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MALNUTRITION AND IRON DEFICIENCY IN LACTATING WOMEN IN URBAN SLUM COMMUNITIES FROM ADDIS ABABA, ETHIOPIA

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ABSTRACT

Objective: To determine the status of iron deficiency anaemia (IDA) and malnutrition in lactating women.

Design: A cross-sectional study.

Setting: Six urban slum communities in *Teklehaimanot* district, Addis Ababa.

Subjects: One thousand and seventeen lactating women were enrolled and assessed for their haemoglobin (Hgb), serum ferritin level and body mass index (BMI) during the month of March 2001. Iron deficiency anaemia was considered when Hgb and serum ferritin concentrations were less than 12gm/dl and 12 µg/l respectively, whereas, a BMI less than 18.5% kg/m² was considered malnourished.

Main outcome measures: Determinations of haemoglobin, serum ferritin and BMI measurements.

Results: The overall prevalence of iron deficiency anaemia (IDA) and protein energy malnutrition in the slum communities was 22.3% and 27.1% respectively. The mean age of mothers (28.4±6.12 years) indicates that prevalence of malnutrition and iron deficiency anaemia was higher among younger mothers than among older mothers. The prevalence of malnutrition was positively correlated with the serum ferritin concentration status, of the mothers ($r=0.12$, $p=0.2$, $RR=1.03$).

Conclusion: It is observed that malnutrition and IDA are major health problems and therefore, an appropriate nutrition intervention package to improve the nutrition situation of the communities is recommended

INTRODUCTION

Iron is one of the most important elements in nutrition and is of fundamental importance to life. As a constituent of haeme, it is present in haemoglobin, myoglobin and in a variety of haeme and non-haeme iron enzymes (1-2). These compounds affect many vital functions.

When iron deficiency is widespread and severe, the prevalence of morbidity and effects on the individual's resistance to infectious disease are significant(3). Some of the effects of iron deficiency are a decrease in white cell phagocytic function and cell-mediated immunity, which can induce and serve to perpetuate a cycle of worsening malnutrition and infection, decreased gastric secretion, and reduced activity of intestinal enzymes (4-5) both of which can result in poor nutrient utilisation.

The prevalence of iron deficiency anaemia (IDA) in any population is a function of the bioavailability of the iron in the average diet, but varying requirements for iron largely determine which members of the population are affected(1). In this regard, infants and children are at risk because of the increased requirements related to rapid growth. It has also been observed that the prevalence of

iron deficiency and its severity is considerably greater in women during their reproductive years than in men(1,6). This is explained by the fact that in women there are increased requirements related to menstruation, pregnancy and lactation.

It has also been established that iron deficiency is most likely to occur among malnourished population and is particularly severe in under-five year old children and adolescent populations(2). Considering this observation and the one above that iron deficiency can perpetuate the malnutrition-infection cycle as well as affecting gastric functions, these problems should not be considered in isolation when either of them is being addressed.

The magnitude of iron deficiency anaemia (IDA) in Ethiopia has not yet been well documented nationwide. However, limited data exist on the prevalence of IDA among pregnant and lactating women in the rural areas, which showed a prevalence rate of 18.7% (7). In slum communities, the information on IDA status is practically negligible or inadequate.

In view of this we studied the magnitude of malnutrition and IDA problem among lactating women, who represent one of the groups at risk, in selected urban slum communities of *Teklehaimanot* district.

MATERIALS AND METHODS

The study was cross-sectional in nature intended to determine the nutritional and iron deficiency anaemia status of lactating mothers in six urban slum communities of *Teklehaimanot* district between March and June 2001. The district is located in the centre of Addis Ababa, Ethiopia and reported to be extremely congested and the poorest in the capital city(8).

Ethical clearance was obtained from the research and ethical clearance committees of Ethiopian Health and Nutrition Research Institute, Ethiopia.

The sample size was based on an estimated 18.7% prevalence of anaemia in rural Ethiopia with 95% confidence interval and 10% error (7,9). A total of 1140 subjects in the six communities was required. However, only 1017(89% of the estimated sample size) mothers who were lactating enrolled.

Socio-demographic information and blood samples for haemoglobin determination were collected in all the subjects.

Qualitative information on dietary practices and consumption from every fifth of the study subjects (n=207), using specific food, rich in vitamin and minerals, frequency checklist, were collected.

Haemoglobin was measured using cyanmethaemoglobin method (10-11). Mothers with haemoglobin value below 12 gm/dl were considered anaemic.

Serum was drawn from a sub-sample of anaemic mothers (n=53) for serum ferritin concentration (SFC) determinations. The samples were analysed at Ethiopian Health and Nutrition Research Institute (EHNRI) with a fully automated ES 300 analyser ELISA technique using-commercial kits supplied by Roche, Boerrhinger Mannheim, Germany.

