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DIETARY ASSESSMENT OF VITAMIN A AND IRON AMONG PREGNANT WOMEN AT NDHIWA SUB DISTRICT HOSPITAL – KENYA

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ABSTRACT

Vitamin A and iron deficiencies are among nutritional deficiencies of public health concern in the developing countries. Infants, children, pregnant and lactating women are at high risk of both deficiencies as a result of inadequate dietary intakes and associated physiological changes that cause increased demands for nutrients. Focus has in the past been on vitamin A and iron status of children below five years with little on maternal vitamin A and iron status and dietary habits. Studies on dietary intakes of these nutrients among pregnant women are limited in Kenya. This study assessed vitamin A and iron consumption levels as well as relationship between vitamin A consumption level, iron consumption levels and nutritional status of pregnant women. A descriptive analytical case study was carried out among 162 pregnant women who were accessed from Ndhiwa Maternal and Child Health (MCH clinic) and outpatient sections and recruited for the study through simple random sampling. Data was collected using a semi-structured questionnaire and focused group discussion on home visits. The study found that most pregnant women (88%) did not meet their Recommended Dietary Allowances (RDA) for vitamin A as indicated by intake of less than 800µg per day. Majority (91.4%) did not meet their RDA for iron as indicated by consumption levels of less than 30mg per day. About 29% had BMI of 19.0-25.0. Other 61% had BMI of <19.0 while 7% had BMI of 26.0-29.0 while 3% had BMI of >29.0. Mid Upper Arm Circumference (MUAC) showed 29% had normal nutritional status (≥21 cm). 61% were under nourished (<21 cm) while 10% were over nourished (>26 cm). There existed significant relationship between vitamin A consumption levels, iron consumption levels and nutritional status of the pregnant women ($r<1$, $P<0.05$). Most women had two meals a day with irregular consumption of vitamin A and iron rich foods.

Key words: Dietary, Assessment, Vitamin A, Iron, Pregnant

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INTRODUCTION

Vitamin A and iron deficiencies are among the most common nutritional deficiencies in most developing countries probably second to Protein- Energy- Malnutrition [1]. Infants, children, pregnant and lactating women are especially at high risk of both deficiencies due to inadequate dietary intakes, physiological changes involved and various socio-demographic factors [2]. It is estimated that 80% of pregnant women in developing countries do not meet their Recommended Dietary Allowance (RDA) for iron and 25% of these women have extremely low vitamin A intakes therefore resulting in clinical and sub clinical signs of iron and vitamin A deficiencies [3]. These deficiencies have implications on maternal nutritional status and health that may ultimately affect birth outcomes [4]. One of the strategies of meeting increased nutrient needs is through utilization of locally available foods including fruits and vegetables which most of the time are produced for sale [5]. In Kenya, 83% of pregnant women were iron deficient, while 65% of pregnant women in Nyanza were iron deficient [6]. The National Micronutrient Survey and National Food Consumption Report indicated that 30% of pregnant women in Nyanza do not meet the increased requirement for nutrients during pregnancy [7]. Both vitamin A and iron deficiencies can compromise maternal health and contribute to complications during pregnancy [8]. Poverty, lack of nutrition knowledge and poor attendance to MCH by pregnant women are among the socio demographic indicators associated with inadequate maternal dietary intakes [9]. Controversies surrounding nutritional status assessment of pregnant women especially with regard to Body Mass Index (BMI) are well recognized. The Norwich Union of Obstetrics (NUO) suggests that 3kg be subtracted from the obtained weights of pregnant women in their first trimester while 2kg be subtracted for women in second and third trimesters. Knee height theory is used to estimate heights of pregnant women in their third trimesters since their stature is significantly affected [10]. Controversy regarding MUAC concerns the fluctuation in body fluids caused by physiologic changes; however, there is reported strong correlation between MUAC values with BMI in men while cut-off point MUAC <23.3cm provide reasonable correlation with BMI in women [11]. This study reports both BMI and MUAC values.

