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ABSTRACT

Background: **Anaemia is among the greatest health problems in reproductive age women in developing countries.**
Objectives: **To estimate the prevalence of anaemia among non-pregnant parous women, and to investigate the main underlying cause for the anaemia.**
Setting: **A sub-urban Maternal and Child Health Clinic (MCH) in Dar es Salaam.**
Design: **Cross-sectional.**
Methods: **Consecutive parous non-pregnant women who had brought their children for vaccination and /or had come for family planning to Mbagala MCH clinic were invited to participate in the study. Obstetric and social history was recorded, and their height and weight were checked. Haemoglobin was measured using HemoCue hemoglobinometer. Anaemic women were further investigated to determine the cause of anaemia by haematological and biochemical tests.**
Results: **Five hundred and four parous non-pregnant women were screened, 49% were anaemic (Hb <12 g/dl) and 1.6% severely anaemic (Hb <7 g/dl). Anaemia was not related to socio-demographic and obstetric history characteristics, but decreased significantly with increasing Body Mass Index (BMI) (p=0.042). The prevalence of anaemia was significantly lower in women using hormonal contraceptives, compared to non-users (36% vs 54%) (p=0.04). Eighty-seven percent of the anaemic women were iron deficient and 8.7% had elevated serum C-reactive protein indicating undiagnosed infections.**
Conclusion: **Nutritional deficiencies in women have to be corrected before and between pregnancies and all contacts women have with the health system should be utilised for anaemia control interventions, in addition to long-term community approaches. To improve maternal health calls for a broader agenda and a change of approach in the MCH-clinics.**

INTRODUCTION

Anaemia is a major public health problem world-wide(1). Women of reproductive age are most affected and the estimated prevalence is 11% in the developed world and 47% in the developing world. In pregnant women the prevalence is over 50% in the developing countries(1). In Sub-Saharan Africa and Southeast Asia prevalences between 60% and 80% have been reported. In a study of over two thousand women in Dar-es-Salaam booking for antenatal care, we found that 60% were anaemic(2). Severe anaemia during pregnancy is also a major cause of maternal mortality and morbidity in Tanzania(3). Interventions to reduce anaemia are targeted to pregnant women through universal supplementation with iron/folate but there are no actions directed to women who are not pregnant although it is known that anaemia is present before pregnancy(1).

The increased risk of anaemia in the non-pregnant women is due to the additional iron loss due to menstruation, and the increased need for iron persists throughout the reproductive cycle. Even in developed countries like Denmark, where diet generally is adequate, 12% of menstruating women were iron deficient even though they were not anaemic and their mean haemoglobin were significantly lower than in the post menopausal women(4). In the developing countries inadequate dietary intake and consumption of foods with low iron bioavailability, in addition to frequent parasitic infections especially hookworm, contribute to chronic anaemia in women(5). There are also frequent childbirths and women do not recover their iron stores before the next pregnancy. The situation is compounded by lack of access to health care for women when not pregnant, even though it is acknowledged that good pre-pregnancy iron stores are essential in controlling pregnancy anaemia(6).

The overall aim of our study on anaemia in Dar-es-Salaam was to determine the magnitude and underlying factors of anaemia in women of reproductive age(2,7). In this part of the study we report on anaemia and underlying factors in non-pregnant parous women from the same community. The Expanded Programme of Immunisation (EPI) is one of the successful health programmes in the country with 85% coverage of eligible under-fives(8). Attendance for antenatal care is also high with a coverage of 97.5% in Dar es Salaam(8). At this MCH clinic we had in 1991-92 done a study on prevalence and the contributing factors for anaemia among pregnant women(2,7).

MATERIALS AND METHODS

Study area and study sample: The study was conducted at Mbagala Maternal and Child Health (MCH) clinic, Temeke District, Dar-es-Salaam. Mbagala ward is a sub-urban area situated about sixteen kilometres from the city. The people are mainly subsistence farmers and petty traders and only a few are formally employed.

