Research Article

Prevalence and correlates of anemia among mothers of children aged 0–23 months in three districts of Karnataka, India

Deepthi Narayan Shanbhag[1], Ramakrishna Goud[1], Naveen Ramesh[1], Sulekha Thimmaih[1], Maya Mascarenhas[2], Arvind Risbud[2], Prem K Mony[3], Arvind Kasthuri[1]

[1]Department of Community Health, St John's Medical College, Bangalore, Karnataka, India.
[2]Faculty, MYRADA, Bangalore, Karnataka, India.
[3]Department of Epidemiology, St. John's Research Institute, Bangalore, Karnataka, India.
Correspondence to: Deepthi Narayan Shanbhag, E-mail: deepthi.shanbhag@gmail.com

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Abstract

Background: Anemia is one of the major leading nutritional deficiencies in India. While vulnerable groups such as pregnant women and preschool and adolescent children have been studied extensively, the problem in lactating women is less well documented.

Objective: To study the prevalence and correlates of anemia among mothers of children aged 0–23 months in three backward districts of Karnataka state in southern India.

Materials and Methods: A cross-sectional study was undertaken using a cluster sampling technique from three geographically dispersed backward districts of Karnataka. We studied 647 mothers of children aged 0–23 months from three taluks in these districts, with hemoglobin estimation using HemoCue method.

Result: In our study population with medium parity, the prevalence of anemia was 65.8% (426/647) [mild/moderate anemia (Hb = 7–11.9 g%) = 63.5%; severe anemia (Hb < 7 g%) = 2.3%]. On multivariate analysis, hemoglobin values were significantly associated with the educational status of the woman and consumption of iron tablets during pregnancy.

Conclusion: Increasing efficiency of anemia control program during pregnancy through improved coverage and adherence along with continued care after delivery well after the traditional 3-month postpartum period will be needed to tackle the overall problem of anemia in women of reproductive age. There should also be a special focus on those from socially disadvantaged groups.

KEY WORDS: India, lactating women, anemia, socioeconomic status, supplementation, adherence

Introduction

Anemia is a global public health problem affecting both industrialized and industrializing countries.[1] The World Health Organization established an epidemiological criterion to classify areas according to the prevalence of anemia: mild (1–9.9%), moderate (10–39%), and severe (≥40%).[2] In India, the prevalence of anemia has been found to be 70%, 59%, and 58% among children, pregnant women (PW), and nonpregnant women (NPW), respectively, according to the National Family Health Survey 3 (NFHS-3).[3] Anemia impacts health adversely by increasing the risk of maternal and child morbidity and mortality; further, it also affects cognitive and physical development with attendant consequences on work productivity that is of major concern for individuals, families, and economies.[2] Anemia is thus an indicator of both poor nutrition and poor health across the life cycle; improving nutritional status will thus contribute to the achievement of the Millennium Development Goals.[4] While anemia in children and in PW has been extensively studied in India, it is less

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well documented in NPW; even so when studied, it is mostly restricted to lactating women in the first few months of postpartum period. Given that absolute and relative nutritional deficiencies persist across an individual's life cycle, the aim of our investigation was to study the prevalence and correlates of anemia among mothers of children aged 0–23 months in three backward districts of Karnataka state in southern India.

Materials and Methods

Study Design

It was a cross-sectional study design.

Study Setting

We purposively selected three districts (Bidar, Chitradurga, and Chamarajanagara) of the 30 districts in Karnataka state, India, to represent the northern, central, and southern regions, respectively. Female literacy rates in these districts were 62%, 66%, and 54% whereas urbanization was 25%, 20%, and 17%, respectively.[5] Within each district, one taluk (administrative subdistrict) was selected—Aurad (Bidar), Molkalmoru (Chitradurga), and Kollegal (Chamarajanagara). This was done purposively by choosing a taluk that was overwhelmingly rural (urbanization ~ 5%) and identified as a "backward taluk" and wherein MYRADA (Mysore Resettlement and Development Agency), a nongovernmental organization worked on socioeconomic and health development programs in that region.