Mothers were identified as suffering from iron deficiency anaemia when both haemoglobin and serum ferritin concentrations were below 12 gm/dl and 12 µg/l respectively (12-13).

To assess the body mass index (nutritional) status of the anaemic mothers, weight and height were measured with minimum clothing, in duplicate to the nearest 100 grams using a digital bathroom scale (11). Women who had given birth in the two months preceding the study were excluded to avoid the confounding effect of puerperium in the measurement of women's weight. Height was then measured using a wooden height-board,

which was positioned upright in duplicates for each subject to the nearest 0.1 cm while footwear was removed, hair was loose and flat. A body mass index (BMI) less than 18.5 kg/meter was considered protein energy malnutrition, while a BM were of 18.5% -<25%, >25%-29.9%, 30.0%-40%, > 40% is considered normal, grade one obesity, grade 2 obesity and grade 3 obesity respectively(14).

Data were analysed using the statistical package for social science (SPSS), version nine. Altitude adjustments for haemoglobin was based on an increase of 0.3 gm/dl per 1000 meters at sea level to determine the prevalence of anaemia(1).

RESULTS

Of the total 1017 lactating mothers recruited during the survey, 1016 were considered for the study because one of the mothers was excluded due to sample coagulation and haemolysis.

The mean haemoglobin concentration was 11.4±0.4 gm/dl. The overall prevalence rate of anaemia for the women was 22.3%. Practically all the subjects had a mild type of anaemia and only one (0.5%) had severe anaemia.

Table 1 shows the distribution of haemoglobin concentration by age. The mean age was 28.4±6.12 years. The prevalence of anaemia was 22.3%. Most of the anaemic mothers were between 15 and 40 years and practically all age groups were significantly affected (p<0.01).

Injera, a locally made unleavened bread from *Tef* (*Eragrostis Tef*, a type of cereal) together with locally prepared sauce from chickpea; little oil and chilli were the commonly consumed staple diet in the district. The frequency consumption of iron rich foods from animal source was uniformly low in the district (Table 2). The commonly and frequently consumed foods of vegetable origin daily were kale and Swiss chard while the commonly consumed food of animal source rich in iron were eggs and milk.

The mean serum ferritin concentration (SFC) was 52.4±47.2 µg/litre. Overall, 12 out of 53 (22.6%) of the subjects had a serum ferritin concentration below 12 µg/L, and the remaining subjects had SFC above 12 µg/L (Figure 1). This indicates that the prevalence of iron deficiency and iron deficiency anaemia are 22.6% and 22.3 % respectively.

Table 1

Distribution of haemoglobin concentration by age in the district

Age breakdown (years)	Haemoglobin concentration				
	<12 gm/dl (anaemic) (n=226)	>12 gm/dl (normal) (n=790)	Total (n=1016)	SE	[95% CI]
15-20	19(1.9)	65(6.4)	84 (8.3)	0.06	-0.71 to -0.38*
21-25	72(7.1)	249(24.5)	321(31.6)	0.03	-0.61 to -0.48*
26-30	64(6.3)	222(21.9)	286(28.1)	0.03	-0.64 to -0.46*
31-35	36(3.5)	129(12.7)	165(16.2)	0.04	-0.63 to -0.44*
36-40	33(3.2)	117(11.5)	150(14.8)	0.04	-0.68 to -0.43*
41-49	2(0.2)	8(0.8)	10(1.0)	0.18	-1.61 to -0.13*

Mean 28.6±6.12

SE= Standard error, CI= Confidence interval.

*P<0.01

Table 2

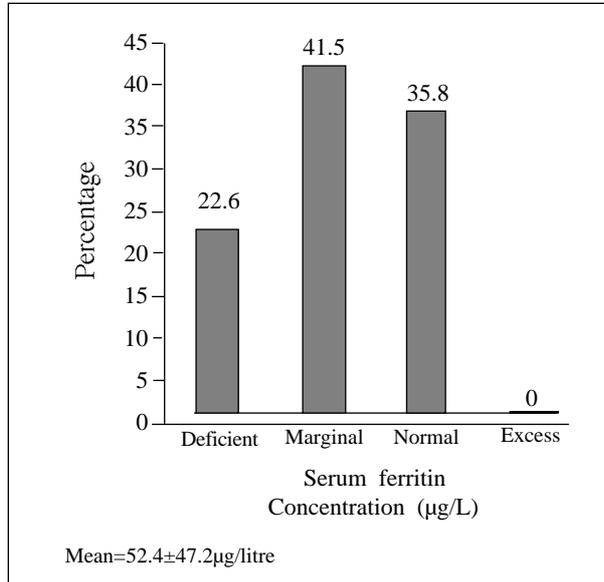
Frequency and consumption of selected foods in the district

