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Nutritional and Psychological Implications of Low Micro-Nutrient Status of Pregnant Women in Imo State, Nigeria

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ABSTRACT

In this paper we examined the micro-nutrient status of pregnant women and its nutritional and psychological implications. Using rural women, we found that their micro nutrient status was low in the first and third trimesters: the nutritional and psychological implications ranging from high mortality and morbidity rate of pregnant women and infants, low birth weight to impaired cognitive and behavioral conditions were discussed.

Keywords: Micro-nutrient status; Pregnant women; Nigeria

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INTRODUCTION

Micro-nutrient malnutrition has become a global problem of immense proportions (ACC/SCN, 1992). Deficiency of iron, vitamin A and iodine is associated with increased mortality rates amongst most poor women, infants and children. It has been suggested that vitamin A status of pregnant women can affect vitamin A source in the liver of the foetus (Underwood, 1994).

The likelihood of a normal labour is better in women brought up in good circumstances, who have eaten a satisfactory diet from birth to maturity (FAO\ WHO, 1994), received good medical care, and continue to have these advantages during pregnancy than those women of the poorer socio-economic classes (Davidson *et al*., 1990). Hence poor maternal nutrition, before and during pregnancy, is a major cause of poor pregnancy outcomes especially in developing countries (WHO, 1995; Kramer, 2003). Micronutrient deficiency during pregnancy contributes to poor maternal weight gain which affects the birth weight of babies. Weight gain during pregnancy is widely used as an indicator of the adequacy of nutrition during pregnancy and has been associated with infant outcome such as mortality, prematurity and low birth weight (WHO, 1995; Caulifield *et al*., 1998).

Poor nutrition and inadequate micronutrient's intake during pregnancy often begin in uterus and extend throughout the life cycle (Schroll *et al*., 1997). Under nutrition manifests in decreased maternal height (stunting), and below normal maternal pregnancy weight and pregnancy weight gain (Prentice *et al*., 2001). Infants born with low birth weight (IBW) suffer extremely low weight, morbidity and mortality from infectious and diseases and are underweight, stunted or wasted beginning in the neonatal period and through childhood (ACC/SCN 2000). Infants weighing 2.0-25kg at birth are more likely to die during their first 28days of life than infants who weigh 2.5-3.0kg and 3.0-3.5kg at birth (Gulmezo in *et al*., 1997). Death of infants, especially among Nigerians who highly value children, goes with numerous psychological challenges such as depression, guilt, spouse abuse and divorce (Uwaoma et al, 2011).

Low birth weight is associated with impaired immune function, poor cognitive development and risk of developing acute diarrhea or pneumonia (Baker and Osmond, 1986). It is postulated that almost half of infant deaths from pneumonia and diarrhea could have been prevented if low birth weights as a result of low nutrient status of their mothers were eliminated (Baker and Osmond, 1986). Infants born with LBW face an increased risk of chronic diseases including high blood pressure, non insulin dependent diabetes mellitus, coronary heart diseases and stroke in adulthood. Again these diseases are killers among rural and poor folks in developing nations and often create opportunities for allied illnesses among children, infants, and adults.

EMPIRICAL REVIEW

Maternal under-nutrition is widely recognized as a major public health issue in the developing world and it is estimated that between 10% and 19% of women in many countries of the developing world are undernourished with a Body Mass Index (BMI) of less than 18.5 (Black *et al*., 2008). Studies in Dietary intake and micronutrient status show that maternal micronutrient deficiency in iron, vitamin A, zinc and vitamin B_{12}, iodine and folate are widespread and have a negative impact on pregnancy outcome (Sunawarg *et al*., 2009). Thus, it is established that micronutrient deficiency plays a major role in increasing morbidity and mortality (Bhutta *et al*., 2008). Poor cognitive development, marasmus, poor psychomotor development, growth retardation and inadequate nutritional balance are some of the adverse consequences of low pregnant mothers' micronutrients status (Afam-Anene, 2008).

Micronutrients have important influences on health of pregnant women and the growing fetus (Allen, 1997). Iron deficiency results in anemia which may increase the risk of death from hemorrhage during delivery. Folic acid deficiency can lead to hematological consequences, pregnancy complications and congenital malformation (Baumslag *et al*., 1970). Zinc deficiency has been associated with some complications of pregnancy and delivery as well as with congenital abnormalities and growth retardation (Caulfied *et al*., 1998)

Vitamin A deficiency (VAD) is one of the nutritional problems in Nigeria that is of public health importance as it may increase morbidity and mortality risk and negatively affect vision (ACC/SCN, 2000).

