

Evaluation of the Level of Awareness of the Role of Folic Acid in the prevention of Neural Tube Defects amongst Women of Reproductive Age in a Tertiary Health Institution

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ABSTRACT

BACKGROUND: Neural tube defects are major cause of infant mortality and disability. Their occurrence has been linked to folate deficiency during pregnancy. Periconceptional use of folate has been shown to significantly reduce their incidence. Awareness of this relationship is key to adopting appropriate measures to prevent them. This study was carried out to assess the level of this awareness among reproductive-age female employees in a tertiary hospital.

METHODOLOGY: Questionnaires designed to assess respondents' knowledge about neural tube defects and folic acid were completed by women of child-bearing age working in various departments of the University of Port Harcourt Teaching Hospital. Data were collated and analysed by a third party who had no knowledge of the respondents.

RESULTS: 94.4% of the respondents had some knowledge about folic acid. 29.6% knew something about neural tube defects. 24.1% were aware that folate has a beneficial role in their prevention. 70.4% said they would not take it daily if they were not pregnant.

CONCLUSION: The level of awareness about the role of folate in prevention of neural tube defects among respondents in this study is low; and thus there is poor response to suggestions regarding its periconceptional use. There is need to enhance this awareness to ensure that populations at risk benefit from research on the subject.

KEYWORDS:

Awareness; Folic acid; Neural tube defects; Periconceptional use; Prevention

RUNNING HEAD: "Folic acid prevention of neural tube defects"

INTRODUCTION

The neural tube defects (NTDs) are a group of congenital disorders resulting from failure of complete fusion of the neural plate during embryogenesis. They

are among the most common congenital anomalies and are believed to occur in 2% to 3% of all live births¹. NTDs are a very important cause of infant mortality and disability² worldwide, and they remain a source of considerable distress to families and other care givers who have to cope with the effects of the disorder. In the Niger Delta area of Nigeria, the neural defects are the most frequently encountered congenital anomalies of the Central Nervous System. Previous studies from our centre show that the incidence of neural tube defects is on the increase³.

Several studies have shown that the NTDs can, to a large extent, be prevented by the periconceptional use of folic acid^{2,4-9}. Consequently, in many parts of the world currently, especially in developed nations, there are various efforts aimed at taking advantage of these findings for the benefit of the populations that are mostly at risk. Significant among these are awareness activities designed to encourage women of reproductive age to comply with recommendations regarding the periconceptional use of folate by enlightening them on the role of the substance.

In this paper, we report the outcome of a study conducted to characterise knowledge about folic acid, and to assess the level of awareness of its role in prevention of NTDs among female employees of child-bearing age in a tertiary health care institution in the South-South geopolitical zone of Nigeria, and review some of the published literature on the subject.

METHODOLOGY

This study was carried out in the University of Port Harcourt Teaching Hospital (UPTH) - one of the tertiary health care and medical research institutions located in the heart of the Niger Delta area of Nigeria. It is an area with a relatively high incidence of neural tube and other congenital defects which many think may be related to the high level of environmental pollution and degradation resulting from the intense oil exploration and exploitation activities going on there. The hospital itself serves as a major referral centre, and receives patients from communities within its catchment area as well as from the adjoining states.

In order to evaluate knowledge about the neural tube defects and folic acid among reproductive-age female

employees in the UPTH, and to assess their level of awareness of the beneficial role of this micronutrient in the prevention of NTDs, questionnaires were designed which included simple questions like: “Do you know what folic acid is?”, “Do you know some neural tube defects?”, “Have you ever taken folic acid?”, “Are you aware that folic acid has been shown to prevent neural tube defects (such as meningocele or encephalocele)?”, “Will you take folic acid everyday even if you were not pregnant?”, etc. The questionnaires were distributed by two women who were mandated to give explanations to respondents where necessary in order to ensure that they understood the questions before attempting to answer them. The respondents included secretaries, clerical officers, ward orderlies, laboratory technicians and catering staff. Female doctors and nurses were excluded from the study. Data were collated and analysed using SPSS statistics 17 software by a third party who had no knowledge of, or had come in contact with any of the respondents.