Inappropriate dietary practices characterised by poor dietary intakes, reduced number of meals and inadequate consumption of fruits and vegetables among pregnant women contribute to under nutrition that may cause complications and poor birth outcome [12]. The objectives of this study were to assess primary and associated health and socio-demographic risks with vitamin A and iron consumption levels, frequency for consumption of vitamin A and iron rich foods, maternal dietary practices and morbidity patterns as well as nutritional status and relationship between vitamin A and iron consumption levels of pregnant women.

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METHODOLOGY

A descriptive analytical case study was adopted to assess maternal dietary intakes of vitamin A and iron [13]. A semi-structured questionnaire and focused group discussion were used to collect data on dietary intakes, nutritional status, morbidity patterns, and socio-demographic characteristics of pregnant women and dietary practices, health seeking behaviours and nutritional knowledge respectively on home visit.

The target and accessible population group comprised pregnant women in their first and second trimesters attending Ndhiwa Sub-District Hospital. A total of 162 pregnant women were recruited in the study using simple random sampling based on the hospitals registers. Data was analysed using the Statistical Package for Social Sciences (SPSS). Weight and height were transformed to BMI values by BMI calculator while MUAC values transformed to nutritional status using Epi-info [14].
Chi-square was used to determine relationships between vitamin A and iron consumption levels, nutritional status and morbidity patterns of pregnant women derived from socio-demographic, dietary and health variables. Significant difference was determined at 95% confidence level. Multiple regressions were used to determine whether vitamin A consumption level, iron consumption levels and number of meals per day predict nutrition status of pregnant women. Descriptive statistics such as means, percentages and frequencies were used for the analytical procedure [15].

RESULTS

Socio-demographic characteristics

Majority (54.9%) were aged 21-25 years, 56.1% were married, 65% had primary education, 69.1% were unemployed, 7% had nutrition knowledge while 46% had household size ranging between 7-12 members and 12.9% were on iron supplements. Table 1 shows socio-economic and demographic characteristics. None of the pregnant women were on vitamin A supplements since the supplement is not recommended for use in pregnancy.

Vitamin A consumption levels

The study found that 88% pregnant women had vitamin A consumption levels below the RDA during pregnancy (<800µg per day), while 12% met their RDAs. Figure 1 shows vitamin A consumption levels by pregnant women in Ndhiwa Sub-Distrct-Hospital.

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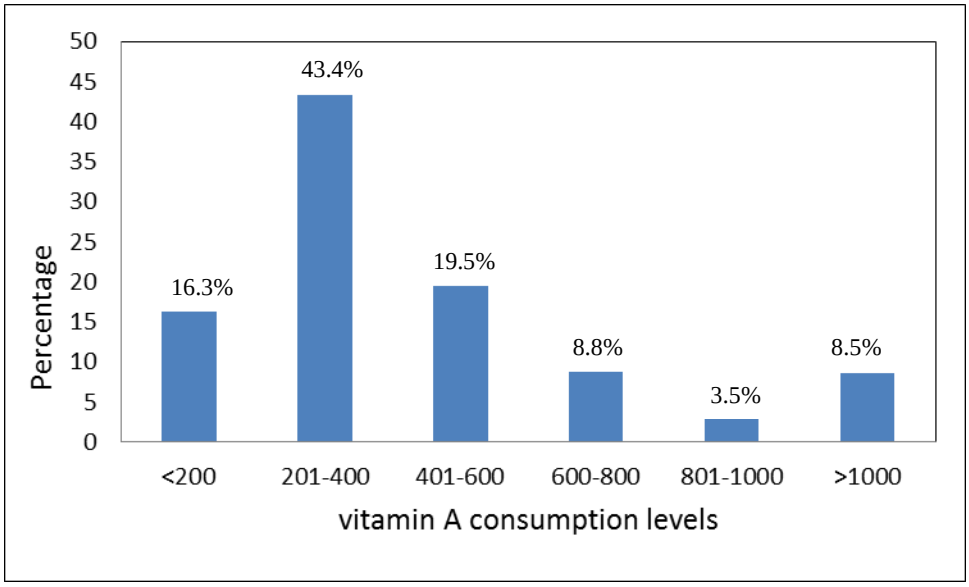

Figure 1: Vitamin A consumption level

Iron consumption levels

Sixty-five percent (64.8%) pregnant women had iron consumption levels of <20mg per day, 26.6% had consumption levels ranging between 21-30mg, while 7% were consuming iron levels between 31-60mg (the remainder consumed over 60 mg/day). Thus 91.4% did not meet their RDA for iron, (which is 30 mg during pregnancy) while 8.6% met their RDA. Figure 2 shows iron consumption levels.

