

High prevalence of anemia among postnatal mothers in Urban Puducherry: A community-based study

Ramya Selvaraj¹, Jayalakshmy Ramakrishnan², Swaroop Kumar Sahu²,
Sitanshu Sekhar Kar², Karthik Balajee Laksham¹, K. C. Premarajan²,
Gautam Roy²

¹Department of Community Medicine, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Karaikal, ²Department of Preventive and Social Medicine, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India

ABSTRACT

Background: Anemia is a common problem across all life stages and ages with a higher burden among women. The postnatal period is an often-neglected period for the provision of effective care to the mothers. Anemia burden is also high during this period, which leads to many morbidities and poor quality of life. **Methods:** A community-based cross-sectional study was done in the field practice area of two Urban Primary Health Centres (PHCs) in Puducherry between March 2015 and February 2016. A total of 227 postnatal mothers were selected by simple random sampling from the list of mothers delivered from the field practice area. House visit was done within 4 weeks of completion of their postnatal period. Socio-demographic details and third-trimester hemoglobin levels were collected using a pretested questionnaire. Hemoglobin level during post-partum was measured using Sahli's Hemoglobinometer. Paired t-test is done to assess the difference in hemoglobin antepartum and post-partum. Multiple Logistic Regression is done to identify factors associated with postpartum anemia. **Results:** The mean (SD) hemoglobin during postpartum was 10.95 (1.1) gm% ranging from 7.4 gm% to 13.8 gm%. The prevalence of anemia among postnatal mothers is 76.2% (n = 173, 95% CI: 70.4%-81.4%). Around 26% (59) had mild anemia, 49.8% (113) had moderate anemia and 0.4% (1) had severe anemia. One-fourth of the mothers who had a normal hemoglobin level in their third trimester had developed anemia in the postnatal period. There was a significant difference in mean hemoglobin during postpartum and that of third trimester (10.95 vs 10.69 gm%, $t = 3.4$, $df = 226$, $P = 0.001$). Birth order of two or more is significantly associated with postpartum anemia (aOR 2.2, 95% CI: 1.07-4.39). **Conclusions:** The prevalence of anemia among postnatal mothers is high. Routine hemoglobin estimation, advice on consumption of iron-rich foods and Iron and Folic Acid (IFA) supplementation have to be provided to postnatal mothers to improve this situation.

Keywords: Anemia, iron and folic acid supplementation, postnatal mother

Introduction

The postnatal period is a critical transitional phase for both the mother and the newborn. Anemia during the postnatal period is a major public health problem worldwide.^[1] Postpartum anemia alters

Address for correspondence: Dr. Jayalakshmy Ramakrishnan, Department of Preventive and Social Medicine, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry - 609 602, India. E-mail: medico.jay@gmail.com

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the emotion and cognition and is also associated with postpartum depression.^[2,3] It also plays an important role in decreased milk production and immunity.^[4] Women with postpartum anemia are at increased risk of venous thromboembolism and endometritis.^[5,6] Studies have shown that antenatal anemia and postpartum hemorrhage (PPH) are the greatest risk factors for postpartum anemia.^[1,7] Women who undergo cesarean section are at risk of postpartum anemia because of their higher risk of developing PPH than women undergoing normal delivery.^[8,9] In a

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study from South India, postpartum anemia is the most common morbidity in women undergoing cesarean section.^[10]

In India, more emphasis and vigilance is given to the antenatal period. However, the postnatal period is often neglected especially with regards to the health of the mother. The entire focus of the family and the health system shifts to the newborn once the mother delivers the baby. Although there is enough published literature on the burden of anemia, studies on postnatal anemia are limited. A community-based study in Rajasthan has found that the most common maternal morbidity in the early postpartum period is anemia.^[11] National surveys like the District Level Household and Facility Survey-4 (DLHS-4) and National Family Health Survey-4 (NFHS-4) have not measured the hemoglobin levels of mothers in their postnatal period.^[12,13] We conducted this study to estimate the prevalence of anemia among postnatal mothers and to identify its determinants.