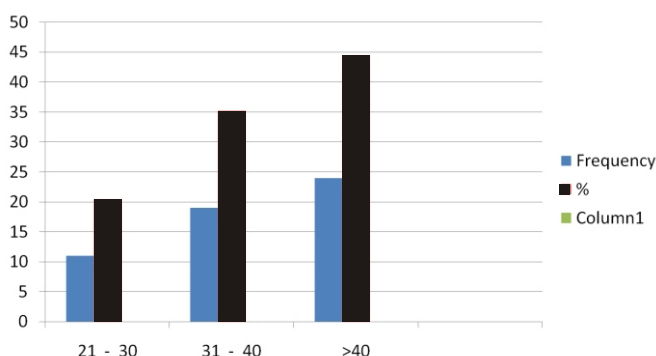
RESULTS

A total of 54 women completed the questionnaire.

Table 1. Marital status

Marital status	Frequency	Percentage
Single	16	29.6
Married	38	70.4
TOTAL	54	100.0

Fig. 1. Age distribution



Their ages ranged between 22 and 43 years (Fig. 1). 38 (70.4%) of the respondents had attained a tertiary level of education (Fig. 2). Among these, 24 (44.4%) were holders of a university bachelor's degree or its equivalent. 16 (29.6%) were single and 38 (70.4%) were married (Table 1).

16 women (29.6%) had either heard about neural tube defects or knew something about them either in the course of their reading or because they had actually come in contact with children that had the disorder. The remaining 38 (70.4%) had no idea what neural tube defects are (Table 2). 51 women (94.4%) knew about folic acid and had used the vitamin either as part of routine medication given to them at antenatal clinic, or it had been prescribed for them by a physician as part of treatment of some ailment (Fig. 3).

13 women (24.1%) knew that folic acid has an important role in the prevention of neural tube defects (Fig. 4). 16 (29.6%) of the women agreed that they would be prepared to take folic acid daily when they were not pregnant, if there was a chance that taking it could prevent developmental anomalies. The remaining 70.4% of the respondents said they would not take it daily if they were not pregnant (Fig. 5).

Table 2. Knowledge of folic acid and awareness of its preventive role in NTDs

	Positive	Negative
General knowledge about folic acid	51 (94.4%)	3 (5.6%)
Knowledge of neural tube defects	16 (29.6%)	38 (70.4%)
Knowledge of role of folic acid in NTDs prevention	13 (24.1%)	41 (75.9%)
Willingness to comply with routine periconceptual use of folic acid even in the absence of pregnancy	16 (29.6%)	38 (70.4%)

