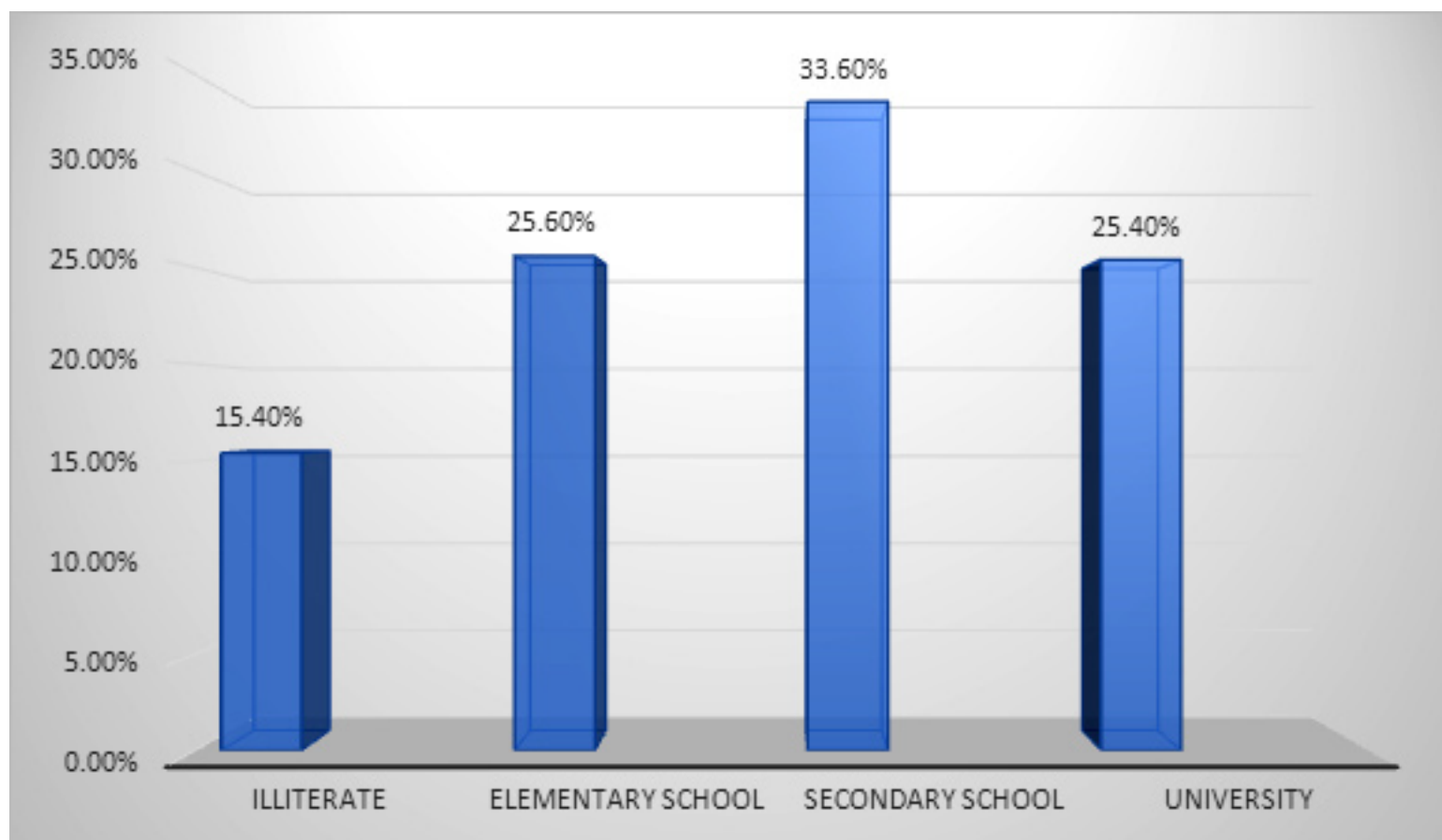


Figure 3: shows distribution of their husbands according to the state of their education