Sample Size, Sampling Technique, and Study Population

With an estimated prevalence of anemia being 50% in the NFHS-3[3] and with 95% confidence interval, we calculated the sample size to be 96. For a 30-cluster sampling technique (with cluster being defined as a village), we applied a conservative design effect of 2.2 and estimated the sample size to be 212.[6] We employed a two-stage, cluster sampling technique in each taluk; in the first stage, we chose clusters using probability proportional to size with the list of villages in each taluk as the sampling frame; and in the second stage, the required numbers of participants were chosen from each cluster picking a random house in a random direction as a starting point, and proceeding to adjacent houses thereafter till the required number was obtained. All the women having children between the ages 0 and 23 months in the selected households were included.

Study Instrument and Data Collection

We developed a brief questionnaire to obtain information on demographic and socioeconomic characteristics, utilization of antenatal care (ANC) services, and obstetric details of participants. Physical examination was undertaken to obtain weight and height using a standardized digital weighing scale and a non-stretchable standard measuring tape respectively. Ninety (30 in each taluk) field workers were trained more than 4 days to be the research assistants. Weight was measured to the nearest 100 g and height to the nearest centimeter. Lab technicians obtained using finger-prick blood samples and used HemoCue photometer for hemoglobin estimation.[7] The study was conducted during the period April and June 2010. Quality control measures with regard to training of staff, data collection at the cluster level, and centralized data entry were supervised by the community health consultant.

Study Definition

Anemia in women of reproductive age was defined as Hb < 12 g/dL 120 g/L. We defined the postpartum period as up to 6 weeks after delivery, when maternal hemoglobin concentration is expected to return to first-trimester or prepregnancy levels.[8] All three study areas were less than 800 m above mean sea level (http://www.altitude.nu/) and smoking prevalence among adult females in Karnataka was rare (0.3%);[9] hence, no correction factor was applied to the estimated hemoglobin value.[10]

Statistical Analysis

Data were entered and analyzed using SPSS (version 16.0). Simple bivariate analysis was undertaken and descriptive statistics are presented. *p*-Values of <0.05 were considered significant. Multivariate linear regression was undertaken to account for confounders; for this analysis, all parameters with *p*-values < 0.10 in bivariate analysis were considered.

Results

A total of 212 women in Aurad taluk, 220 in Molkalmoru taluk, and 215 in Kollegal taluk were interviewed to participate in the study. Socioeconomic and clinical characteristics of the mothers in the three taluks are shown in Table 1. Women aged 15–40 years were the study participants. Overall mean [±standard deviation (SD)] age was 23.3 (±3.6); mean age of women in Kollegal taluk (22.4 years) was lower than that of women in Molkalmoru and Aurad taluks (23.8 years). While one in four had completed at least 8 years of schooling in Molkalmoru taluk, about two-thirds had completed grade 8 in the other two taluks. While about two-thirds had been classified as being poor (below poverty line) in Aurad taluk, more than 80% were classified as poor by the government in Kollegal and Molkalmoru taluks.

Work-force participation rate was 35%, 48%, and 55% in Kollegal, Aurad, and Molkalmoru taluks, respectively; most of the working women in Molkalmoru and Aurad taluks were employed in agriculture whereas women in Kollegal taluk worked as housemaids or as agricultural laborers. The mean (±SD) number of living children per family was 2.0 (±1.0); while it was 1.7 in Kollegal taluk, it was 2.1 in the other two taluks and this was statistically significant. In Kollegal taluk, 13% of women had >2 living children whereas in Molkalmoru and Aurad taluks, about 30% of women had >2 living children.

Prevalence of anemia was 62%, 71%, and 65% in Kollegal, Molkalmoru, and Aurad taluks, respectively. Overall, 2.3% (15/647) of women had severe anemia (Hb < 7 g%) and

Table 1: Socioeconomic characteristics of participants in the three taluks

Characteristic		Test of significance	No. (%)	
District	Kollegel	Molkalmoru	Aurad	
χ^2; df				
p-Value	(*n* = 215)	(*n* = 220)	(*n* = 212)	
Age (years)				
15–19	34 (15.8%)	21 (9.5%)	10 (4.7%)	18.9; 4
20–29	172 (80.0%)	178 (81.0%)	182 (85.8%)	0.001
≥30	9 (4.2%)	21 (9.5%)	20 (9.4%)	
Education				
<8 years	127 (59.1%)	167 (75.9%)	130 (61.3%)	
≥8 years complete	88 (40.9%)	53 (24.1%)	82 (38.7%)	<0.001
Socioeconomic status				
Below poverty line	173 (80.5%)	193 (87.7%)	139 (65.6%)	32.0; 2
Above poverty line	42 (19.5%)	27 (12.3%)	73 (34.4%)	<0.001