The MCH clinics provide comprehensive care for the mother and child in the catchment area, including antenatal care, family planning, under-five immunisation and growth monitoring. No socio-economic changes had taken place in the community since the earlier study was conducted.

At each clinic day from mid-October to mid-December 1995, all consecutive women who had brought their children to the under-five clinic, and/or those who came for contraceptive services were invited to participate in the study (n=504) and informed consent was obtained. None of the women had any medical complaint.

Definitions: We adopted the WHO definition for anaemia in the non-pregnant woman Hb <12.0 g/dl, and for severe anaemia Hb <7.0 g/dl. Prior to commencement of the study a pilot study was done, which showed that nearly 50% of the women had Hb<12.0 g/dl and 20% had Hb <11.0 g/dl. For logistic reasons we applied a cut off level of <11.0 g/dl for those selected for further investigations to determine the cause of anaemia, as it ensured inclusion of those with mild to moderate as well as severe anaemia in the sub-sample investigated.

Methods: For each woman who gave consent for the study a questionnaire was administered by a trained research midwife, to record the socio-demographic and obstetric history of the women and exclude the possibility of an ongoing pregnancy. Their height and weight were checked using a weighing scale with an adjustable height measure. Body mass index (BMI) was calculated using the formula BMI = weight (kg)/height^2 (m).

Haemoglobin (Hb) was estimated using a portable HemoCue Hemoglobinometer (HemoCue AB, Ängelholm Sweden). The methodology for Hb assessment using HaemoCue and its suitability for use in outpatient care by non-technical trained personnel has been described by Schenck *et al.*(9). Women who gave consent for investigations were also asked to bring a stool specimen on the following day for analysis of intestinal parasites. Only a few women (n=24) complied so no further analysis on intestinal parasites could be done. One trained research midwife performed all Hb measurements (finger prick).

A sub-sample of women with Hb <11.0 g/dl (n=90) were further investigated. A venous blood sample was drawn into EDTA tube, another specimen in a tube without anticoagulant and both samples were sent to the Central Laboratory at Muhimbili Medical Centre for analysis. Specimens were processed within three hours of collection. Haematological analysis was done by a technician using the Coulter electronic counter system (Coulter-Electronic Ltd). The Coulter was calibrated daily by a standard, according to the manufacturers instructions. There was a high correlation ($r=0.88$; $p<0.01$) between the Coulter and HaemoCue measurement of Hb for the 71 samples. Thick blood films for malaria parasites were prepared and reported by the same technician, using standard laboratory procedures. Serum was separated on the same day. It was preserved, and ELISA for HIV-1 was assessed at the Department of Virology at Muhimbili Medical Centre and the results were non-linked to individual identification. Serum samples were kept frozen at -20°C, and transported to the Department of Clinical Chemistry, Uppsala University for analysis of serum ferritin (S-ferritin) and serum C-reactive protein (SCRP). S-CRP was assayed by an immunological turbidimetric method and S-ferritin by 2-point fluoroimmunometry based on a direct sandwich technique. The ferritin assay method was calibrated according to WHO standards. We used a cut off for S-ferritin of 50 ug/l as recommended by WHO Expert Committee(10) in areas where infections and inflammations are common, and would lead to an underestimation of iron deficiency. All women who were found to be anaemic were given oral ferrous sulphate and folic acid, counselled on nutrition and were given appropriate treatment for intestinal parasites. Severely anaemic women (Hb <7.0 g/dl) were in addition advised to report for follow up at the nearby dispensary.

Ethical clearance and informed consent: Ethical clearance was granted before the beginning of the study by Muhimbili University College of Health Sciences Research and Ethics Committee and by the Ethics Committee of the Medical Faculty at Uppsala University, Sweden. Informed consent was obtained from all women who participated in the study for screening and for further investigations.