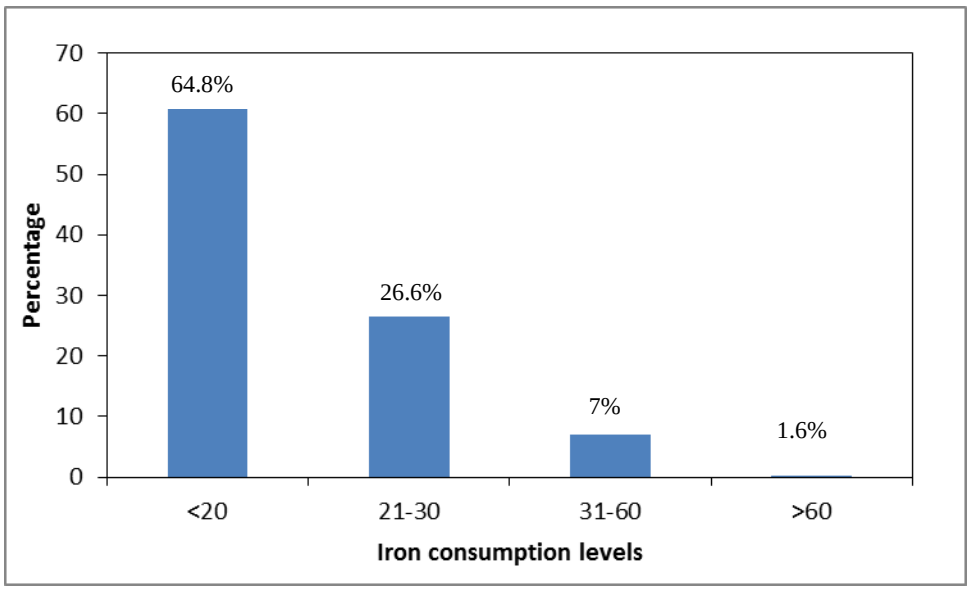

Figure 2: Iron consumption levels

Nutritional status of pregnant women

Based on BMI values, 29.2% had BMI values of <19.0, 61.8% had BMI ranging between 19.0-25.9, 6.1% had BMI of 26.0-29.9 while 1.9% had BMI of 30-35 and 1% had BMI ≥40. Based on MUAC values, 28.6% had MUAC of <21cm, 62.7%

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respondents had MUAC of 21cm-24cm,8.1% had a MUAC of 25cm while 1.5% a MUAC of >25cm.

