

PERCEPTION TOWARDS ANEMIA AND ESTIMATION OF HEMOGLOBIN LEVELS: A COMPARATIVE STUDY ON ADOLESCENT AND YOUNG ADULT MOTHERS

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ABSTRACT

Purpose was to understand the perception of adolescent and young adult mothers towards anaemia. Furthermore, we compared the hemoglobin level between these two groups of mothers. Additionally, we attempted to find out the association of hemoglobin level with socio-demographic, reproductive and anthropometric characteristics. The study involved 87 Bengali speaking rural living Muslim mothers (adolescent = 68 and young adult = 19) following the inclusion criteria- aged 15-25 years, neither pregnant nor lactating, and had at least one surviving child at the time of interview. The study was conducted in the rural areas of Howrah and South 24 Paraganas, West Bengal, India. Initially, perceptions about anemia along with other socio-demographic and reproductive characteristics were recorded using pre-tested schedules. Later, hemoglobin level and anthropometric characteristics were measured following standard protocols. Results showed that young adult mothers had better perception regarding anemia than adolescent counterparts. Hemoglobin level failed to differ significantly between these two groups of mothers. Multivariate analysis showed that the independent variables failed to show significant association with hemoglobin level. Thus, we conclude that both adolescent and young mothers had reduced hemoglobin level. The young adult mothers despite having an improved perception towards anemia than adolescent mothers, failed to show elevated hemoglobin level compared to its counterpart. This probably indicates that at least for these study groups, the perception towards anemia did not determine the hemoglobin level.

Key words: Hemoglobin levels, perceptions towards anemia, adolescent mothers, young adult mothers, Muslim, West Bengal.

INTRODUCTION

World Health Organization (2011) suggests that hemoglobin concentration below the recommended reference level denotes the occurrence of anemia. It is estimated

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that about 1.62 billion people in the world suffer from this chronic illness; pre-school children, adolescent girls (47.4%), and pregnant women (41.8%) of developing countries are more susceptible to iron deficiency anemia than adult men (12.7%) (Pasricha, 2014; WHO, 2008). In South-East Asia, a large number of women from Thailand (13.4%), Bangladesh (74%), Nepal (63%), Sri Lanka (58%), Indonesia (51%) and India (87%) are reported to be anemic (Capoor and Gade, 2000; IIPS and ORC Macro, 2007).

Data from National Nutrition Monitoring Bureau (NNMB, 2002), Indian Council of Medical Research (ICMR, 2004) and District Level Household Survey (DLHS, 2006) show high prevalence of anemia among females during the infancy, adolescence, pregnancy and lactation periods in several states of India. Furthermore, data from NFHS-III (2005-2006) reveals that the cases of anemia are predominantly higher among married women living in Assam (72%), Haryana (69.7%) and Jharkhand (68.4%) (IIPS and ORC Macro, 2007).

Literature shows that socio-demographic (age, educational levels, area of living, ethnicity, family income) and reproductive characteristics (ages at menarche, early marriages, first child birth, parity, spontaneous abortion, miscarriage, low birth weight of neonates, perinatal death, and maternal mortality), and lifestyle differentials (food consumption and physical activities) are responsible for lowering the amount of hemoglobin in women along with other genetic factors (Beard, 2005, IIPS and ORC Macro, 2007, Finberg *et al.*, 2008; Bharati *et al.* 2009; Chellan and Paul, 2010; De Falco *et al.*, 2013; Sukrat *et al.*, 2010; Hanafi *et al.*, 2013). It is found that poor knowledge of iron supplementation and misperception about anemia are closely associated with the reduced level of hemoglobin (Bentley and Griffiths, 2003; Jarrah *et al.*, 2007; M'Cormack and Drolet, 2012) that consequently impairs the physical health (reduced energy, low capacity of work, poor concentration, amenorrhea, chronic illness) of women during their reproductive age (Pala and Dundar, 2008).