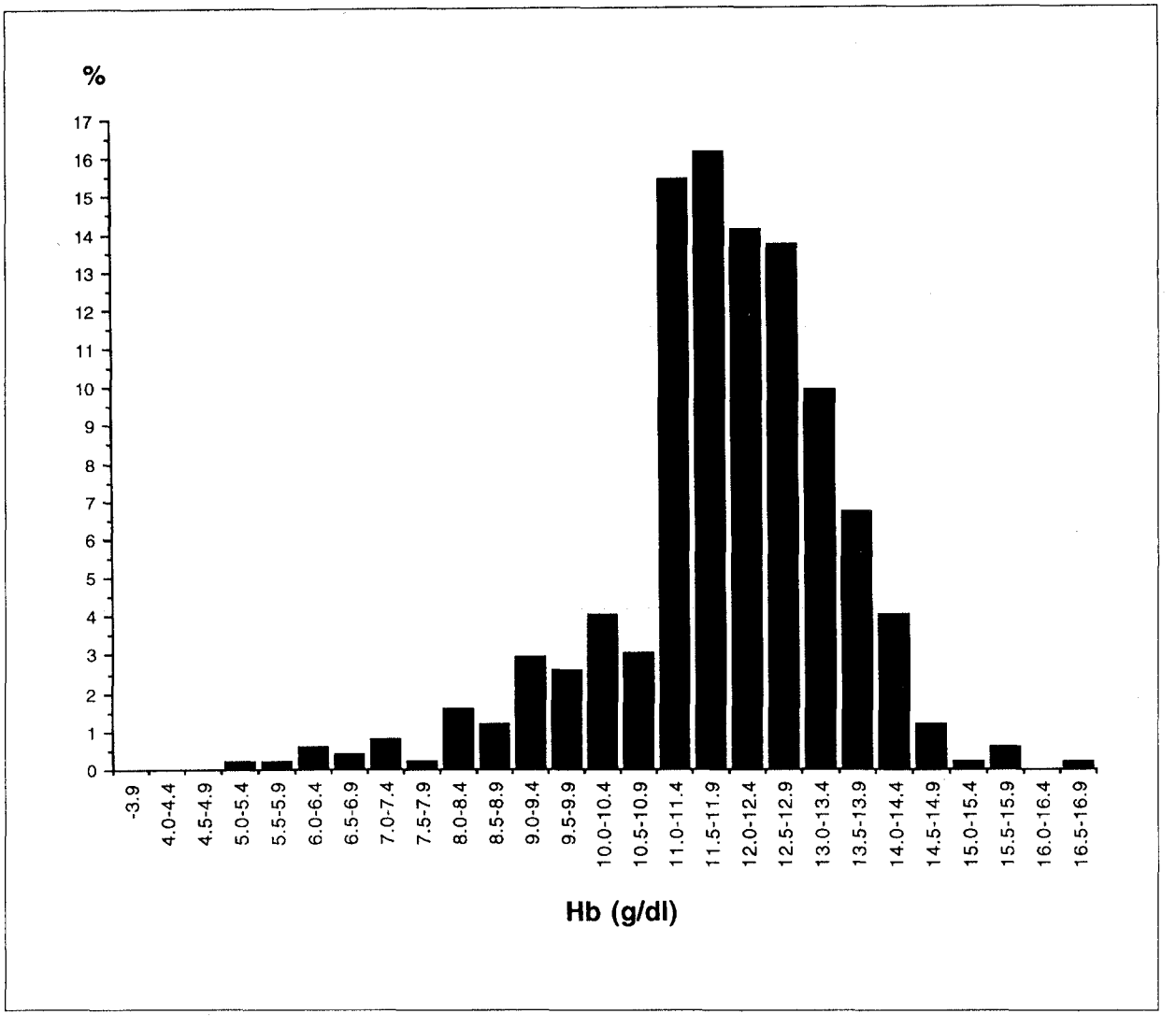
Statistical methods: To estimate whether a difference between groups were due to random variation or not Student's t-test (2 groups) and Chi-square test for trend (>2 groups) were applied. Statistical significance was defined as $p<0.05$.