Vitamin A (retinol) is an essential micro-nutrient needed in small amounts by humans for the normal functioning of the visual system, growth and development; and maintenance of epithelial cellular integrity, immune function and reproduction (FAO/WHO, 2002). In the view of Barren et al. (2001), Vitamin A is an essential micro-nutrient for growth especially in highly proliferative and development stages of pregnancy. Vitamin A thus plays an important role in reproduction and cell differentiation and proliferation (Pijnappel *et. al.*, 1976; Van Den Berg, 1996). It has also been found to be involved in organ development and maturation (Hofmann and Eichele, 1994).

When maternal vitamin A is deficient, fetal demands do not allow maintaining maternal reserves and sub-clinical deficiency appears because pregnancy is a period of vulnerability to nutritional deficiencies (Baron *et. al.*, 2001). Thus, Vitamin A deficiency is a serious public health problem. It is one of the serious nutritional disorders in the world. WHO estimates show that over 250 million children worldwide have deficient Vitamin A stores (Bloom *et. al*., 1997). The highest prevalence of Vitamin A deficiency is found in pre-school children, pregnant and lactating women. VAD is associated with increased morbidity and mortality amongst pre-school children. Extensive evidence now show that the survival chances of children aged 6 months to 5 years is increased by 20-25% when their Vitamin A status is improved (Beaton *et. al*., 1993). West (2001) defined Vitamin A deficiency as a level of depletion of total body stores of retinol and its active metabolites such that normal physiological functions are impaired. In line with the above observation, WHO views VAD as tissues concentrations of vitamin low enough to have adverse health consequences even if there is no evidence of clinical exophthalmia (WHO/UNICEF, 1996). Vitamin A deficiency is indeed, associated with increased morbidity and mortality (West *et. al.* 1989; Martinez *et. al.* 2006), affects growth and rapid cellular differentiation that occurs early in life (Sklan, 1987), impairs iron status (Shemba *et. al.* 1993), increases susceptibility to respiratory infections and diarrhea (Van Den Berg, 1996). Again these conditions pose many behavioral problems to both the infants and their parents leaving the wider society to extensive embarrassments.

Sommer (1992) and Welch 2000) in their independent studies have found that Vitamin A deficiency is the most important cause of childhood blindness in developing countries. Welch (2000) further explained that before vitamin A deficiency impairs the visual system in children, the integrity of epithelial barriers and the immune systems are compromised leading to increased severity of certain infections and increased risk of childhood death. Evidence then suggests that severe VAD results in a fatality rate of 60% amongst those afflicted (Welch, 2000). Moderate VAD is associated with a 23% increase in infant, children and pregnant women's mortality in regions where VAD is prevalent (McGuire, 1993).

Night blindness is the first clinical sign of VAD but many children who do not show clinical signs of Vitamin A deficiency may already be at risk of increased morbidity and mortality. Prevalence of night blindness is again an indicator of whether Vitamin A deficiency is a problem at community level (Helen, 2000). According to WHO and INACG criteria, a prevalence rate of night blindness of 1% or above within a population is regarded as a public health problem (Christian, 2001). This disease is an indicator of low Vitamin A status in women of reproductive age and those that are pregnant (Christian, 2001). It indicates health and survival risks for women and a general indicator of vitamin A inadequacy in a population. Night blindness tends to occur in the later part of pregnancy, more especially in the second or third trimester of pregnancy. (Christian, 2001). Data from Nigeria Food Consumption and Nutrition Survey (2001-2003) did not report any night blindness in pregnant women although they were vitamin A deficient.

However, Melch (1991) has shown that VAD is most common in populations consuming most of their vitamin needs from pro-vitamin carotenoid sources and where minimal dietary fat is available. The pregnant women delivering in rural Nigeria are vulnerable to this condition. About 90% of ingested preformed vitamin A is absorbed whereas the absorption efficiency of pro-vitamin carotenoid varies widely depending on the type of plant source and the fat content of the accompanying meal (Erdman, 1988). VAD can occur in individuals of any age but children, pregnant and lactating women are more vulnerable to VAD (FAO/WHO, 2002). Women of reproductive age are thought to be vulnerable to VAD during pregnancy and lactation because they often report night blindness (Bloem *et. al.*, 1994; Christian, 1998) and because their breast milk is frequently low in vitamin A (Sommer *et. al.*, 1980).