Methods

We conducted a community-based cross-sectional study in Puducherry, a coastal town in South India. Puducherry has a population of 1.1 million with a sex ratio of 943 and 100% institutional deliveries. Health services are catered by 27 Primary Health Centres, 54 Health Sub-centres, two Community Health Centres and two District hospitals along with Medical colleges.^[14] Under the National Health Mission (NHM), all pregnant women are registered and provided Antenatal Care along with 100 Iron and Folic Acid (IFA) Tablets. Among the 27 Primary Health Centres (PHCs) in Puducherry, 12 are urban and 15 are rural.^[15] The PHCs catering to a population of 30,000 and above and located in the urban region were included. Among the five eligible PHCs, two were selected randomly. Women aged 18 years and above, and who had registered for antenatal care in the two selected PHCs, and completed 6 weeks after delivery, residing in the service area were included. Eligible women who could not be contacted within 4 weeks of completion of their postnatal period were excluded. Postnatal anemia is defined as hemoglobin less than 12 gm% at the end of 6 weeks of delivery.^[1] The World Health Organization has classified the hemoglobin level of 11.0%-11.9 gm% as mild, 8.0-10.9 gm% as moderate and less than 8.0 gm% as severe anemia in non-pregnant women.^[16] The study was conducted between 1 March 2015 and 29 February 2016. Considering the prevalence of postnatal anemia as 26.5%,^[17] with an absolute precision of 6% and 10% non-response rate, the estimated sample size was 227 using OpenEpi software version 2.3.^[18]

An eligible list of mothers from the respective PHCs was prepared every month during the study period. Simple random sampling was done to select the proportionate sample of mothers to be covered from the respective PHC for that month. The contact details were collected from the Mother and Child Tracking Card (MCTC). At the end of 6 weeks postpartum, mothers were contacted over phone and their availability in the service area confirmed. House visit was done and participants

interviewed after obtaining informed consent. A pre-tested semi-structured proforma was used to obtain information on socio-demographic characteristics such as age, education, place of residence, religion, occupation, family type, total family members, monthly family income, and comorbidities. Hemoglobin was measured using Sahli's Acid Hematin method.^[19] The principal investigator received the training in this technique and measured the hemoglobin of the participants once during the house visit. The study protocol was approved by the Institute Ethics Committee (Human studies) of JIPMER. Permission from the Deputy Director of Public Health (DDPH), Puducherry and the respective Medical Officer In-charge of the two PHCs was obtained. Informed written consent from the study participants was obtained after explaining the details of the study and its implications. Mothers identified to be anemic were referred to their respective PHC. Mothers and newborn having any health problems were referred to respective PHC for appropriate treatment. All participants were advised to take iron-rich foods and continue IFA tablets.

Statistical methods

Data were entered using EpiData^[20] version 3.1 (EpiData Association, Odense, Denmark) and analysed using IBM SPSS version 20 for Windows.^[21] Continuous variables such as age and hemoglobin were summarised as mean and standard deviation (SD); and categorical variables such as education, occupation, family type, socio-economic status, parity, comorbidities, delivery type and IFA consumption as percentage. The mean hemoglobin concentration during the last trimester and postpartum period were compared using a paired t-test. Univariate analysis of factors associated with postpartum anemia was done using the Chi-square test and a $P < 0.05$ is considered significant. Multivariate analysis was done using Multiple Logistic Regression and all important predictors of postnatal anemia as determined from previous studies such as age, education, socio-economic status, parity, anemia in third trimester and type of delivery were included in the model.

Results

We examined 227 postnatal mothers of which 123 (53.9%) were from the first PHC and 104 (45.6%) from the second PHC. The mean (SD) age of the participants was 26.5 (4.6) years and ranged between 19 and 42 years. The socio-demographic details of the participants are given in Table 1. Most of them had an education above primary schooling (90%) and were homemakers (91.6%). More than half (58.1%) belonged to lower socio-economic status. All the mothers had institutional delivery (100%) and the majority (87.7%) delivered in a Government institution. Around one-third (30.4%) were delivered by Lower Segment Cesarean Section. Gestational Diabetes Mellitus (12.7%) and Pregnancy-induced Hypertension (9.2%) were notable co-morbidities observed during the antenatal period.