Fig. 2. Level of education

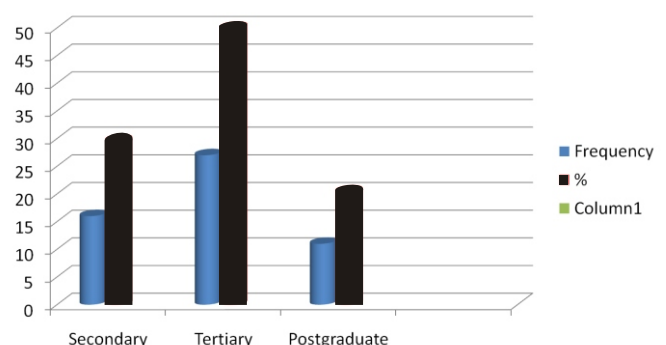


Fig. 3. Reasons for folic acid intake

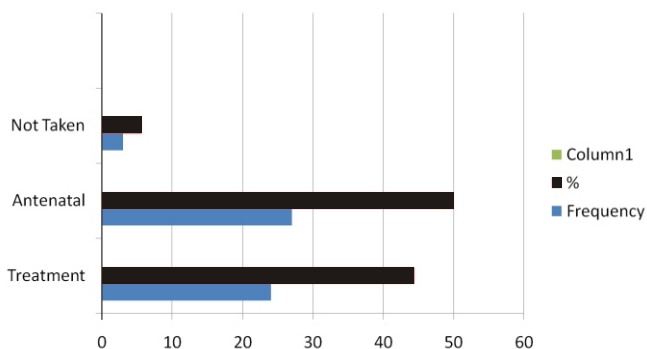


Fig. 4. Awareness of neural tube defects prevention by folic acid

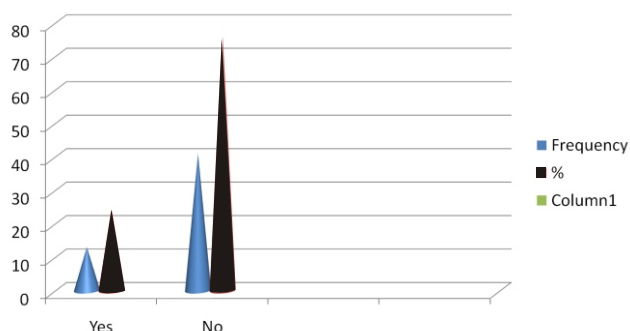
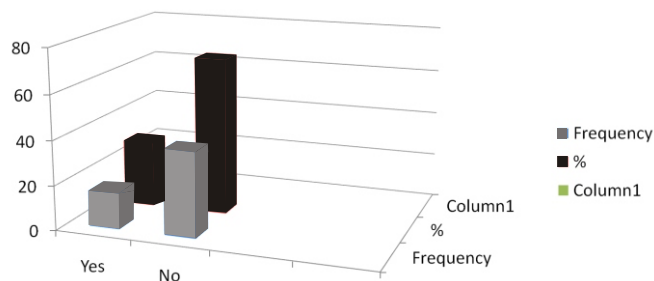


Fig. 5. Willingness to take folic acid if not pregnant



DISCUSSION

Congenital anomalies are thought to occur in 2% to 3% of live births^{1,2}. Neural tube defects (including anencephaly, spina bifida and encephalocele), which affect mainly the developing nervous system, are among the most common of these, with their incidences varying depending on prevailing conditions. Anencephaly and spina bifida are the most common NTDs, and they occur with about equal frequency, with encephalocele being seen less frequently. Even though spina bifida is compatible with survival, many of the patients have to live with varying degrees of physical and mental disabilities^{1,10}. The impact of NTDs can thus be enormous and is often not limited to the patient alone; but may also involve several other people, including family and friends with whom they share significant relationship, as well as

organisations (such as societies or other bodies to which they belong) who must cope with the physical, emotional, and financial effects of these devastating birth defects. One study estimates the lifetime medical costs for just one child with spina bifida to be over \$635,000¹¹!

Even though the exact aetiology of NTDs is not known in majority of cases, it is thought that they probably have a multifactorial origin, and result from the interaction of a significant genetic component with environmental risk factors¹²⁻¹⁴. Some of the risk factors that have been associated with them include: socioeconomic status¹⁵, parental occupation¹⁶, the presence of lead in drinking water¹⁷, maternal influenza¹⁸, maternal heat exposure¹⁹, maternal obesity²⁰ and maternal nutritional status²¹.

One micronutrient, folic acid, has been shown to play a particularly critical role in the occurrence of neural tube defects.

FOLIC ACID DEFICIENCY AND THE NEURAL TUBE DEFECTS

Folate was first described by Lucy Wills in 1930 as a factor that cured nutritional deficiency anaemia in pregnant women²². Folate and folic acid derive their names from the Latin word *folium* (which means "leaf"). It is a water-soluble B-complex vitamin which is considered an essential nutrient because humans are not able to synthesise it. Its only source is the diet. Though there are folate-producing bacteria in the human intestine, the amounts they are able to synthesise do not contribute significantly to the body's daily requirements for it²³.

Leafy vegetables are a principal source of the vitamin. In many Western diets, however, bread as well as fortified cereals may be a larger dietary source.

Folates are essential to numerous bodily functions. They serve as cofactor for the enzymes that synthesise DNA and RNA and are required for the conversion of homocysteine to methionine²⁴. Folic acid is especially important during periods of rapid cell division and growth, such as pregnancy and foetal development. At such periods, the body's requirement for the vitamin increases and insufficient levels in mothers have been linked to higher risk of congenital malformations². The importance of folic acid is of such magnitude that one of the world's very authoritative newspapers, The New York Times, acclaimed it as the "World's Healthiest Food" in recognition of the fact that its deficiency, as well as that of a handful of other micronutrients during foetal development can lead to severe deformities which are otherwise preventable. According to the Times' article, the mere addition of folic acid and micronutrients to the food supply of developing nations would make a greater impact on world health than any other single action aimed at

improving world health²⁵!

Folate deficiency was first linked to NTDs in 1960; and in the early 1990s well-designed randomised trials established that folate supplementation could prevent neural tube defects^{4,26}.

Clinical data show that up to 70% of the neural tube and other birth defects (such as cardiac, orofacial, limb, and renal anomalies) can be prevented by taking 0.4mg of folic acid daily^{4,26-28}. Among women with no previous history of the disorder, studies have reported decreases in the incidence of NTDs of from 40% to 100% if they took folic acid on a daily basis^{5,6,29,30}. Furthermore, in women who have had a previous NTD, all published reports indicate a similar reduction in the incidence after folic acid supplementation⁷⁻⁹.