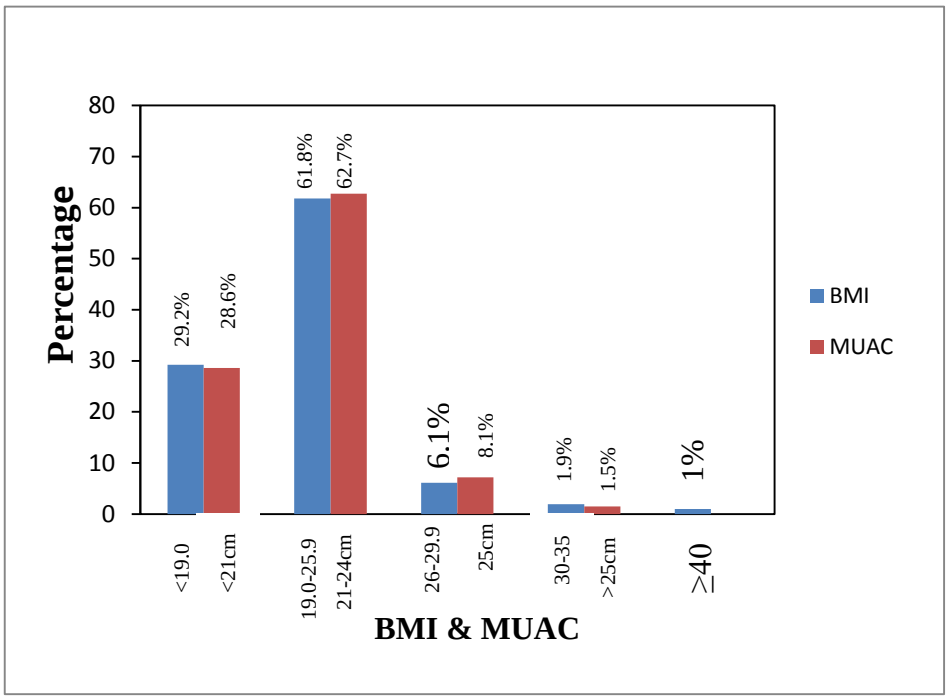

Figure 3: Nutritional status of pregnant women

Factors affecting vitamin A and iron consumption

Food availability affected vitamin A and iron consumption levels most (46.3%), followed by food cost at 38.9%. Morning sickness affected consumption levels at 9.2% while advice from clinic and food taboos affected 3.6% and 2%, respectively.

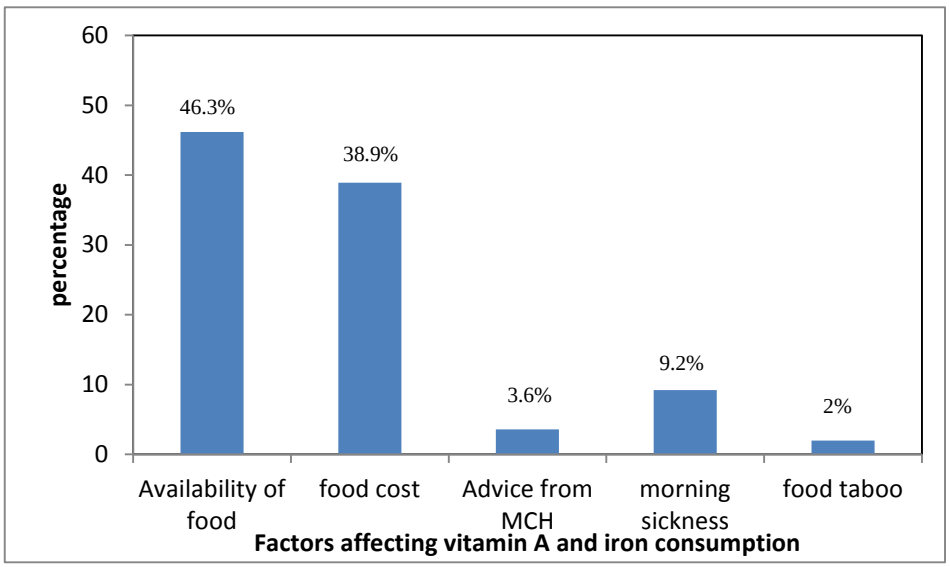

Figure 4: Factors affecting vitamin A and iron consumption levels

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Meal pattern and consumption frequencies of vitamin A and iron rich foods

Majority 84.8% had two meals a day while 15.2% had three. Further assessment of meal pattern showed that 78.2% were taking breakfast in form of porridge and tea; 64.7% reported having porridge while 13.5% took tea, and 21.8% were not taking breakfast. Lunch was taken by 93.4% who either took ugali with kale or *sardine* (omena). About 27.4% consumed ugali and kale while 66.0% took ugali and omena, and other 6.6% were not taking lunch. Staple food (maizemeal mush or ugali) was regularly consumed by 97% and millet was regularly consumed by 72%. Of foods rich in vitamin A like cowpeas and tomatoes, were regularly consumed by 80% and 77% while foods rich in iron such as groundnuts, fish, kidney beans and milk were regularly consumed by 80%, 77%, 66%, 64%, 68% and 50%, respectively. Adequacy/regular consumption of foods showed that 88% and 91.4% of the women had irregular consumption of vitamin A and iron. This was achieved through food frequency checklist that consisted of 14 food groups and specific attention paid to vitamin A and iron rich foods. Consumption of a food item/food group 4 times a week was considered regular/adequate while less than 4 times a week consumption was Irregular/inadequate food consumption [3].