Like other developing countries, in India, the incidence of early marriage followed by early child birth, subsequent pregnancies and nutritional deficiency increase the risk of anemia among adolescent girls and young adult women of lower socio-economic group (Banerjee *et al.*, 2009; Ahmad *et al.*, 2010; Kulkarni *et al.*, 2012; Sinha and Haldar, 2015). It was hypothesized that the difference in age between adolescent and young adult mothers possibly makes a gap in their perception and knowledge about anemia that finally impinges on their hemoglobin levels. Thus, we attempted to understand the perception towards anemia among both adolescent mothers and young adult mothers. Later, we compared the hemoglobin level between these two groups of mothers. Additionally, we aimed to find out the association of hemoglobin level with socio-demographic, reproductive and anthropometric characteristics of these mothers.

MATERIALS AND METHODS

Study area

The present study was conducted in the rural areas of the district of Howrah and South 24 Paraganas of the state of West Bengal, India. These two districts are located in the eastern part of India: (a) Howrah, the second smallest district of West Bengal, situated in the west of the city of Kolkata (i.e. the state capital of West Bengal); (b) the district of South 24 Paraganas is the largest district of West Bengal, situated between the urban fringe of Kolkata in the north and the Bay of Bengal in the south. In Howrah, we selected two villages namely, Gorbagan and Jujersaha from two Community Development Blocks 'Domjur' and 'Panchla' respectively. The Block 'Domjur' is the part of rural agglomerate of Howrah Sadar Subdivision. The Block 'Panchla' is under the jurisdiction of Uluberia Subdivision of Howrah district. In South 24 Paraganas, we selected two villages namely, Doulatabad and Gazipur under the Community Development Block 'Kulpi'. The Block 'Kulpi' is under the jurisdiction of Diamond Harbour Subdivision. All these villages were selected for operational convenience.

Study participants

A total number of 142 mothers (presently aged 15-25 years) belonging to Bengali speaking Muslim ethnic group were initially enlisted from the study area. The lists of these mothers were provided by the staff members of respective Primary Health Centers (PHC) of the selected villages. We conducted a door to door survey approaching each of these mothers to participate in this study. Only 87 mothers were finally recruited based on the following inclusion criteria (i.e. they were neither pregnant nor lactating at the time of interview, and had at least one surviving child); 68 individuals belonged to the adolescent group and 19 individuals from young adult group. Following the definition provided by World Health Organization (1999), the study participants aged up to 19 years were considered as adolescent and those aged beyond 19 years but less than 25 years were considered as young adults. All the young adult mothers had their first conception and/or first childbirth after the age of 19 years. Similarly, all the mothers of adolescent group experienced their first conception and/or child birth below 19 years of age. The participation rate was low among the young adult mothers, because the time of field work coincided with the period of *Ramzan* festival of the Muslims. A total of 55 individuals were excluded as they declined to participate (n=29), were pregnant (n=14), at menstrual discharge stage (n=2), remained unavailable (n=6) and practicing exclusive breastfeeding (n=4) at the time of interview. The study was conducted during the time period of April to July, 2015.

Data types

Initially, the participants were interviewed for their socio-demographic, reproductive and menstrual characteristics, and perceptions about anemia using

pretested structured schedules. The face-to-face interview was conducted by a same sex interviewer (AS). Later, hemoglobin levels and anthropometric characteristics were measured for each of the participants.

Socio-demographic and reproductive characteristics

Data on socio-demographic characteristics include age of the participants at the time of interview, educational levels and occupational types of both the participants and their husbands, monthly household income. Age of the participants at the time of interview was taken in completed years.