63.5% (411/647) had mild/moderate anemia (Hb = 7–11.9 g%). Proportion of women with severe anemia was almost three times higher in Molkalmoru (4.2%) compared to the other two taluks (1.5%). Hemoglobin values in the study population raged from 4.8 to 15.5 g% with a mean (±SD) of 11.2 (±1.6) g%. The mean (±SD) Hb in Molkalmoru taluk was lower at 9.8 (±1.4) g% compared to that of 11.3 (±1.6) in Kollegal and 11.4 (±1.5) in Aurad taluks; this was statistically significant.

Table 2 shows the bivariate analysis of factors associated with hemoglobin values in these women. The residents in Mulkalmoru taluk, lower education (not completed 8 years of schooling), inadequate consumption of iron and folic acid (IFA) tablets (<100 during pregnancy) and home deliveries were found to be associated with a lower hemoglobin value.

Educational status (≥8 years of schooling) and IFA consumption (≥100 tablets) were found to be statistically significant predictors of hemoglobin value in multivariate regression analysis. However, they explained only about 4% of the variation in Hb values (Table 3).

Discussion

Iron deficiency is the most common and widespread nutritional disorder in the world. Two billion people—over 30% of the world's population—are anemic, many due to iron deficiency, and in resource-poor areas, this is frequently exacerbated by infectious diseases. Nutritional iron deficiency is the most common deficiency disorder in the world, affecting about two billion people worldwide. This deficiency is severe enough to cause anemia in half of them globally. Women of child-bearing age and children are identified as the most vulnerable subgroups.

Agarwal et al.[11] in an earlier study, during 2001–2003, reported that anemia among lactating women in India, it was found that a total of 92% of lactating women were anemic with severe anemia in 7.3%; within the subset of south Indian states of Kerala and Tamil Nadu, the prevalence was 80%. In another study in a north Indian village in Haryana, 70% of the 168 study participants were anemic (Hb < 11 g/dL) at the end of 6 weeks postpartum.[12]

In Vietnam, of 901 women surveyed [281 PW, 348 PPW (women up to 6 months postpartum) and 272 NPW of reproductive age], more PPW had anemia (62%) than NPW (54%) and PW (53%).[13] Even in industrialized countries, postpartum anemia is not uncommon. The prevalence of postpartum anemia was found to be 27% among low-income women in the USA; it was higher among minority women, reaching 48% among black women at 4–26 weeks postpartum.[14] The major causes of postpartum anemia are antepartum anemia combined with acute anemia due to blood losses during parturition and postpartum hemorrhage.[15]

Our study has also identified educational status and regular consumption of IFA tablets to be significant predictors of hemoglobin values among these rural women. In the study in Vietnam, factors associated with anemia in NPW were ethnicity, education, and age.[13] Importance of woman's educational status as a determinant of anemia is well known.[16]

IFA supplementation during pregnancy and presumptive deworming treatment is established in programs usually delivered through ANC services.[17] However, in our study, we found that while coverage of IFA tablets was about 80%, only 70% of women had ≥3 ANC visits with the attendant opportunities for clinical care and counseling. Further, only 30% of women receiving IFA consumed them for ≥100 days during pregnancy; in effect, overall adherence with adequate IFA consumption was only 20% for all these women during their pregnancy. These have been identified as key implementation issues in large-scale nutrition programs—with ANC coverage, ensuring availability of tablets, and improving adherence being critical factors responsible for the success of programs.[18,19] In addition, programs pay less attention to regional variations in dietary intake, bioavailability of iron, inhibitors in diet, identification and counseling