The mean (SD) hemoglobin at third trimester was 10.69 (1.08) gm% and two-thirds (63.9%) had anemia during the

Table 1: Socio-demographic characteristics of postnatal mothers in Urban Puducherry, 2016 (n=227)

Characteristic	Frequency	Percentage
Age in years		
19-24	83	36.6
25-30	102	44.9
31-36	36	15.9
37-42	6	2.6
Educational status*		
No formal schooling	4	1.8
Primary	11	4.8
Middle and High	65	28.7
Higher Secondary	48	21.1
Bachelors	76	33.5
Masters	23	10.1
Employment status		
Homemaker	208	91.6
Employed [§]	19	8.4
Religion		
Hindu	201	88.5
Christian	17	7.5
Muslim	9	4.0
Family type		
Joint	125	55.1
Nuclear	102	44.9
Socio-economic class [†]		
Class I (>5571)	32	14.1
Class II (2786-5570)	63	27.8
Class III (1671-2785)	50	22.0
Class IV (836-1670)	62	27.3
Class V (<836)	20	8.8
Total	227	100

*International Standard Classification of Education by UNESCO, 2011. [§]Housekeeping, Teacher/Lecturer/Professor, Engineer, Software developer, Tailor, Dance teacher, Staff nurse, Graphic designer. [†]Updated Modified Prasad classification 2014^[5]

third trimester. The mean (SD) hemoglobin during postpartum was 10.95 (1.1) gm% ranging from 7.4 to 13.8 gm%. The mean rise in the hemoglobin is 0.25 gm% (95% CI: 0.10-0.40) and this is statistically significant (t = 3.4, df 226, P = 0.001). The prevalence of anemia among postnatal mothers was 76.2% (n = 173, 95% CI: 70.4%-81.4%). In all, 26% (59) had mild anemia, 49.8% (113) had moderate anemia and 0.4% (1) had severe anemia [Table 2]. Half the mothers (115) who had anemia in the last trimester (Hb <11 gm%) continued to have postnatal anemia (Hb <12 gm%). One-fourth of the mothers who had normal hemoglobin levels during the third trimester had developed anemia in their postnatal period.

Following delivery, 82% (186) of the mothers were given IFA tablets at the respective health facility. Among the mothers who had received postnatal IFA supplementation, one-fourth had received the tablets for 1 month and 15% (34) received for 3 months. Univariate analysis of factors associated with postpartum anemia showed that birth order of two or more was significantly associated with postpartum anemia [Table 3]. Along with parity, other clinically important factors such as delivery type, education, anemia in the third trimester, age and socio-economic status were

Table 2: Postnatal anemia status of the study participants (n=227)

ANEMIA STATUS (Hb in gm %)	FREQUENCY	PERCENTAGE
No anemia (≥12.0)	54	23.8
Mild (11.0-11.9)	59	26.0
Moderate (8.0-10.9)	113	49.8
Severe (<8.0)	1	0.4
TOTAL	227	100

entered into a Logistic Regression Model [Table 4]. Birth order of two or more was significantly associated with postpartum anemia (aOR 2.2, 95% CI: 1.07-4.39).

Discussion

In India, the prevalence of postnatal anemia is estimated at 65%^[22] and it ranged from 26.5% in a rural area of coastal Karnataka^[23] to 94.6% in a rural area of Rajasthan.^[11] In our study, the prevalence is 76.2% which is higher than the national average. Studies in other developing countries have shown that the prevalence varies from 50% to 80%.^[1,24,25] The huge variation in the prevalence may be due to the difference in the time of estimation following delivery and the method used for the estimation of hemoglobin. High prevalence of postpartum anemia highlights the fact that it is a major public health problem.

Our study has identified birth order as a significant factor associated with postpartum anemia which can be addressed by strengthening family welfare services. Half of the mothers who had antenatal anemia in the third trimester continued to have postnatal anemia. One-fourth of the mothers who had normal hemoglobin level in their third trimester had developed anemia in the postnatal period similar to the findings from other studies.^[26,27] These findings have a major policy implication in providing maternal care services. Mothers with antenatal anemia need to be vigilantly followed up during postnatal period for anemia. There is a need to routinely examine the hemoglobin levels during the postnatal check-ups at the health facility or during the home visit by the health worker. The Centres for Disease Control and Prevention (CDC) has also recommended screening for postnatal anemia in all women with antenatal anemia.^[28] The World Health Organisation recommends that IFA supplementation should be provided for at least three months after delivery.^[29] Postpartum iron supplementation should begin as early as possible after delivery.^[30] However, there is a lack of emphasis on the importance of postnatal IFA supplementation and poor implementation of this service provision at the health facility. Health workers can be trained to identify anemia clinically among postnatal mothers during their house visits and to give counseling regarding the importance of consuming iron-rich foods and IFA tablets. The mothers should be counseled adequately to collect the IFA tablets from their respective PHCs. Pill count method can be employed at the PHC level along with monitoring of the hemoglobin level of the mothers during their visit for immunization of their babies.