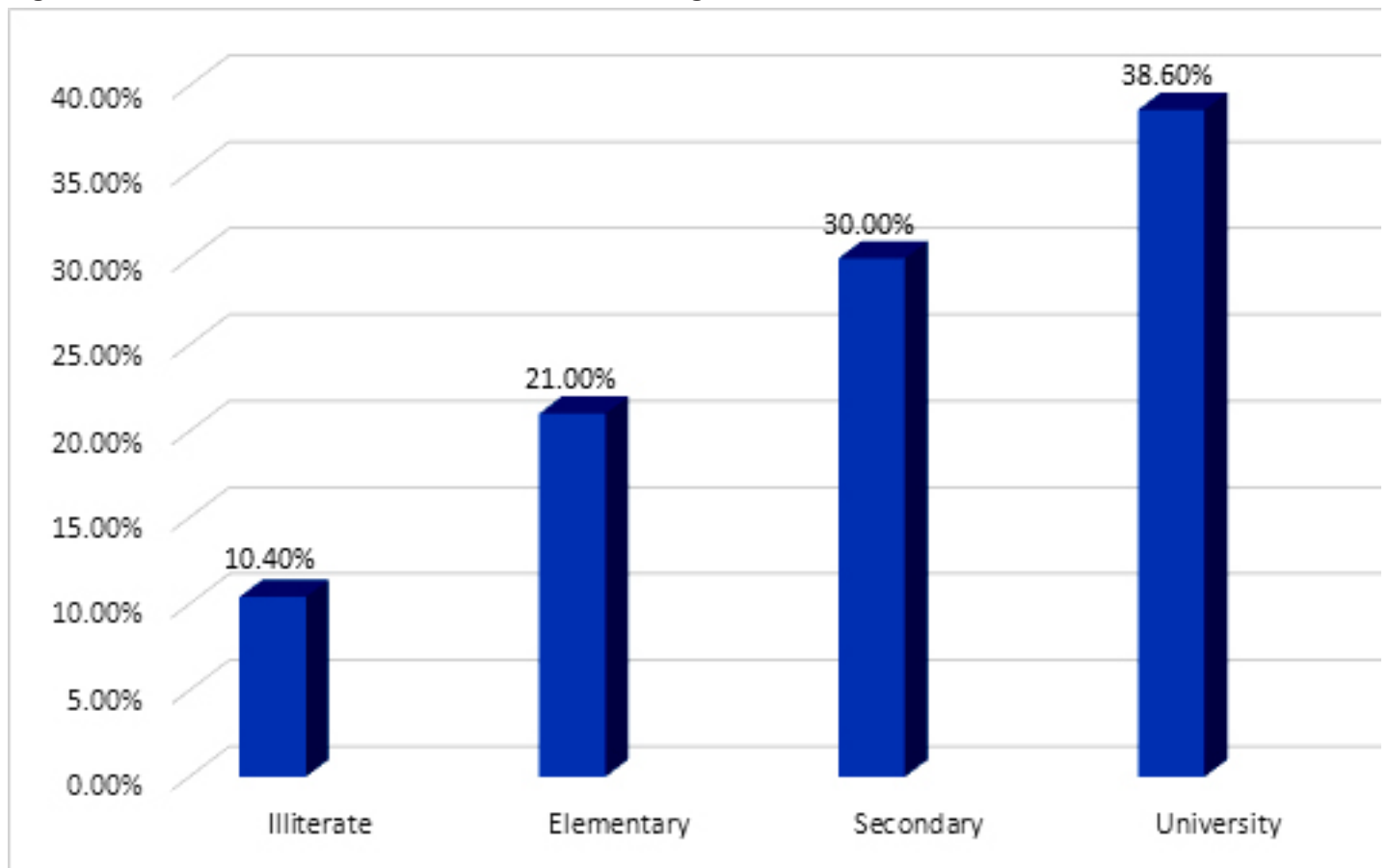


Figure 4: Shows the distribution of the population of the study according to the duration of marriage

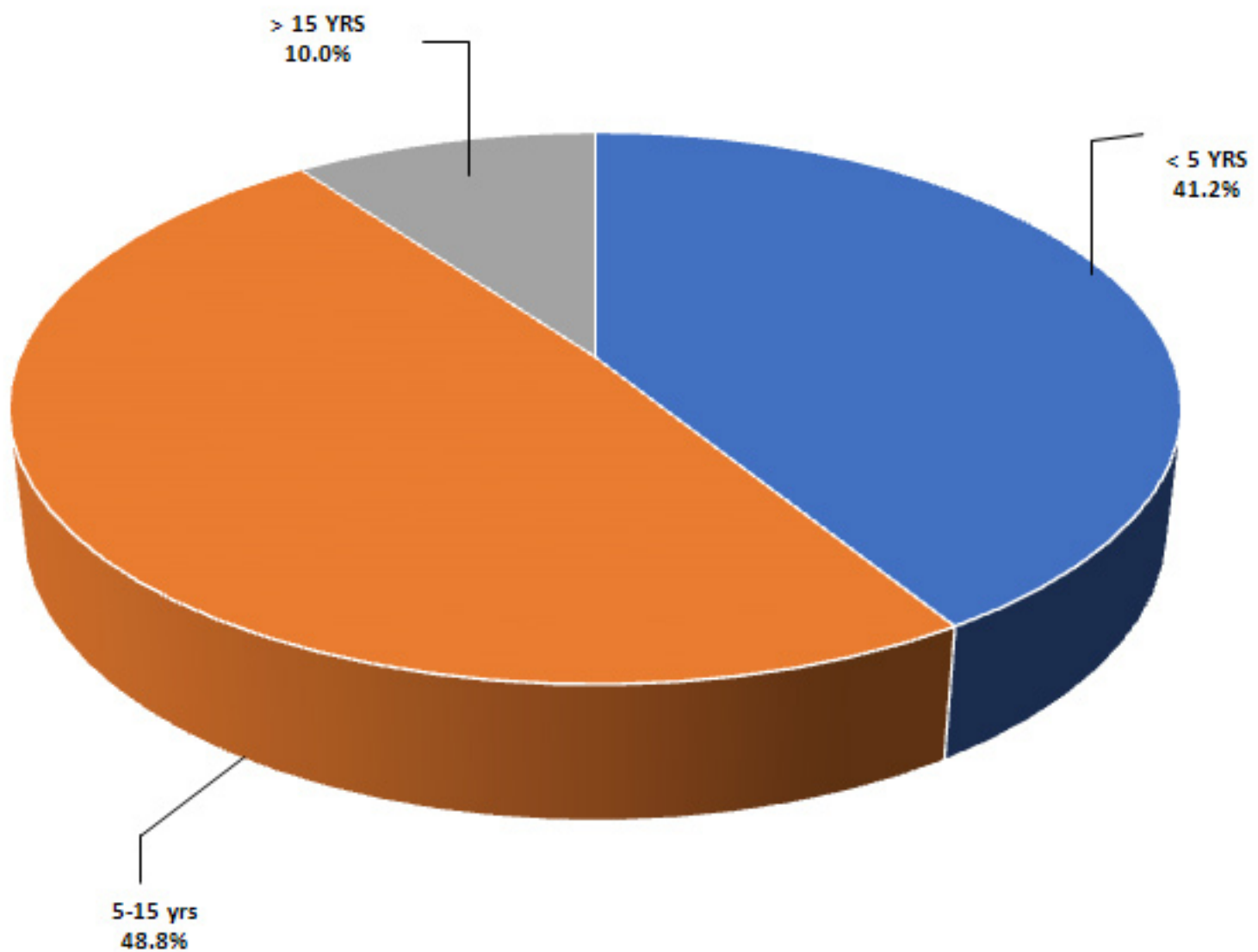


Figure 5: shows 7.6% of participants had a history of congenital malformed conception