RESULTS

A total of 504 women participated in the study. Their median age was 25 years (range: 16-45), median parity 2 (range: 1-13), and median education was seven years. Only five women were formally employed. Nearly 80% were still breastfeeding their babies and median age of the youngest child was 14 months. The frequency distribution of Hb (n=504) is illustrated in Figure 1. The median Hb was 12.0 g/dl. The prevalence of severe anaemia was 1.6% and 18% had Hb < 11.0 g/dl.

Figure 1

Distribution of haemoglobin (Hb) level (g/dl) in 504 non-pregnant women visiting Mbagala clinic



There were no differences in the prevalence of anaemia in subgroups with respect to sociodemographic or obstetric history characteristics (Table 1). The prevalence of anaemia decreased significantly with increasing BMI (p=0.042) (Chi-square test for trend). There was no difference in the prevalence of anaemia among those who were breastfeeding and those not breastfeeding. Out of 504 women only 143 (29%) were using hormonal contraception, mainly the pill (n=88) and Depo Provera (n=49), and the prevalence of anaemia was significantly lower in users of hormonal contraception (36%) compared to non-users (54%) (p=0.04).

Laboratory studies: In the sub-sample of anaemic women with Hb <11.0 g/dl (n=90) at the clinic, six refused to give venous blood, and some other samples were either clotted or inadequate for analysis, leaving 71 samples for analysis of haematological variables, S-ferritin, S-CRP and malaria (Table 2).

The mean corpuscular volume (MCV) was <80 fl (the cut off value for microcytosis) in 83%. S-ferritin was assessed in 68 cases and it was <50 ug/L (10) in 87%. Based on both MCV and S-ferritin, iron deficiency was a predominant factor. Malaria was positive in 11%. The prevalence of abnormal S-CRP (> 10 mg/L) was 8.7% and HIV-1 serology was positive in 14.5%. The median Hb among HIV seropositive women was lower compared to the median Hb in the sero-negative women, median Hb =8.7 g/dl (range 6.6-10.5) versus Hb =9.7 g/dl (range 5.2-10.9). However, the difference was not statistically significant.

Table 1

Prevalence of anaemia (haemoglobin <12.0 g/dl) by some socio-demographic, obstetric history and health status characteristics

Characteristic	Categories	Prevalence of anaemia	Number of women
Socio-demographic:			
Age (years)	>19	54.4	68
	20-29	49.7	318
	30<	46.0	113
Education (years)	0	50.5	95
	1-7	49.9	391
	8<	44.4	18
Occupation	Housewife	49.7	481
	Other	46.2	23
Marital status	Single	48.1	54
	Married	49.5	441
	Divorced/ Cohabiting/ Widowed	40.0	5
Obstetric history:			
Parity	1	51.3	150
	2-4	48.7	267
	5<	48.5	87
No. of living children	1	50.6	157
	2-4	48.7	269
	5<	48.5	78
No. of abortions	0	49.9	457
	1<	44.7	47
Health status:			
Breastfeeding	Yes	49.6	397
	No	47.6	105
Body Mass Index	>19.9	51.8	195
	20.0-21.9	52.3	132
	22.0-24.9	47.2	106
	25<	36.2	66
Menstruating	Yes	43.3	64
	No	50.0	434
	No, lactational amenorrhoea	57.5	186
Use of contraceptives	Yes	36.4	143
	No	54.0	354
Total		49.4	504

Table 2

Prevalence of iron deficiency and infections in a sub-sample of anaemic women (Hb<11.0 g/dl) (n=71)

	Prevalence %	Number of women
Iron deficiency:		
MCV<80 fl	82.9	71
S-ferritin<50 µg/l	86.8	68
Infections:		
Malaria	11.4	70
S-CRP>10 mg/l	8.7	69
HIV-1 pos	14.5	69

DISCUSSION

Prevalence of anaemia: In this study 49% of parous non-pregnant women attending MCH clinics were anaemic, and nearly 2%were severely anaemic. In a study done in Lindi, a southern coastal district of Tanzania, the prevalence of anaemia was 45% among non-pregnant women(11). Our findings are also similar to those found in other studies done in developing countries. In Burkina Faso, the prevalence of anaemia in women in reproductive ages was 59%(12) and in Nigeria it was 46% in non-pregnant women(13). Compared to the pregnant women in Dar-es-Salaam from the same community, severe anaemia was less prevalent, (1.6% vs 4.8%)(2).