Table 3: Univariate analysis of factors associated with anemia at 6 weeks postpartum (n=227)

Characteristic	Categories	Anemia (%)	No anemia (%)	Chi-square value	P
Age of mothers (years)	19-24	64 (77.1)	19 (22.9)	0.371	0.94
	25-30	78 (76.5)	24 (23.5)		
	31-36	27 (75.0)	9 (25.0)		
	37-42	4 (66.7)	2 (33.3)		
Education	≤10 th	64 (80.0)	16 (20.0)	0.98	0.32
	>10 th	109 (74.1)	38 (25.9)		
Employment	Homemaker	159 (76.1)	50 (23.9)	0.03	0.87
	Employed	14 (77.8)	4 (22.2)		
Family Type	Joint/Three Generation	91 (72.8)	34 (27.2)	1.79	0.18
	Nuclear	82 (80.4)	20 (19.6)		
Socio Economic Status	Class I-III	110 (75.9)	35 (24.1)	0.03	0.87
	Class IV-V	63 (76.8)	19 (23.2)		
Parity	Primi	72 (69.9)	31 (30.1)	4.14	0.04
	≥2 nd	101 (81.5)	23 (18.5)		
Delivery Type	Normal	118 (74.7)	40 (25.3)	0.67	0.41
	LSCS	55 (79.7)	14 (20.3)		
IFA Tablets consumed in antenatal period	<100	166 (76.5)	51 (23.5)	Fisher's Exact test	0.71
	≥100	7 (70.0)	3 (30.0)		
Anemia in third Trimester	<11 gm% ^o	115 (79.3)	30 (20.7)	2.13	0.15
	≥11 gm% ^o	58 (70.7)	24 (29.3)		
IFA tablets consumed in Postpartum Period	<30	165 (76.7)	50 (23.3)	0.64	0.43

Table 4: Logistic regression model for factors associated with postpartum anemia (n=227)

Factor	Adjusted OR	95% CI
Delivery Type (LSCS)	0.74	0.36-1.52
Education (>10 th)	0.74	0.36-1.5
Anemia in third trimester	0.71	0.37-1.35
Parity (≥second)	2.2	1.07-4.39*
Age	0.30	0.05-2.05
25-30		
31-36	0.42	0.07-2.70
37-42	0.54	0.08-3.70
Socio Economic Status (Class IV-V)	1.21	0.35-4.13

*Statistically significant (p<0.05)

Sahli's method is cheap, less time consuming, more convenient and easy to perform. Therefore, it is a better alternative for field-based studies in resource constraint setting.^[31] This method has a sensitivity of 83.7% and specificity of 63.2% for capillary blood.^[32] It is comparable to the Drabkin's Cyanmethemoglobin method by finger prick as well as venepuncture method.^[33] The hemocue portable photometer is expensive when compared to Sahli's Hemoglobinometer. Health workers can be trained in estimating hemoglobin of postnatal mothers using Sahli's Hemoglobinometer. Primary care physicians need to be sensitized on the burden of postpartum anemia and the importance of screening for it in their clinics. Opportunistic screening can be done to all postpartum women approaching a physician for any illness or for vaccination of their babies.

The strengths of this study are that this is the first community-based study in Puducherry to estimate the burden of postnatal anemia. A single investigator did the hemoglobin estimation and interviewed the participants. Epidata software enabled to carry

out an error free data entry procedure. The enrolment of study participants within 4 weeks of completion of their postnatal period helped to reduce the recall bias.

Conclusion

The prevalence of anemia among postnatal mothers is high. Routine hemoglobin estimation and advice on consumption of iron-rich foods and IFA supplementation need to be provided to postnatal mothers to improve this situation.

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Conflicts of interest

There are no conflicts of interest.

Ethical approval

Approval was received from Post-Graduate Research Monitoring Committee and the Institute Ethics Sub-Committee (Human studies) of JIPMER.

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