Selected foods rich in vitamin or minerals	Frequency of consumption			
	Daily		Weekly	
	No.	%	No.	%
Plant source				
Kale	178	(86.0)	29	(14.0)
Lettuce	102	(49.3)	105	(50.7)
Swiss chard	171	(82.6)	36	(17.4)
Fruits	137	(66.2)	70	(33.8)
Animal source				
Eggs	160	(77.3)	47	(22.7)
Fish	23	(11.1)	184	(88.9)
Meat	77	(37.2)	130	(62.8)
Milk	68	(32.9)	139	(67.1)

Number of mothers interviewed for consumption was 207

Figure 1

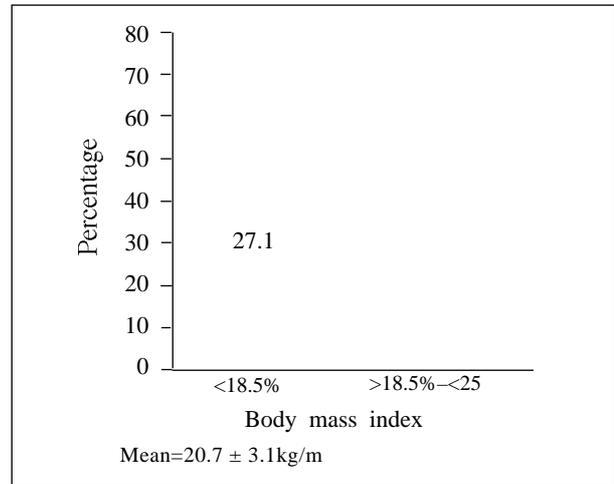
Distribution of serum ferritin concentration in the district (n=53)



The prevalence of malnutrition as determined by body mass index (BMI) is presented in Figure 2. The overall proportion of mothers with desirable weight (BMI 18.5%-25% kg/m²) in the community is 151 (72.9%). While the proportion of mothers with chronic energy deficiency or malnutrition (BMI<18.5 kg/m²) was 27.1%. The mean BMI was 20.4±2.94kg/m². As expected chronic energy deficiency/malnutrition was positively correlated to the serum ferritin (r=0.12, p=0.2, RR=1.03) concentration status.

Figure 2

Nutritional status as determined by body mass index (n=1017) in the district



DISCUSSION

The prevalence of nutritional anaemia remains high in many parts of the world despite the considerable efforts made to alleviate the situation (13). The social, health, and economic costs of iron deficiency anaemia are important and should always be considered along with the public health implications. The significance of nutritional anaemia has been widely reported to cause long-term retardation of national development because individuals fail to realise full genetic potential and to optimally exploit opportunities(1,6). Likewise, work capacity is reduced due to physical and mental lethargy and equally important increased susceptibility to infections arising from immunological impairment is well documented (1,6,15,16).

The present study shows a slightly higher prevalence rate of iron deficiency anaemia in the district, as determined by low haemoglobin and serum ferritin concentrations (less than 12 gm/dl) below 12 µg/litre respectively) than previously reported figures for pregnant and lactating mothers in rural Ethiopia (22.3% vs. 18.7%). However, when compared with the study results in Azerbaijan(17), Pakistan(18-19), Sri Lanka(20), South Africa(21), Ireland(22), which showed a prevalence between 30% and 50%, this community is relatively better. This is probably due to consumption of fermented *injera* which probably enhances the bioavailability of iron present in the staple diet of the community(7).

The mean age of mothers, which was 28.4±6.12 years, indicates that the younger mothers were the most affected. This depicts that younger mothers are the high-risk groups, which is in conformity with previous studies among the rural mothers in Ethiopia(7). The higher risk faced by these groups could probably be related to heavy menstrual blood loss (23).

The use of BMI, calculated as weight/height², is gaining acceptance as a weight status index for use in

diagnosing both protein energy malnutrition and obesity. Most of the assumptions of weight status are fulfilled by BMI, although some limitations are noted(14). When low BMI occurs among impoverished communities, it is usually associated with higher rate of morbidity, mortality and perpetuation of poor reproductive performance. Body mass index data shows lower prevalence of malnutrition than data from neighbouring countries in Africa(24). In South Africa the prevalence of malnutrition was reported to be 30% to 50% and 15% to 30% in South Asia. However, the prevalence of malnutrition in the slum community is slightly higher than previously reported for Addis Ababa Administrative region (17.9%) (25). This indicates that the slum community is at greater risk than the other population in the state. The high rate of malnutrition was attributed to the low intake of nutrients as reported by the mothers.

In conclusion, maternal malnutrition appears increasingly a concern in the studied community and therefore it is justifiable to call for an immediate nutrition intervention packages.

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