Despite a reinforcement of antenatal intervention for anaemia control, including ensuring of availability of iron/folate supplementation, individual counselling and education on anaemia prevention in the community, 47% of the women were still mildly anaemic late in pregnancy, although severe anaemia was reduced(14). Our findings show that 50% of the women were anaemic also during the lactation period, median fourteen months since delivery. This situation is to be expected in the absence of any intervention post delivery. Anaemia in women is related to adverse pregnancy outcome(1). However, it is also important to consider non-medical effects of iron deficiency anaemia, such as diminished well being and reduced work capacity, which have consequences also for the economy of the country. In a study from Indonesia anaemia reduced work capacity even in women performing less strenuous tasks, which included childcare(15).

Factors contributing to anaemia: Contributing factors for anaemia identified in this study are fairly similar to those in the anaemic pregnant women

studied(7), and the majority of the anaemic women were iron deficient as manifested by a low S-ferritin or microcytosis. Women with low BMI had higher prevalence of anaemia. General under-nutrition in women is common in developing countries. Especially when the pregnancy interval is short, there is no time for the woman to replenish essential nutrients and a continuous cycle of pregnancy and lactation is an important cause of chronic depletion of iron stores and anaemia.

An earlier study in this community on food consumption in women showed that the amount consumed was adequate but that the food had low iron bioavailability although women had adequate knowledge on iron nutritious foods(16). This is a common phenomenon in Tanzania and the main reason is that food containing heme iron often is expensive and therefore consumed in only small quantities. The overall socio-economic situation in this community could be considered to be generally poor as reflected by the level of education and employment status. Anaemia is thus a problem for most women and no association was observed with any social or obstetric characteristic that would single out a sub-group for special interventions. Similar findings were observed in other developing countries where anaemia is common(17).

Non-specific infections were less often associated with anaemia than in a previous study of pregnant women. S-CRP, which is an indicator of acute and chronic infections, was elevated in 8.7% compared to 42% in pregnant anaemic women studied earlier(7). The altered immunity in pregnant women predisposes them to infections, but in the absence of infections, women maintain normal CRP levels throughout pregnancy(18). Chronic infections may impair erythropoiesis and inhibit bone marrow activity, thus causing anaemia.

Hormonal contraceptive, which was the most frequently used method among these women, reduces menstrual blood loss and thereby reduces anaemia. This was confirmed in this study, thus promotion of hormonal contraceptive use is therefore an important anaemia control strategy in women and should be emphasised in MCH clinics.

The HIV-1 prevalence of 15% in anaemic women is of concern as it reflects the acceleration of the HIV epidemic among women in the reproductive age in the country. Although the sample of non-pregnant women was small, (n=71) it is in agreement with the reported HIV-1 prevalence in pregnant women in Dar-es-Salaam of 12% (19). Severe anaemia was more prevalent in HIV infected pregnant women, and this is in agreement with results of other studies done in developing countries(5,20). HIV/AIDS and related infections is ranked high as a major determinant of anaemia in reproductive age women in Africa(5,21). Strategies to reduce HIV transmission in the country will have an impact on the prevalence of anaemia in women especially during pregnancy. On the other hand control of severe anaemia in women will minimise the risk of HIV transmission through emergency blood transfusion for life threatening obstetric complications, which is often a life saving treatment for severe anaemia especially in pregnant women.

Presence of intestinal parasites particularly hookworms was not analysed because only a few women were willing to bring a stool specimen. However, hookworm is known to be very prevalent in the area(11,22) and in the study of anaemic pregnant women from the same community, presence of hookworm contributed to severe anaemia(7). In hookworm endemic areas women of reproductive age are susceptible to anaemia even with light hookworm load, because their iron stores are inadequate(21). Hookworm control is therefore an essential component of anaemia control in Tanzania. We recommend inclusion of de-worming of pregnant women in Tanzania which is currently not a routine practice, but has been shown to significantly increase the beneficial effects of iron supplementation on Hb concentration and iron status(23).