Relationship between BMI and MUAC, vitamin A and iron consumption levels and sicknesses suffered by pregnant women

Table 1 indicates the common sicknesses suffered by the pregnant women that were correlated with BMI, MUAC and vitamin A and iron consumption levels. Table 2 shows that there were no significant relationships between BMI, MUAC and vitamin A and iron consumption levels of the pregnant women ($r<1$, $P>0.05$); however, there were significant relationships between BMI, MUAC and sicknesses suffered by pregnant women ($r<1$, $P<0.05$).

Contribution of vitamin A, iron consumption levels and number of meals per day to the nutritional status of the pregnant women

Only 4.7% of nutritional status could be explained by vitamin A consumption levels. Iron consumption levels contributed to 8.8% of nutritional status while number of meals consumed per day contributed to 9.7% of nutritional status as shown in Figure 5. From the study it can be reported that number of meals taken per day, vitamin A and iron consumption levels contributed to 23.2% of the nutritional status. Thus, the rest of the variation in nutritional status (76.8%) could be contributed by other factors especially those related to pregnancy and socio-economic status assessed and those not assessed by the study.

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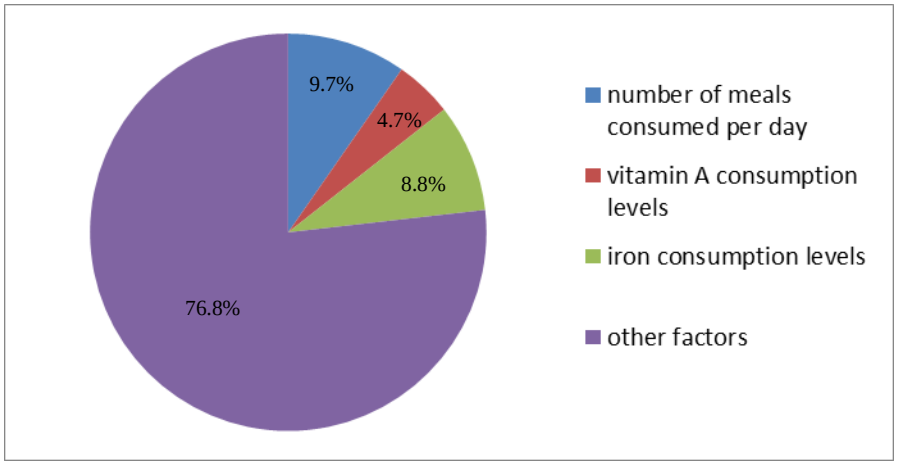

Figure 5: Contribution to nutritional status by number of meals, vitamin A and iron consumption level

DISCUSSION

Majority of pregnant women had low education level, were unemployed and had large family size. According to Kenya Demographic and Health Survey (KDHS) [6] these are some of the socio-economic and demographic factors that determine dietary intakes of pregnant women which ultimately affect their nutritional status. Pregnant women should be empowered with nutrition education during MCH visits to help them make good food choices and meet their RDA for vital nutrients [1].

Most pregnant women did not meet their RDAs for vitamin A. This meant that they did not consume adequate vitamin A rich foods since their diets mainly consisted of maize meal (maizemeal mush or ugali) and sardines (omena). This study is in agreement with the study done by the Kenya National Bureau of Statistics, which found that pregnant women had inadequate dietary intakes for micronutrients [6]. Adequate dietary intakes characterized by individual dietary diversity score are an essential pillar of health for the pregnant mother and the developing foetus [3]. Cellic [2] emphasizes that adequate dietary consumption especially for micronutrients can be achieved through dietary diversity that increases chances of adequate nutrient consumption. Ministry of Health [7] emphasizes the importance of adequate dietary consumption of vitamin A during pregnancy since it is not possible to give vitamin A supplements to pregnant women.