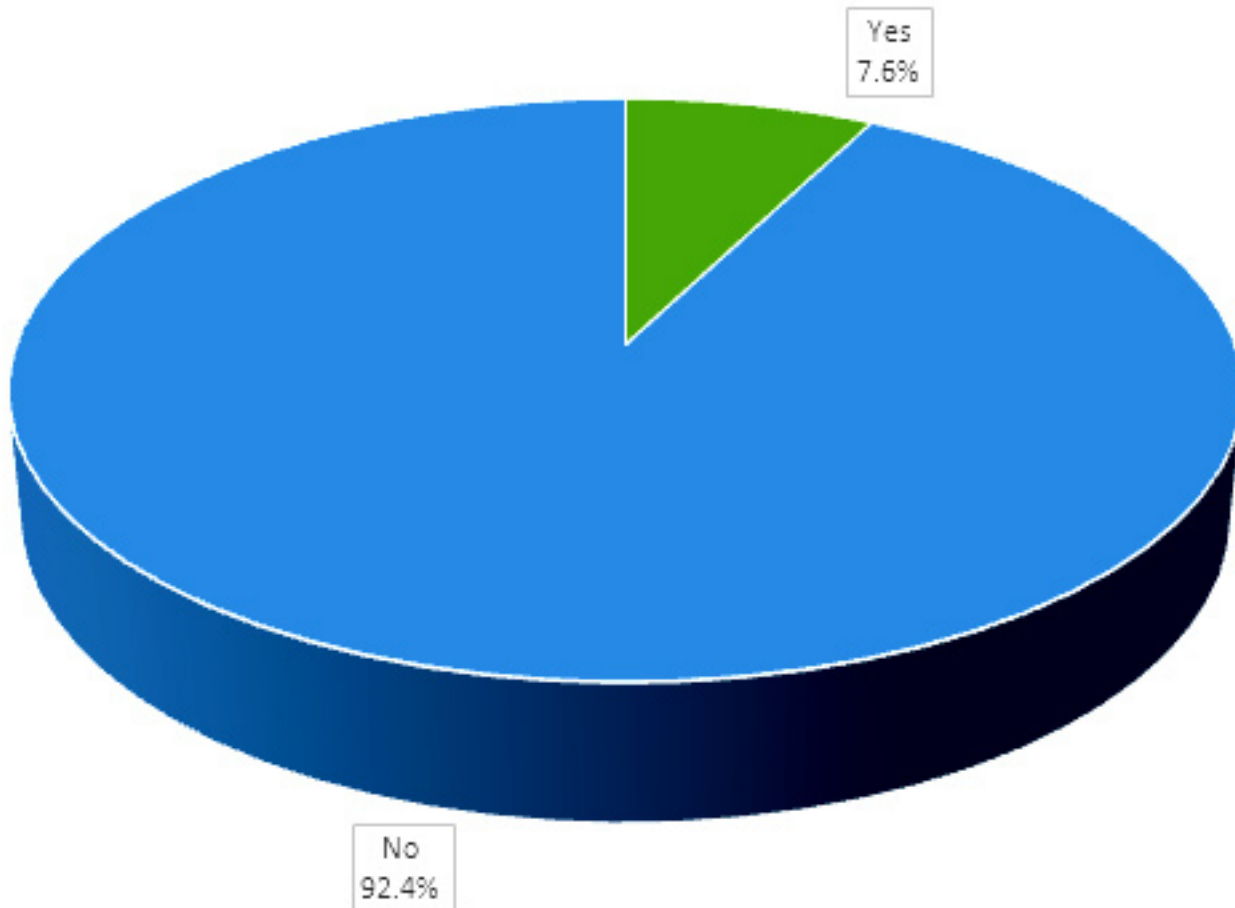


Figure 6: Shows the distribution of the population of the study concerning use of FA

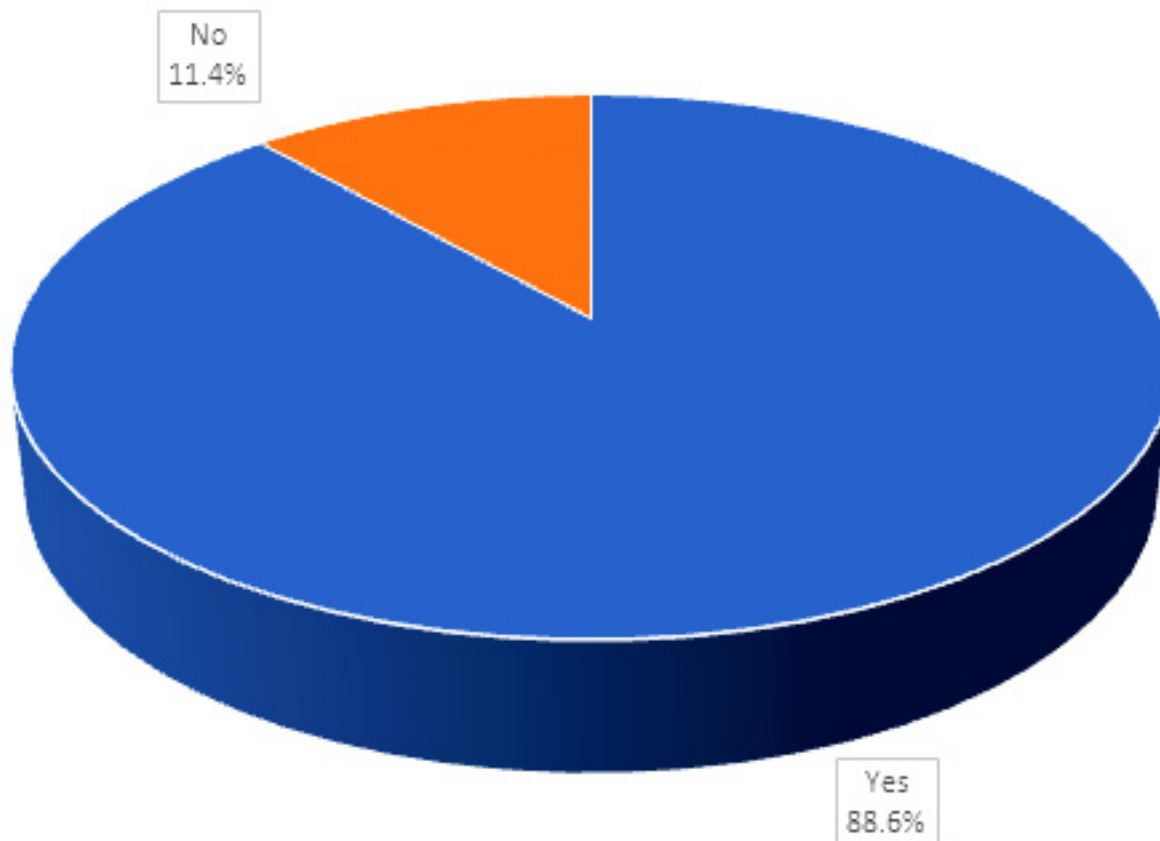


Figure 7: shows the distribution of the study population according to their knowledge about the color of FA