Due to the fact that complete closure of the neural tube occurs within the first 28 days after conception (which is often before many women realise that they are pregnant), and because many pregnancies are unplanned (up to 50%), it is now held that primary prevention of NTDs is best achieved by the periconceptional use of folic acid, either alone or in multivitamin supplements^{1,2,8,9}.

Thus, in several parts of the world currently, especially in developed nations, a number of measures have been put in place to ensure that women in the reproductive age take advantage of this knowledge. For example, in 1992 the U.S. Public Health Services recommended that all women of child-bearing age should consume at least 0.4 mg (400 micrograms) of folic acid daily³¹. In Canada, folic acid fortification of grain-based foods was introduced in 1998². Not only has this resulted in about 50% reduction in NTDs, but it is also reported to have had a similar beneficial effect on the incidence of the fatal childhood neuroblastoma².

Apart from fortification of food supplies³¹, other strategies that have been tried as means of encouraging increased multivitamin intake among women of child-bearing age include: the use of electronic and print media, health care provider education, school programs and counselling³². In some parts of the world, folic acid tablets have even been distributed free of charge as part of the campaign strategy³³. The observance of January each year as "National Birth Defects Prevention Month", and January 5th to 11th as "Folic Acid Awareness Week" are part of efforts aimed at increasing the awareness of the benefit of folic acid in women of child-bearing age in the United States of America³⁴.

Even though majority of the respondents of this study

had some knowledge about folic acid (94.4%), they only knew it as one of the routine medications given at antenatal clinics or as one of the drugs used to treat various disorders such as anaemia, etc.

That this percentage (those with some knowledge about folic acid) is relatively high is not surprising considering their level of education - most of them having attained at least a tertiary level of education - and the fact that they work in a hospital environment. However, more than 75% of them were unaware that folic acid had a significant role in the prevention of NTDs; and less than 30% reacted positively to suggestions about its periconceptional use. Previous studies in our environment show that most pregnant women commence folic acid intake only when they are pregnant, sometimes as late as 8 to 12 weeks into the pregnancy, by which time the neural tube has already completely formed and any beneficial effect folate would have had as far as NTDs prevention is concerned would have been lost^{3,35}. A similar survey among Georgian women in the United State showed that the prevalence of knowledge about folic acid varied directly with respondents' educational background and income levels, with women that possessed a college degree being more likely to have heard about folic acid than those who had only been to high school³⁶.

This study cannot be acclaimed to be an accurate representation of the level of awareness of the beneficial role of folate in the prevention of NTDs in the general population in Nigeria. At best, it may be regarded as only a pointer to what the actual situation might be like. This is because of the nature of the population surveyed. In our opinion, if the level of awareness is so low in this category of persons in the society, it can be expected to be even much lower in the general population, judging from the high levels of illiteracy and poor socioeconomic status of a great proportion of the larger society.

Clearly, there is need to expand the scope of the study to make it even more relevant. This can be achieved by sampling a larger and more diversified cohort of women in the reproductive age. Also, multicentre collaborative studies can be undertaken that will involve respondents from other geopolitical sections of the country.

CONCLUSION/RECOMMENDATIONS

The level of awareness of the preventive role of folic acid in the occurrence of neural tube defects amongst respondents in this study is low. Since women who know about the benefits of folate are more likely to take it daily, the design and implementation of health education programs for women of child-bearing age will be important in educating them about its benefits at the earliest possible time before they become pregnant³⁶.

Enlightenment programs and other activities to increase awareness in the concerned populations can be carried out by way of newspapers, radio jingles, televisions adverts, etc. Encouraging women to attend antenatal clinic is one means that can be exploited to reduce the incidence of NTDs. Here, women attending the clinics can be encouraged to continue taking folic acid even after delivery if they are still desirous of having more children. In rural communities, traditional rulers and clan heads can make use of town criers to reach the people directly. Another powerful tool that might be useful for increasing the awareness of the people is through cell phones. The current strong patronage of mobile phone services in the country can be taken advantage of. In this regard, the telephone networks - in collaboration with the Federal Ministry of Health - can help by placing short messages in their various communications to subscribers. Furthermore, the "National Birth Defects Prevention Month" and "Folic Acid Awareness Week" as currently observed in the United States can be adopted.

These measures will no doubt enhance the awareness of the populations at risk, and the kind of poor response to suggestions about the periconceptional use of folic acid observed in this study can also be expected to improve.

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