Majority did not meet RDA for iron. They did not have adequate and regular consumption of iron rich foods given that they mostly had two meals a day consisting of either maize meal (maizemeal mush or ugali) with sardines (omena) or vegetables. The common vegetable was kale which had a consumption of less than four times a week indicating its inadequate intakes as a food source for iron. A few were on iron supplements that were given in MCH. This study is in agreement with a study done in Bangladesh that reported inadequate dietary intakes of iron among pregnant women in rural and urban areas of Bangladesh [12]. Ngare [4] reported inadequate iron intakes

and use of iron supplements by pregnant women in the developing countries. Catherine [13] reported the importance of meeting increasing demands for iron during pregnancy through adequate dietary intakes. The demand for iron increases during pregnancy especially in the first and second trimesters and adequate intakes ensures maternal stores and good health as well as supporting the developing foetus [9]. Bloem [17] asserts that adequate dietary intakes of iron prevent maternal anaemia. A study by Suprapto [8] recommends that increasing number of meals of individuals and diversified diets/meals increase chances of meeting RDAs of both macro and micro nutrients.

More than half of the pregnant women had satisfactory BMI hence normal nutritional status while some had BMI <19.0kg/m^2 indicating they were underweight and at risk of malnutrition. Others had BMI more than 25.9kg/m^2 indicating they were overweight. A few had BMI of 40kg/m^2 and more indicating class III obesity and were at risk of pregnancy complications like pre-eclampsia and other cardiovascular diseases. The Ministry of Health of Kenya [7, 11] says that BMI either < 19.0 or > 26.0 may lead to nutrient deficiencies and eating disorders that are high risk factors in pregnancy. Similarly, MUAC values showed that more than half of the pregnant women had values more than 21cm indicating that they had normal nutritional status while others had MUAC values less than 21cm indicating that they were malnourished. Haileslassie *et al.* [18] reported a study on the nutritional status of lactating women using BMI and MUAC that showed almost similar values for nutritional status of the women.

Food availability and food cost were the factors that affected consumption of vitamin A and iron rich foods most. Others included advice from MCH and food taboos. Kenya. Demographics and Health Survey [6] reported similar results on the factors that determine dietary consumptions of households with children less than five years in Kenya where most food consumption is based on food availability and market prices. Fauzi [16] reported poor micronutrient intakes among children in Ethiopia as attributed to cost of food.

Majority of pregnant women had two meals a day with breakfast being the meal that was skipped most while dinner was consumed by all pregnant women. World Health Organization [1] recommends that pregnant women consume at least three meals a day with two snacks to help meet the increased caloric demands during pregnancy. Consumption of an average of two meals a day by majority of pregnant women in Kenya is common practice especially those in the urban areas KDHS [6]. The meals mainly consisted of the staple foods with either sardines or leafy vegetables as accompanying dish. Consumption of fruits and other animal and dairy products was occasionally done depending on availability. Staples, vegetables, fruits and milk were mostly produced by households on small- scale for both household consumption and for sale. Selling of food produce to purchase other none food items could lead to household food insecurity and contribute to inadequate dietary intakes among pregnant women [6]. This study is in agreement with a study by Hossain *et al.* [12] that reported a decreased number of meals consumed per day among pregnant women

in urban areas of Bangladesh. Food and Agriculture Organization [3] recommends that every household should have kitchen gardens where vegetables and fruits can be produced to increase consumption frequencies of these foods that are good sources of micronutrients, vitamin A and iron included. Most pregnant women did not meet the recommended dietary diversity score given that their food consumption of food items in a food group was less than four times a week. Consumption of foods rich in vitamin A and iron as well did not meet the FAO recommendations for adequate/regular consumption frequency. Consumption of food items in a food group should be ensured in a day's meal so as to meet the dietary diversity which is believed to improve nutritional wellbeing of individuals FAO [3].