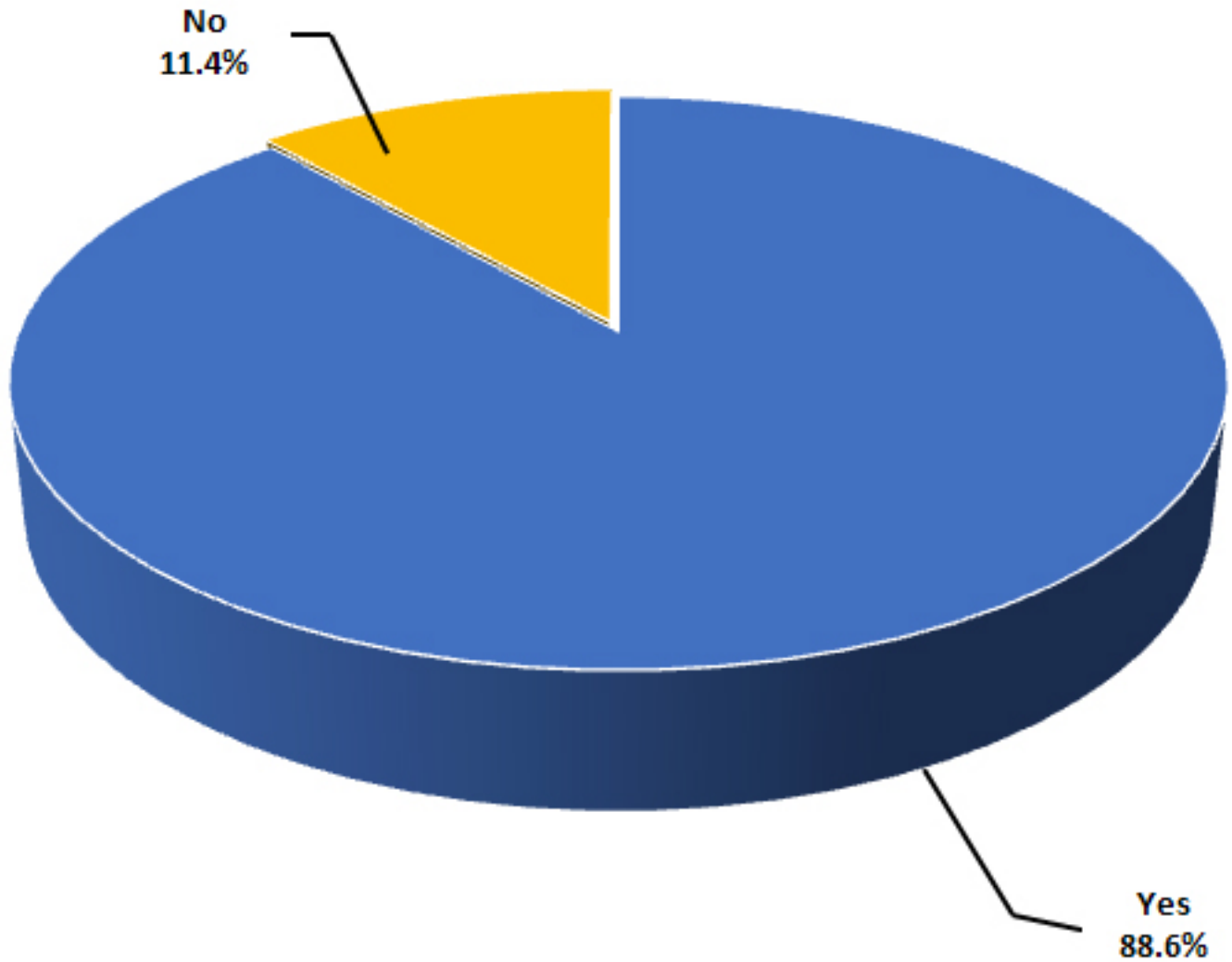


Figure 8: shows the distribution of the dose taken by the population of the study

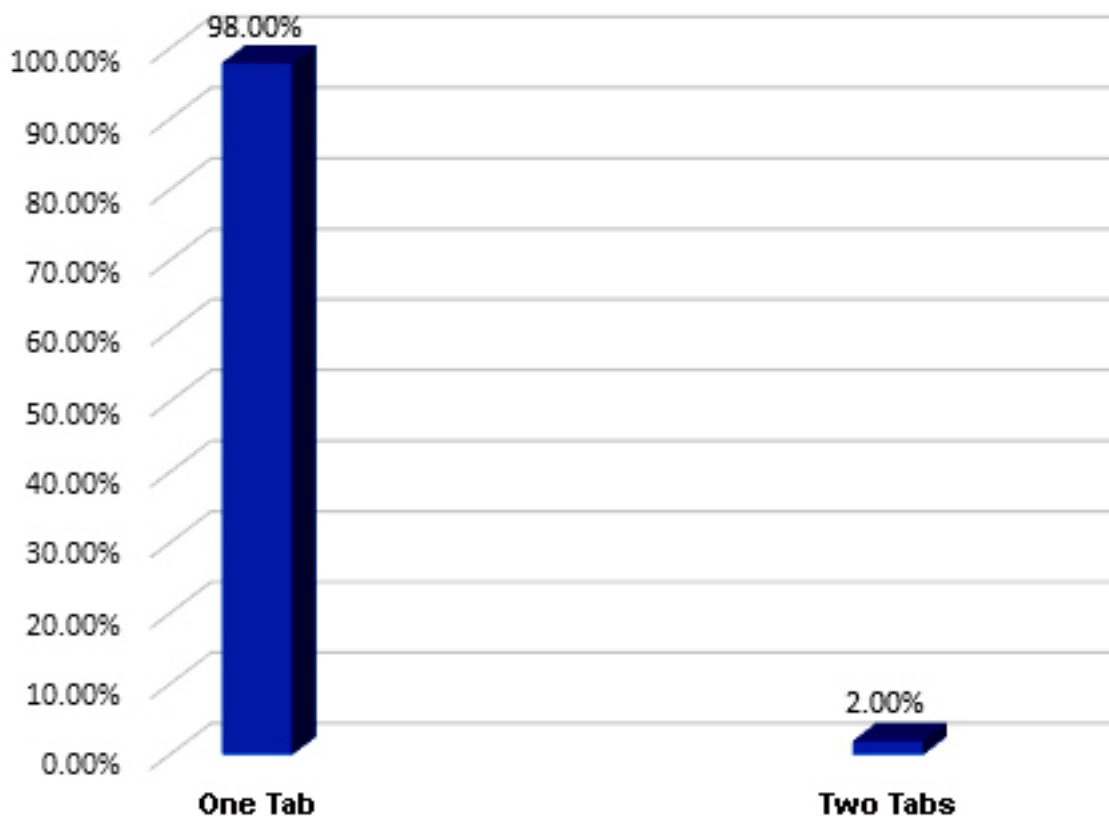


Figure 9: shows the distribution of the study population according to the time of use of FA in relation to pregnancy