Iron deficiency anemia (IDA) is presently the most prevalent nutritional problem in the World (INACG, 1993). Young children and women of reproductive age, especially pregnant and lactating women are at greatest risk. Low intake of foliate (<240µ/day) and lower concentration of serum foliate measured at 28 weeks of pregnancy have been found to be associated with a twofold increased risk of preterm delivery.

The risk of iron deficiency increases during periods of rapid growth, especially in infancy, adolescence and pregnancy. Generally, the consequences of iron deficiency include impaired body temperature and regulation, impairments in behaviour and intellectual performance and decreased resistance to infections. Iron deficiency manifests when ingestion or absorption of dietary iron is inadequate to meet iron losses or iron requirements imposed by growth or pregnancy (NFCNS, 2003).

GENERAL OBJECTIVES

The general objective of this study is to examine the micro-nutritional status of pregnant women living in rural Communities of Ihitte/Uboma L.G.A. of Imo State of Nigeria. In specific terms, the study is aimed at: (i) examining the nutritional consequences of Low Iron and Vitamin A status of pregnant women and (ii) evaluating the nutritional and psychological implications of deficiency of iron and vitamin A in pregnant women.

METHOD

Participants

A sample of 100 pregnant women who attended ante-natal at the used local Government Area's Medical Centre during the period of study and who were willing to participate was obtained. A written consent was obtained from them. Their age ranged between 21 and 48 years and more than 95% of them were satisfactorily married.

Instruments and Equipment Used

These instruments and materials were used; Needles and Syringes (10ml), Dry specimen bottles and Test tubes, Pipette (0.2ml, 0.5ml and 5mls), conical flask, Measuring cylinder (100cm^3), 1000cm^3 volumetric flask, Thermometer, Corvettes, Heater with magnetic stirrer, spectrophotometer, Capillary tubes, Centrifuge, Lancet, and Refrigerator (Thermocool 400).

Procedure:

(a) Sample Collection

Blood samples were collected intravenously by Venipunture method. Ten mls of the venous blood was collected using 10ml syringe. Six mls were put into heparinised and EDTA bottle to prevent coagulation and labeled. The remaining 4 mls were delivered into plain containers, allowed to clot and then centrifuged. The serum was separated into clean dry well labeled bottles. The samples were put into vaccine carrier containing ice packs and transported to the place of analysis.

(b) Biochemical Analysis

Hemoglobin was estimated using cyanomethaemoglobin method of Drabicin and Austin as described by INACG (1984) and Cheesbrough, (2000). Serum ferritin was determined using a quantitative test kit based on a solid phase enzyme linked immunosobent assay (Elegance Amplified kits, Blocione Australia pty). The extent of color development was measured spectrophotometrically at 45nm (White *et al.*, 1986). Serum folate was determined by microbiological assay. Serum vitamin A was determined using the Biochemical methodology for the assessment of vitamin A status (IVACG, 1989).

Design and Statistics

A simple random sampling was employed to get population sample and t-test statistics and percentages were used in data analysis.

RESULTS

Table 1
Micronutrient Status of the Pregnant Women Expressed in Percentages

Trimester of	Vitamin A (µmol/l)		Serum ferritint (mg/ml)		Serum folate (nmol/l)	
Pregnancy	<0.70	0.70 – 2.0	<18	>18	<6. 8	6 – 8 – 41
1	6	94	82	18	8	92
3	39	61	100	–	53	47

Table 1 shows the percentage distribution of the vitamin A, iron and folate status of the pregnant women. About 94% of the pregnant women had normal vitamin A status and 6% had deficient vitamin A in the first trimester of pregnancy. However, as the pregnancy progresses to the third trimester there was depletion in their vitamin A status, 39% had deficient levels of vitamin A while 61% had normal levels of vitamin A.

The percentage distribution of the iron status of the pregnant mothers is also shown in Table 1. Approximately 82 of the pregnant mothers had deficient serum ferreting in the first trthird trimester.

The serum folate status of 92% of the women was within the normal range in the first trimester but in the third trimester more than half 53% of the pregnant women had deficient serum folate levels.