There were no significant relationships between BMI and MUAC and vitamin A and iron consumption levels. Hossaine [12], however, reported a significant relationship between BMI, MUAC and sicknesses suffered by the women. There were significant relationships between sicknesses suffered and BMI and MUAC. One of the key recommendations by WHO is that all pregnant women should get malarial prophylaxis and deworming tablets to prevent parasitic and helminthic infestations which are likely to deplete nutrient stores and increase morbidity during pregnancy WHO [1].

Number of meals per day contributed most to BMI and MUAC of women. This is in agreement with a study by American College of gynaecologist and obstetricians [14] that reported improved nutritional status of facility based malnourished patients with increased number of meals in a day.

CONCLUSION AND RECOMMENDATION

Pregnant women at Ndhiwa Sub-District-Hospital had inadequate vitamin A and iron consumption levels and may be under nourished. The inadequate dietary intakes of these nutrients put them at risk of these nutrients deficiencies as well as of pregnancy complications such as anaemia and maternal morbidity.

This paper recommends maternal nutrition education, sensitization and empowerments that enable them to produce foods locally both for their consumption and commercial purposes so that they are able to meet both nutritional and financial demands with minimal compromises.

Government should ensure integrated and subsidised maternal services including nutritional counselling and education which empowers women to make informed decisions. Government should enforce community linkages and mobile MCH to benefit women in the rural set up for better nutrition and health. Nutritional messages can also be advocated for through electronic and print media. There is need for NGOs and Government to develop a strategy that would enhance adequate distribution of nutritional supplements especially in the rural areas. Fortified maizemeal and wheat flour should be sold at subsidized cost to encourage their consumption that ultimately reduces iron deficiencies.

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GLOSSARY

Sardine: a small bonny fish locally known as omena.

Staple foods included maizemeal, millet, sorghum, cassava, sweet potatoes and socotus locally known as nyoyo.

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Table 1: Demographic characteristics of the pregnant women at Ndhiwa Sub-District Hospital

Variables	Categories	N (%)
Age	14-20	6 (3.7%)
	21-25	89 (54.9)
	26-30	27(16.6%)
	31-35	23(14.1%)
	36-40	9 (5.5%)
	41-45	8 (6.7%)
Nutrition knowledge	<20% score	88(54.3%)
	21-40% score	67(41.3%)
	41-50% score	5 (3.0%)
	≥60% score	2 (1.2%)
Marital status	Married	91 (56.1)
	Single	21(12.9%)
	Separated	33(20.3%)
	Widow	17(10.4%)
	Divorced	0 (0%)
Education level	< std 8	106(65.4%)
	KCPE	38 (23.4%)
	KCSE	12 (7.4%
	College level	6 (3.7%)
Occupation	Not employed	112 (69.1)
	Casual	19 (11.7%)
	Self employed	22 (13.5%)
	Civil servant	6 (3.7%)
	NGO	3 (1.8%)
Household size	1-3	8 (4.9%)
	4-6	58 (35.8%)
	7-12	75 (46.2%)
	11-13	21 (12.9%)
Common illness	Malaria	19 (11.7%)
	Typhoid	8 (4.9%)
	Apathy	123(75.9%)
	Diarrhea	12 (7.4%)
Supplementation	Vitamin A supplements	0 (0%)
	Iron supplements	21 (12.9%)

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Table 2: Relationships between vitamin A and iron consumption levels and BMI, MUAC, Malaria, Typhoid Apathy and diarrhoea of the women

Variables	Vitamin A (ug)	Iron (mg)	BMI	MUAC
BMI				
X^2	0.174	0.187	0.100	0.265
Sig P (2-tailed)	0.099	0.073	0	0.042
MUAC				
X^2	0.163	0.192	0.265	0.100
Sig P (2-tailed)	0.065	0.078	0.042	0
Malaria				
X^2	0.179	0.183	0.232	0.228
Sig P(2-tailed)	0.062	0.072	0.046	0.040
Typhoid				
X^2	0.199	0.185	0.125	0.172
Sig P (2-tailed)	0.082	0.067	0.025	0.036
Diarrhoea				
X^2	0.176	0.181	0.217	0.231
Sig P (2-tailed)	0.070	0.075	0.043	0.045

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