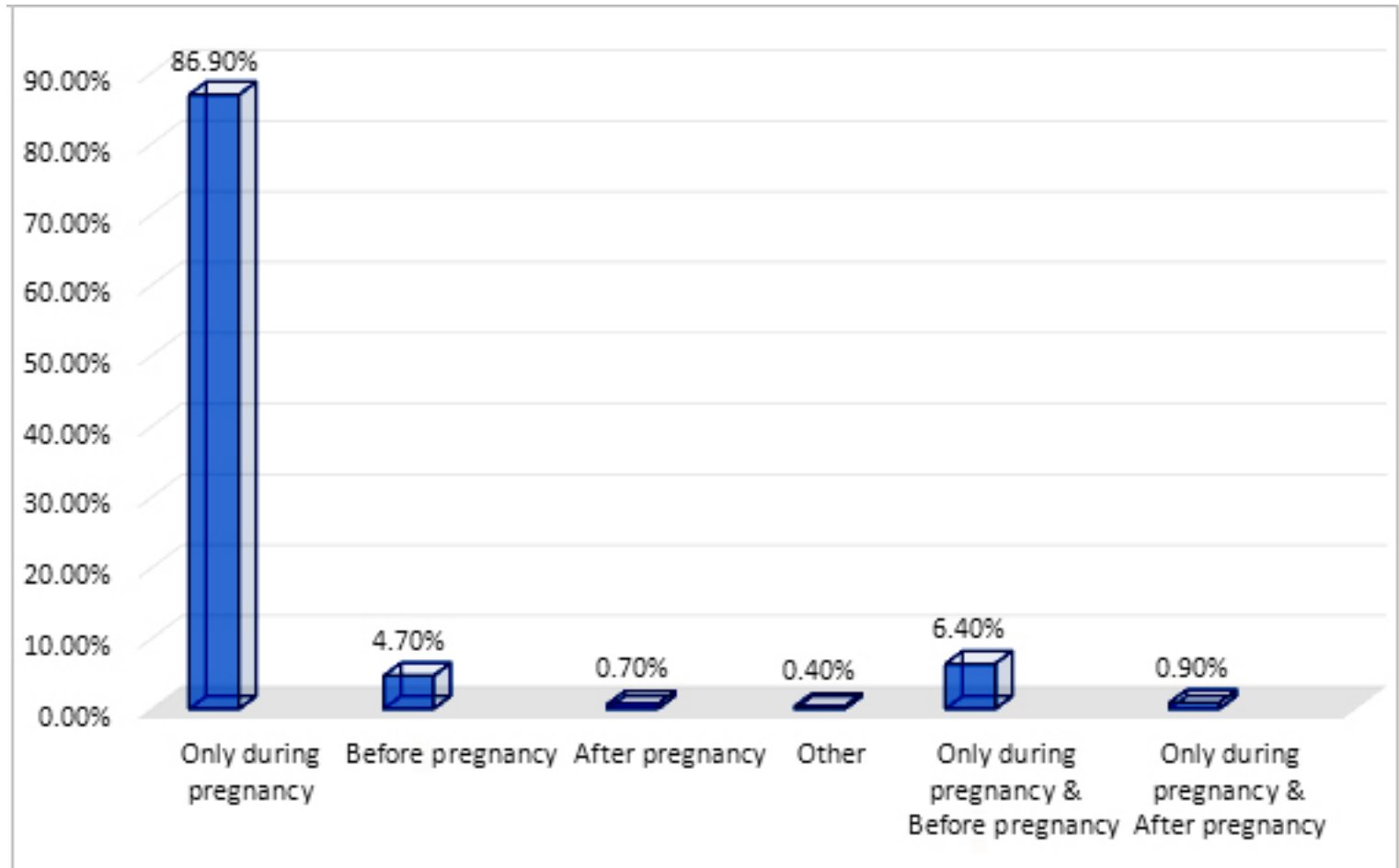


Figure 10: shows the frequency of ANC for the study population

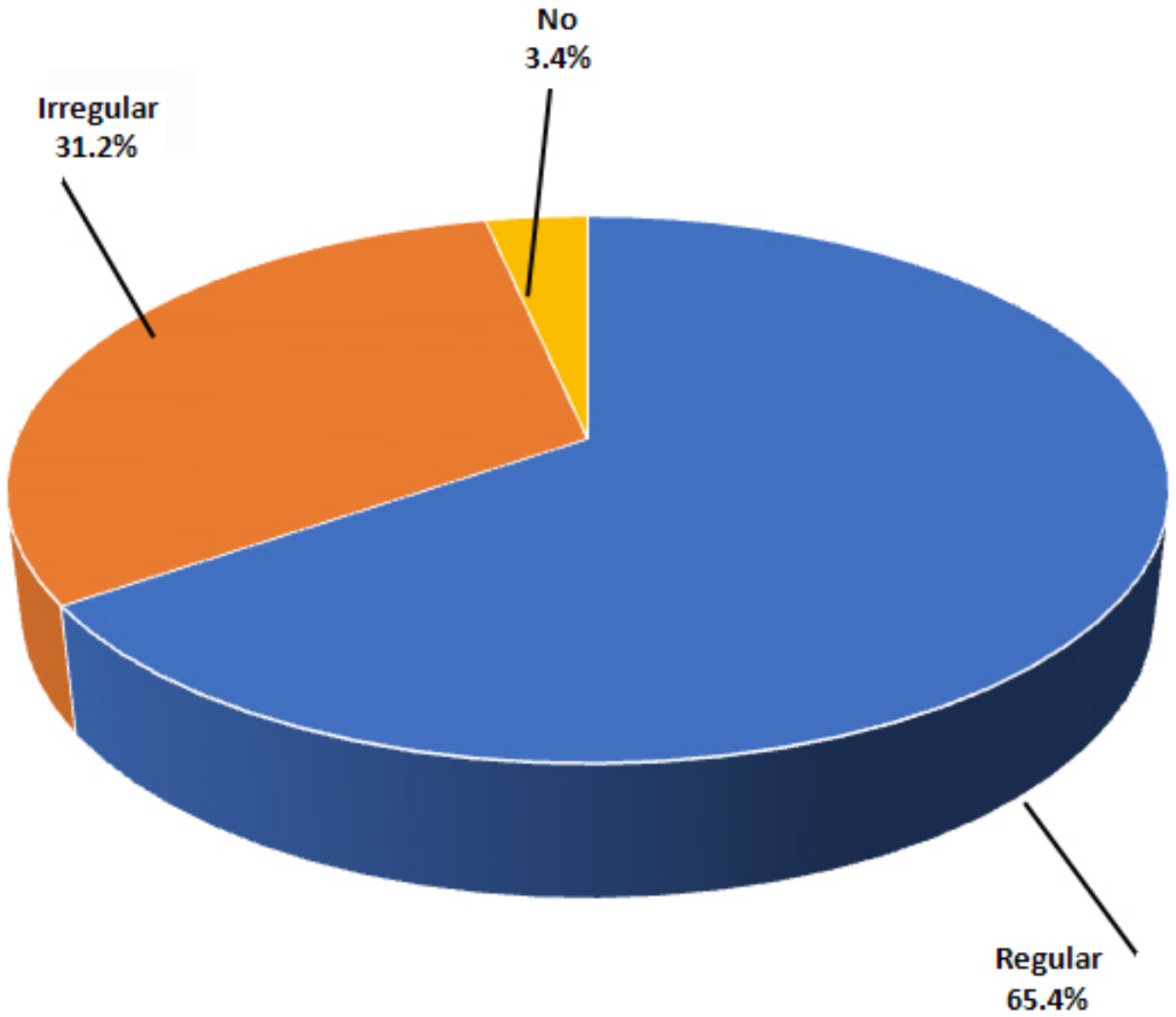


Figure 11: show the distribution of the study population according to the use of other multi vitamins combinations