Recommendations for health care programmes: The national policy is to provide prophylaxis (iron and folic acid) to all pregnant women. In our study on anaemia in pregnancy in the same study area, 60% of the women were anaemic when they registered for antenatal care. Most of these women registered in late second trimester, and had too short time to benefit from the prophylaxis given(2). Furthermore anaemia in these women as in other places in Africa(5,7) had multiple underlying factors, which could not be adequately addressed by supplementation alone, and many women in developing countries embark on a pregnancy already iron depleted(1). Attention should be given, not only to pregnant women, but also to those in the post partum period. Interventions to reduce anaemia in the non-pregnant women would thus reduce the morbidity and mortality related to anaemia in pregnant women.

The women came to the MCH clinics for immunisation of their babies, but they would have needed a general health screening and treatment themselves. The lack of organised health care services for the postnatal women is therefore of much concern. There is a need to establish health services for the mother-baby pair during the postnatal period. Our study demonstrates that 50% of women are anaemic in between pregnancies and during lactation, and iron deficiency is the predominant cause (in 87% of the anaemic women). Continued supplementation with iron should therefore be given throughout the lactation period so as to replenish their iron stores before the next pregnancy. It has been shown that if no iron supplements are given postpartum, it takes more than two years to replenish the iron stores of a woman after a pregnancy(24). The care of mother and baby

in the perinatal period has recently been co-ordinated by WHO in the Mother-Baby Package(25). A similar approach should be developed for MCH services in the postnatal period. This should also encourage counselling and utilisation of family planning especially hormonal contraceptives, which is protective to women's health. Alternative long-term community based preventive approaches, which include dietary modifications, and sanitary environmental measures should also be emphasised. Reduction of anaemia in women of reproductive age requires strategies of ongoing routine supplementation that aim at good iron stores before pregnancy and assure adequate supplements throughout pregnancy as well as postpartum. Prevention and treatment could easily be carried out within the existing MCH services.