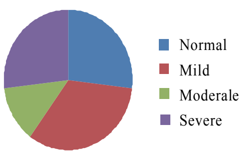

Figure 1
Prevalence of Anemia in First Trimester

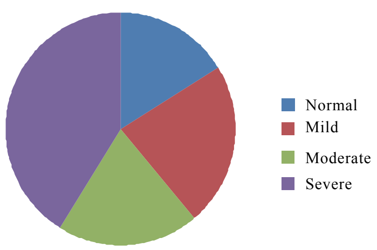

Figure 2
Prevalence of Anemia in the Third Trimester

Analysis of figure one and two shows that anemia was present in the first and third trimester of pregnancy although the severe rating varies. Anemia occurred more in third trimester of pregnancy: eighty four percent of the pregnant women were anemic. Severe anemia was also higher in the third trimester (41%) than in the first trimester (27%).

DISCUSSION

The results of this study show that the pregnant women were low in micronutrients' status. Thus they manifested 73% anemia in their first trimester and 84% anemia during their third trimester as indicated in pie chart (figures 1 and 2). The present result and its anemic manifestation is in agreement with previous studies (e.g. Kramer, 2003; WHO, 1995; Allen, 1997, Baron et al, 2001).

Nutritional Consequences of Low Macronutrients States

The nutritional implications of the anemic condition of the pregnant women of our study as a result of their low micronutrient status are numerous. Anemia increases the risk of poor pregnancy outcomes and complications, congenital malformation and death from hemorrhage during delivery. It impairs body temperature and regulations, and resistance to infections of pregnant women. Indeed, low status of micronutrients during pregnancy is highly associated with poor maternal weight gain which leads to prematurity and extreme low birth weight of babies. Such babies born with low birth weight suffer high morbidity and mortality from preventable infectious diseases and face increased risk of chronic diseases such as high blood pressure, non-insulin dependent diabetic mellitus, coronary heart diseases and stroke in adulthood (West, 2001). Furthermore low serum vitamin A status correlates with a high tendency of childhood blindness and night blindness of pregnant women in the later part of pregnancy especially in the second and third trimesters (Christian, 2001).

Nutritional and Psychological Implications

There is identifiable growing evidence on the relationship between nutritional status and cognitive-behavioural development and manifestations. Poor nutritional condition is associated with impaired cognitive development and performance. Ordinarily, poor or low micronutrient status leads to anemia which invariably results in pregnancy complications and general poor outcomes, decreased resistance to preventable infections and increased mortality of infants and pregnant women. All these conditions singly and jointly mount pressure and stress on the family, pregnant women and health care providers. Death of infants or pregnant women is devastating. Ibo Nigerians highly value children and as such their death goes with numerous Psychological problems such as depression, insomnia, anxiety, spouse abuse and divorce, especially when such deaths could be prevented. Again, low micronutrient status is associated with poor cognitive development which leaves a person or the entire family frustrated. This again hampers national and individual developments.

The evidence of this study demands that more micro-nutrient attention and care be given to pregnant women especially those living in the rural areas. Again there is the need for more advocacies and health campaigns emphasizing the need of the micronutrients: Efforts should indeed be geared towards more provision of micronutrients to pregnant women using every local means especially in the rural areas.

RECOMMENDATIONS

There is a need for multiple micronutrient supplementations during pregnancy. Most of the ongoing supplementation programmes are for folate and iron. Deficiency of one or more micros nutrient might affect the absorption of others. Community based nutrition programmes should be established and aimed primarily at preventing under nutrition and should complement health services. There should be more advocacies and health campaigns with community heads and local community assemblages to ensure wide and timely coverage of key health services such as immunization.

Food based interventions aimed at increasing production, availability and access to vitamin A and iron rich foods through promotion of home production, nutrition education, communication and behavioural change programmes should be encouraged.

CONCLUSION

Evidence suggests that in the third trimester, there was low serum vitamin A, serum ferritin, serum folate and Hb concentration among the pregnant women studied. This indicates the need for micronutrient interventions during pregnancy because the consequences of anemia and VAD are enormous. Anemia impairs human functions at all stages of life. Severe anemia during pregnancy is observed to increase the risk of maternal mortality, and associated with preterm delivery and subsequently low birth weights (LBW) of infants. All these militate against the achievement of Millennium development goals 4 and 5 unless intervention programmes are implemented.

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