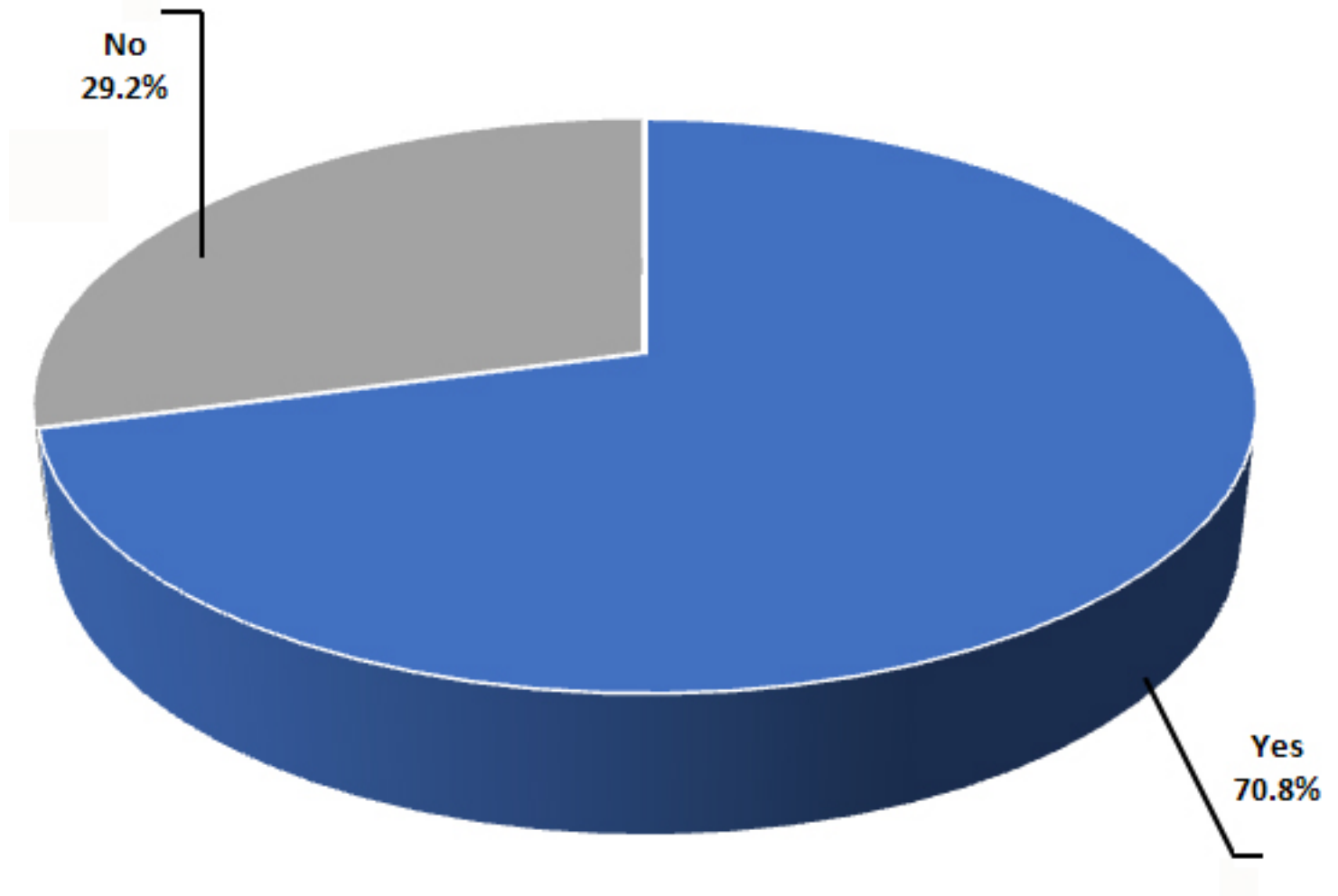


Figure 12: show the distribution of the causes of their avoidance of FA intake

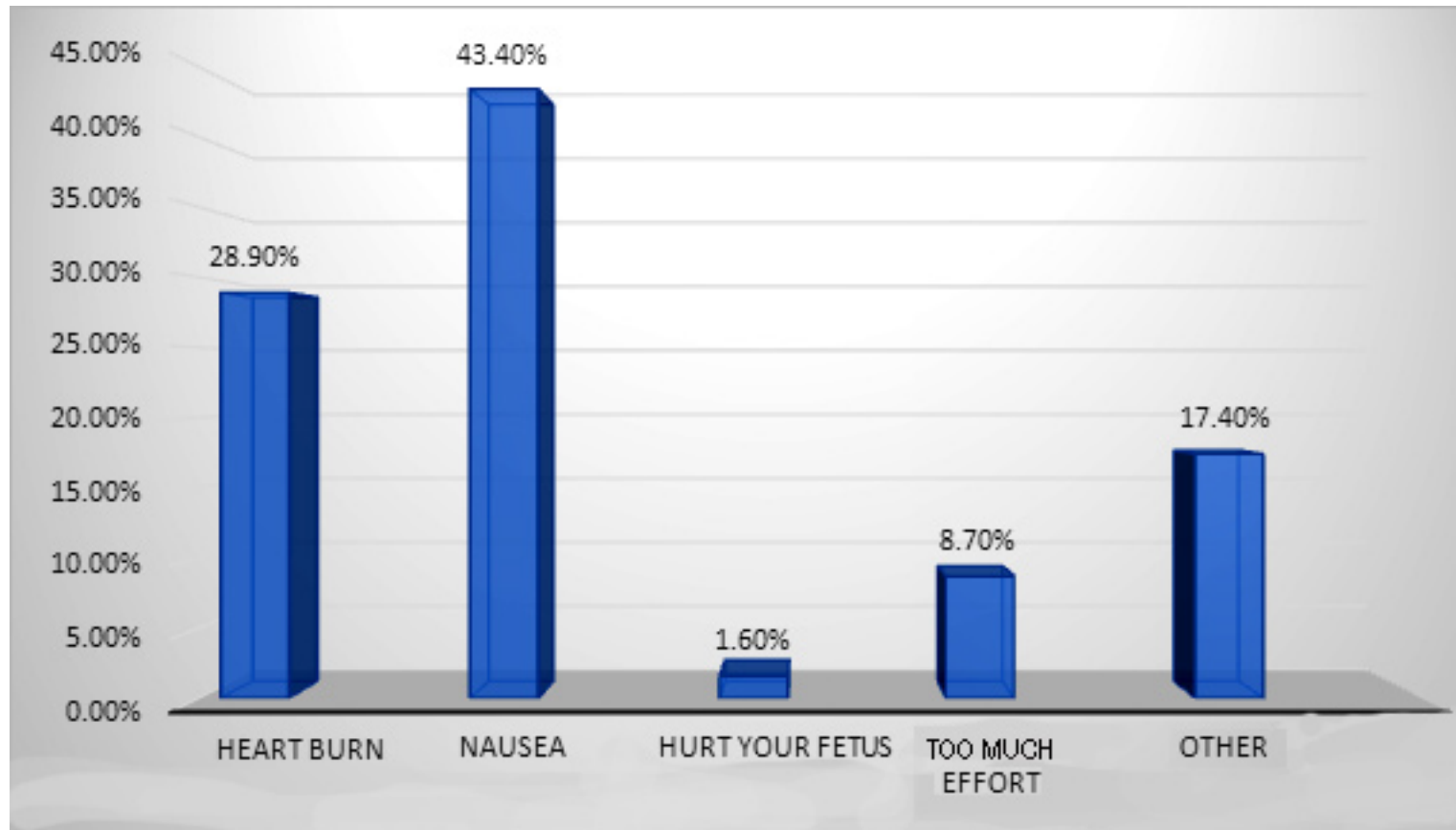


Table 1: shows the distribution of the study population according to their occupation

Occupation	Frequency	Percentage
House wife	760	76.0
Employee	188	18.8
Worker	40	4.0
Other	12	1.2
Total	1000	100.0

Table 2: shows the distribution of the study population according to their husband's occupation

Occupation	Frequency	Percentage
Employee	362	36.2
Worker	258	25.8
Business man	78	7.8
Merchant	220	22.0
Other	82	8.2
Total	1000	100.0

Table 3: shows the distribution of the study population according to their parity

Parity	Frequency	Percentage
PG	134	13.4
Para 1	290	29.0
Para 2-4	340	34.0
> 4	236	23.6
Total	1000	100.0

Table 4: shows the distribution of the study population according to their mode of deliveries

Mode of delivery	Frequency	Percentage
C/S	208	20.8
Vaginal delivery	580	58.0
C/S & Vaginal delivery	78	7.8
Total	866	86.6

Table 5: shows the distribution of how frequent the study population uses

How frequent they use folic acid	Frequency	Percentage
Daily	466	46.6
Not daily	424	42.4
Other	18	1.8
Total	908	90.8

Table 6: shows the distribution of the reason, why the study population use FA

Why they use folic acid	Frequency	Percentage
Prevent morning sickness	24	2.4
Prevention of anemia	732	73.2
Prevent the risk of congenital malformed conception	84	8.4
Other	12	1.2
Prevention of anemia & Prevent the risk of congenital malformed conception	64	6.4
Total	916	91.6

Table 7: shows the distribution of their source of knowledge about FA

Source of knowledge about folic acid	Frequency	Percentage
Relative	38	3.8
Medical assistant	26	2.6
Doctor	768	76.8
Broadcast	4	.4
Television	12	1.2
Others	56	5.6
Total	904	90.4

Table 8: shows the distribution of the provider of ANC

Provider of antenatal care	Frequency	Percentage
Health visitor	44	4.4
Medical assistant	22	2.2
Doctor	794	79.4
Midwife	106	10.6
Total	966	96.6

Table 9: shows the distribution of study population according to their place of ANC

The place of your antenatal care is	Frequency	Percentage
The nearest health centre	204	20.4
Hospital	634	63.4