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REFERENCES

1. WHO. The prevalence of anaemia in women. A tabulation of available information. WHO/MCH/MSM/92.2, Geneva, Switzerland, 1992.
2. Massawe, S., Urassa, E., Lindmark, G., Möller, B. and Nyström, L. Anaemia in pregnancy. A major heath problem with implications for maternal heath care. *Afr. J. Health Sci.* 1996; **3**:126-132.
3. Urassa, E.J.N., Massawe, S.M., Lindmark, G. and Nyström, L. Maternal mortality in Tanzania - medical causes are interrelated with socio-economic and cultural factors. *South Afr. Med. J.* 1996; **86**:436-444.
4. Milman, N., Rosdahl, N., Lyhne, N., Jorgensen, T. and Graudal, N. Iron status in Danish women aged 35-65 years. Relation to menstruation and method of contraception. *Acta Obstet. Gynecol. Scand.* 1993; **72**:601-605.
5. Fleming, A.F. The aetiology of severe anaemia in pregnancy in Ndola, Zambia. *Ann. Trop. Med. Parasitol.* 1989; **83**: 37-49.
6. Viteri, F.E. Iron supplementation for the control of iron deficiency in populations at risk. *Nutr. Rev.* 1997; **55**:195-209.
7. Massawe, S.N., Urassa, E.N.J., Mmari, M, Ronquist, G., Lindmark, G. and Nyström, L. The complexity of pregnancy anaemia in Dar-es-Salaam. J. Gynecol. *Obstet. Invest.* 1999; **47**:76-82.
8. TDHS. (1996). Tanzania Demographic and Health Survey. Bureau of Statistics (Tanzania), and Macro International Inc. 1997. Claverton, Maryland.
9. Schenck, M., Falkesson, M. and Lundberg, B. Evaluation of "HemoCue" a new device of determining haemoglobin. *Clin. Chem.* 1986; **32**:526-529.
10. WHO. Report of the African Regional Consultation on control of anaemia in pregnancy. World Health Organization Regional office for Africa Brazzaville-Congo. Geneva WHO mimeographed document AFR/MCH/86, 1989.
11. Tatala, S. Svanberg, U. and Mduma, B. Low dietary iron availability is a major cause of anaemia: a nutrition survey in Lindi district, Tanzania. *Amer. J. Clin. Nutr.* 1998; **68**:171-178.
12. Meda, N., Cousens, S. and Kanki, B. Anaemia among women of reproductive age in Burkina Faso. *World Health Forum* 1996; **17**:369-372.
13. Isah, H.S., Fleming, A.F., Ujah, I.A. and Ekwempu, C.C. Anaemia and iron status of pregnant and non-pregnant women in the guinea savanna of Nigeria. *Ann. Trop. Med. Parasitol.* 1985; **79**:485-493.
14. Massawe, S.N., Urassa, E.N., Nyström, L. and Lindmark, G. Effectiveness of primary level antenatal care in decreasing anemia at term in Tanzania. *Acta Obstet. Gynecol. Scand.* 1999; **78**:573-579.
15. Scholz, B.D., Gross, R., Schultink, W. and Sastroamidjojo, S. Anaemia is associated with reduced productivity of women workers even in less-physically-strenuous tasks. *Brit. Nutr.* 1997; **77**:47-57.
16. Hultèn, K. Dietary iron sources among pregnant women in Mbagala, Dar-es-Salaam Tanzania, MFS report no 10. Department of Epidemiology and Public Health, Umeå University, Sweden, 1996.
17. Haidar, J., Nekatibeb, H. and Urga, K. Iron deficiency anaemia in pregnant and non-pregnant women in Rural Ethiopia. *East Afr. Med. J.* 1999; **76**:618-622.
18. Watts, D.H., Krohn, M.A., Wener, M.H. and Eschenbach, D.A. C-Reactive Protein in Normal Pregnancy. *Obstet. Gynecol.* 1991; **77**:176-180.
19. Karlsson, K., Massawe, A., Urassa, E., Kawo, G., Kazmoto, R., Lyamuya, E., Urassa, W., Bredberg-Raden, U., Mhalu, F. and Biberfeld, G. Late postnatal transmission of human immunodeficiency virus type 1 infection in Dar-es-salaam, Tanzania. *Paediatr. Infect. Dis. J.* 1997; **16**:963-967.
20. UNICEF. Preventing iron deficiency in women and children. Technical Consensus on Key Issues. UNICEF/UNU/WHO/ M1 Technical Workshop. UNICEF, New York, 1998.
21. Antelman. G. Msamanga, G., Spiegelman, D. Urassa, E.N., Raymond, N., Hunter, D.J. and Fawzi, W.W. Nutritional factors and infectious disease contribute to anaemia among women with human immunodeficiency virus in Tanzania. *J. Nutr.* 2000; **130**:1950-1957.
22. Vaugh, J.P., Menu. J.R., Kihamia, F., Brooke D. and Kiwia A. Anaemia in the coastal area of Tanzania. *East. Afr. Med. J.* 1973; **50**:86-93.
23. Atukorala. T.M.S., De Silva, L.D.R., Dechering, W.H.J.C., de C. Dassenaeike, T.S. and Perera. R.S. Evaluation of effectiveness of iron-folate supplementation and antihelminthic therapy against anaemia in pregnancy: a study in the plantation section of Sri Lanka. *Amer. J. Clin. Nutr.* 1994; **60**:286-292.
24. Taylor, D.J., Mallen, C., McDougall, N. and Lind, T. Serum ferritin in women of reproductive age. *Brit. J. Obstet. Gynaecol.* 1982; **89**:1000-1005.
25. WHO. Safe Motherhood. Mother-Baby-Package: implementing safe motherhood in countries. WHO/FHE/ MSM/94.11, Geneva, Switzerland, 1994.