Table 2: Socioeconomic and clinical correlates of hemoglobin in mothers, 2010

Characteristic	Hemoglobin Mean (±S.D)	Test of significance *t*-test/F-test; df *p*-Value
Taluk		
Kollegal (*n* = 215)	11.4 (±1.5)	10.3; 2
Molkalmoru (*n* = 220)	10.8 (±1.8)	<0.001
Aurad (*n* = 212)	11.3 (±1.6)	
Age		
15–19 (*n* = 65)	11.1 (±1.8)	0.2; 2
20–29 (*n* = 532)	11.2 (±1.6)	0.84
≥30 (*n* = 50)	11.3 (±1.7)	
Education		
<8 years complete (*n* = 424)	10.9 (±1.7)	20.8; 1
≥8 years complete (*n* = 223)	11.6 (±1.6)	<0.001
Socioeconomic status		
Below poverty line (*n* = 505)	11.1 (±1.6)	3.4; 1
Above poverty line (*n* = 142)	11.4 (±1.6)	0.07
No. of children		
1–2 (*n* = 488)	11.2 (±1.6)	0.3; 2
3–4 (*n* = 141)	11.1 (±1.7)	0.74
≥5 (*n* = 17)	11.1 (±1.6)	
ANC coverage		
1–2 visits (*n* = 108)	11.2 (±1.8)	0.02; 1
≥3 (*n* = 470)	11.2 (±1.6)	0.90
IFA tablets – coverage		
Yes (*n* = 518)	11.2 (±1.7)	0.21; 1
No (*n* = 127)	11.1 (±1.5)	0.65
IFA tablets – adherence (*n* = 484)		
<100 tablets (*n* = 345)	11.1 (±1.8)	6.0; 1
≥100 tablets (*n* = 139)	11.5 (±1.6)	0.02*
De-worming tablets		
Yes (*n* = 69)	11.1 (±1.7)	0.32; 1
No (*n* = 576)	11.2 (±1.6)	0.58
Footwear use		
Always (*n* =)	11.2 (±1.7)	0.16; 1
Never/occasionally (*n* =)	11.1 (±1.5)	0.69
Place of delivery		
Home (*n* = 177)	10.9 (±1.7)	8.2; 1
Health facility (*n* = 4 69)	11.3 (±1.6)	0.004

Table 3: Multivariate linear regression of determinants of hemoglobin in mothers

Model	Unstandardized coefficients B	Standard error	*t*-value	Significance *p*-value
1				
Constant	10.4	0.2	47.2	<0.001
Educational status	0.6	0.2	3.9	<0.001
2				
Constant	10.0	0.3	34.3	<0.001
Educational status	0.6	0.2	3.7	<0.001
IFA consumption	0.4	0.2	2.2	<0.03

of vulnerable groups, and tailoring of prescribed supplementation to the individual's needs.

Anemia has also been associated with diminished work performance in settings where physical labor is common[20] and to a lesser extent, suboptimal cognition.[21] These may be subtle, rarely being the reason for women to seek medical attention; their functional outcomes, however, have serious socioeconomic and behavioral consequences.

Where the population prevalence of anemia is high, along with regular IFA supplementation initiatives, there should be a specific component of continued IFA supplementation for the first 3 months postdelivery. In such NPW, there should not only be advice to the woman to continue the prophylaxis for the first 3 months of the postpartum period,[22] but routine supplementation for postpartum women should be incorporated into national IFA supplementation program.

Identification of this extended period of a woman's life when she is anemic offers an additional window of opportunity to improve the nutritional status of women before or after a pregnancy. This will help boost the lifetime well-being of the woman and weaken the intergenerational cycle of poor nutrition. In addition, a focus on malnutrition should inevitably involve a focus on individuals who are socially disadvantaged and especially vulnerable to risk. This will help contribute to the achievement of several Millennium Development Goals[4] in similar settings.

The strength of the study is that it is a community-based study with a standard method used to estimate hemoglobin done in poor performing districts of Karnataka. The study shows evidence regarding the prevalence of anemia even among lactating mothers and the necessity of continuing iron supplementation in them. The main limitation of the study has been the lack of assessment of actual dietary iron intake among the mothers, which would have given an actual link between dietary insufficiency and anemia. This probably can serve as a basis for further research in this area.

Conclusion

Prevalence of anemia among women aged 15–40 years was more than 60% in all the three surveyed taluks. In Molkalmoru taluk, severe anemia was three times higher (4.2%) as compared to other two surveyed taluks. Coincidentally women in this taluk had lower educational status and home deliveries were relatively common here along with lower levels of IFA consumption.

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