Private doctor	128	12.8
Total	966	96.6

Table 10: Shows the relationship between the age of study population and the use of FA

Age (in years)	Do you use folic acid				Total	
	Yes		No		NO	%
	NO	%	NO	%		
15 – 30	372	87.7 %	52	12.3 %	424	100.0 %
30 – 45	420	89.7 %	48	10.3 %	468	100.0 %
> 45	94	87.0 %	14	13.0 %	108	100.0 %
Total	886	88.6 %	114	11.4 %	1000	100.0 %

	Value	P - Value
Pearson Chi-Square	1.181	.554

Table 11: Shows the relationship between the occupation of the study population and the use folic acid

Occupation	Do you use folic acid				Total	
	Yes		No		NO	%
	NO	%	NO	%		
House wife	664	87.4 %	96	12.6 %	760	100.0 %
Employee	178	94.7 %	10	5.3 %	188	100.0 %
Worker	36	90.0 %	4	10.0 %	40	100.0 %
Other	8	66.7 %	4	33.3 %	12	100.0 %
Total	886	88.6 %	114	11.4 %	1000	100.0 %

	Value	P - Value
Pearson Chi-Square	13.817	.003

Table 12: Shows the relationship between the states of education of the study population and the use of folic acid

State of education	Do you use folic acid				Total	
	Yes		No		NO	%
	NO	%	NO	%		
Illiterate	104	67.5%	50	32.5%	154	100.0 %
Elementary school	224	87.5%	32	12.5%	256	100.0 %
Secondary school	316	94.0%	20	6.0%	336	100.0 %
University	242	95.3%	12	4.7%	254	100.0 %
Total	886	88.6 %	114	11.4 %	1000	100.0 %

	Value	P - Value
Pearson Chi-Square	89.058	.000

Table 13: Shows the relationship between their husband's occupation and the use folic acid

Husband Occupation	Do you use folic acid				Total	
	Yes		No		NO	%
	NO	%	NO	%		
Employee	332	91.7%	30	8.3%	362	100.0 %
Worker	202	78.3%	56	21.7%	258	100.0 %
Business Man	78	100.0%			78	100.0 %
Merchant	200	90.9%	20	9.1%	220	100.0 %
Other	74	90.2%	8	9.8%	82	100.0 %
Total	886	88.6 %	114	11.4 %	1000	100.0 %

	Value	P - Value
Pearson Chi-Square	42.017	.000

Table 14: Shows the relationship between the presence of history of CM and the use folic acid

History of congenital malformed conception	Do you use folic acid				Total	
	Yes		No		NO	%
	NO	%	NO	%		
Yes	62	81.6%	14	18.4%	76	100.0 %
Yes	824	89.2%	100	10.8%	924	100.0 %
Total	886	88.6 %	114	11.4 %	1000	100.0 %

	Value	P - Value
Pearson Chi-Square	65.065	.000

Table 15: Shows the relationship between the source of knowledge about FA and its usage

Source of knowledge about folic acid	Do you use folic acid				Total	
	Yes		No			
	NO	%	NO	%	NO	%
Relative	36	94.7%	2	5.3%	38	100.0 %
Medical assistant	24	92.3%	2	7.7%	26	100.0 %
Doctor	760	99.0%	8	1.0%	768	100.0 %
Broadcast	2	50.0%	2	50.0%	4	100.0 %
Television	12	100.0 %			12	
Others	52	92.9%	4	7.1%	56	100.0 %
Total	886	98.0 %	18	2.0 %	904	100.0 %

	Value	P - Value
Pearson Chi-Square	4.014	.045

Table 16: Shows the relationship between the state of education of the study population and why they use FA

		State of education								Total	
		Illiterate		Elementary school		Secondary school		University			
		No	%	No	%	No	%	No	%	No	%
Folic Acid is used to	Prevent Morning Sickness	10	41.7%	2	8.3%	8	33.3%	4	16.7%	24	100.0%
	Prevention of anemia	104	14.2%	204	27.9%	262	35.8%	162	22.1%	732	100.0%
	Prevent The risk of congenital malformed conception			14	16.7%	30	35.7%	40	47.6%	84	100.0%
	Other	10	83.3%	2	16.7%					12	100.0%
	Prevention of anemia & prevent the risk of congenital malformed conception			8	12.5%	20	31.3%	36	56.3%	64	100.0%
Total		124	13.5%	230	25.1%	320	34.9	242	26.4%	916	100.0%

	Value	P - Value
Pearson Chi-Square	138.781	.000

Discussion

Concerning the results propounded from our study, 91.2% of women know about FA and this was almost similar to a study done in Qatar and Oman. This may be because both populations share ideas, culture and behavior.

In this study 46.6% take FA regularly, where in Qatar and Oman the percentage is 85%. This may be because in our study many women think it causes gastric upset. The case of periconceptional FA usage is low in the literature, but here in our study it is the lowest (4.7%). This reflects that most women lack the knowledge about the goal of its preconception use, or that the HCP did not care to teach the population about FA.

In this study, the percentage of FA usage is higher among female employees (94.7%) and those who are highly educated with a similar result to the study done in Qatar and Oman.

A study done in Canada, Quebec province, showed that 70% of pregnant women were aware of the role of FA for prevention of birth defect, but only 25% used it during the Preconception period. While in our study 8.4% were aware of the preventive role of FA towards birth defects, and only 4.7% used it preconceptionally. As you can see, there is a big difference between the two studies, which also shows that there is a very low level of knowledge and practice of the periconceptional use of FA.

The March of Dimes Gallup Survey in 2007 revealed that of those aware of folic acid, only one-third had heard about it from a health provider. Another 31% read about folic acid in magazines and 23% received the news from radio or television. However, in our study 79.4% had heard about it from a health provider, 1.2% received the news from radio or television, 3.8% heard about it from their relatives and 5.6% received their knowledge from other resources e.g. Magazine. In our study those who receive their knowledge from doctors is higher than that present in literature, but this may be because our study is a hospital-based study, so the percentage of the source of knowledge from doctors is higher.

Hence, most of the knowledge is from the HCP; and the total impact of knowledge is low compared to that in literature where the role of policy maker to spread the knowledge by other means is deficient.

Conclusion

The purpose of this article was to describe knowledge and practice of FA among Sudanese women, where the study population was taken as a sample. Our study shows that neither the knowledge nor the practice of FA is enough to protect our offspring from the risk of the morbidity and mortality encountered by FA deficiency.

In our study the preconception use of FA constitutes the lowest rate compared with other studies in the literature. From this study the HCP role is deficient and there is no clear policy to encounter or reduce the parameters of this problem.

Recommendations

- So, it is recommended to enhance the knowledge about FA especially, for the preconception use using the mass media, prepare training courses about FA importance and provide a protocol for its usage in all the ANC centers.
- To introduce the knowledge about FA in the schedule of the elementary and secondary level of education.
- To make it mandatory, for the policy maker to put an end for this problem by working with the manufacturer to spread the idea and introducing food fortification, which is ideally done successfully with grain fortification in other developed countries

Dedication

We would like generously to give our dedications to those who stood and supported us throughout our life, our precious parents where they are always our center of love.

We also give our dedication to our sincere friends who always gave us support in all happy and hard situations.

Our thanks extend to all our colleagues who devote themselves and seek a new life full of pleasure and health.

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Appendix

A Questionnaire on the Knowledge and practice (KP) of Folic acid intake during conceptive period

1. No:
2. Age: (1) 15-30 yrs. (2) 30-45 yrs. (3) More than 45 years
3. Residence.....
4. Tribe.....
5. Occupation: (1) housewife (2) employee (3) worker (4) others
6. State of education:
(1) Illiterate (2) elementary school (3) secondary school (4) university
7. Husband age:
8. Husband occupation:
(1) Employee (2) worker (3) businessman (4) merchant (5) Others
9. Husband state of education:
(1) Illiterate (2) elementary school (3) secondary school (4) university
10. Duration of marriage:
(1) Less than 5 yrs. (2) 5-15 yrs. (3) More than 15 yrs.
11. Parity:
(1) Primigravida (2) Para 1 (3) Para 2-4 (4) more than 4
12. Mode of deliveries: (1) c/s (2) vaginal delivery
13. History of congenital malformed conception:
(1) Yes (2) No
14. Do you use folic acid: (1) Yes (2) No
15. The color of the folic acid is:
(1) Red (2) Yellow (3) Blue (4) other color.....
16. How frequent do you use folic acid:
(1) Daily (2) Not daily (3) others.....
17. Folic acid is used to:
(1) Prevent morning sickness (2) Prevention of anemia
(3) Prevent the risk of congenital malformed conceptions (4) others.....
18. If you use folic acid how many taps you take:
(1) One tap (2) Tow taps (3) More than tow taps
19. You use folic acid:
(1) Only during pregnancy (2) before pregnancy (3) after pregnancy
(4) Others
20. Source of knowledge about folic acid:
(1) Relative (2) medical assistant (3) doctor (4) broadcast (5) television
(6) Others.....
21. State of antenatal care: (1) regular (2) irregular (3) no
22. Provider of antenatal care:
(1) Health visitor (2) Medical assistant (3) doctor (4) Midwife
23. The place of your antenatal care is:
(1) The nearest health center (2) A hospital (3) A private doctor
24. Do you use other multivitamin combinations:
(1) Yes (2) No
25. If you avoid taking folic acid, what do you think it causes:
(1) Heart burn (2) Nausea (3) Hurt your fetus
(4) You cannot afford it (5) other.....