Reproductive and menstrual characteristics including ages at menarche, marriage, first conception and first childbirth; number of conceptions, live births and fetal loss; gestational length of the last pregnancy and birth weight of the last child; menstrual cycle length and nature of menstrual discharge; adoption of family planning practices and ever use of oral contraceptives were recorded. The age at menarche was ascertained by asking the participants to recall actual date of the incident, if not, then the nearest month. A few of the participants could recall their age at menarche by referring some landmark event (any specific festivals) or any eventful personal moments (like, her own birthday), which occurred around the time of menarche. The participants were asked to report their menstrual cycle length prior to the date of interview. However, data on the nature of menstrual discharge were collected for the last three months period prior to the date of interview in order to avoid recall lapse. Ages at marriage, first conception and first child birth were further cross checked by asking their husbands and /or mothers. Participants were also asked to report whether they adopt any family planning measures during the period of conjugal life. Furthermore, information about duration of family planning practices (in months) and ever use of oral contraceptives were also collected.

Perception towards anemia

Perceptions were recorded by asking the participants about the probable causes, symptoms and preventive measures of anemia and groups susceptible to anemia. Further, they were also asked to state about their perceptions of how the incidence of anemia impairs menstrual health, health of mothers and fetus during pregnancy, and health of mothers and child during lactation.

Hemoglobin level

We measured the hemoglobin level (g/dl) of the participants. Blood specimens were drawn from the tip of the second finger of the left hand of all the participants and analyzed using a portable HemoCue (Hb 201+ system). Following the classification of World Health Organization (2011), the incidence of anemia was determined with the hemoglobin level below 12 g/dl in non-pregnant women above 15 years.

Anthropometric measurements

Anthropometric measures were taken following standard protocols (Lohman *et al.*, 1988). Waist circumference (WC), hip circumference (HC) and mid upper arm circumference (MUAC) were measured to the nearest of 0.1 cm with a non-stretchable fiber glass insertion tape over light clothing. WC was measured at the minimum circumference of torso between the iliac crest and the rib cage. HC was measured horizontally at the level of maximum extension of the buttocks. MUAC was measured at the right upper arm in the midway between the point of acromion and olecranon process while the arm was hanging relaxed. Anthropometric index like, waist-hip ratio (WHR) was calculated following the standard formula [WHR= waist circumference (cm)/ hip circumference (cm)].

Statistical analyses

Descriptive statistics were applied to find out the distribution of socio-demographic, reproductive and menstrual characteristics, and perceptions about anemia among both adolescent and young adult mothers. Student's t-test was conducted to compare the hemoglobin level and anthropometric characteristics between these two groups of mothers. Multiple linear regression analysis (enter method) was computed to find out the factors affecting the hemoglobin level of these mothers. In this analysis, the hemoglobin level was included as the dependent variable; while, the socio-demographic (age of the participants at the time of interview, educational levels of both spouse, working status of self, occupational types of husbands and monthly household income), reproductive (ages at menarche, marriage, first conception, total number of conception, gestational length of the last child and ever use of oral contraceptives) and anthropometric (WHR and MUAC) variables were incorporated as the independent variables. Variables like, educational levels of both spouse, working status of self and occupational types of husbands, and ever use of oral contraceptives were categorical, thus converted into dummy variables. Data were analyzed with the help of Statistical Package for Social Science software version 20.0 (IBM Corporation 2011).

RESULTS

Socio-demographic and reproductive characteristics

Table 1 describes socio-demographic, reproductive and menstrual characteristics of the participants. Adolescent mothers and young adult mothers differed significantly with respect to the mean age at the time of interview. Young adult mothers and their husbands mostly attained education up to 12th standard. Most of the adolescent mothers were working; their husbands were mostly skilled manual labors. Mean monthly household income failed to differ significantly between these two groups of mothers. Chi square test indicates that educational levels of both spouses, working status of self and occupational types of husbands significantly differed between adolescent and young adult mothers.

Reproductive and menstrual characteristics show that mean ages at marriage and first conception, and birth weight of the last child differed significantly between the adolescent mothers and young adult mothers. However, mean age at menarche, duration of menstrual discharge, length of menstrual cycle and the gestational length of the last pregnancy failed to differ significantly between these two groups. About 60% of adolescent mothers reported scanty menstrual discharge while less than half of young adult mothers reported normal menstrual discharge. Majority of mothers from both groups conceived once, had one live birth and never experienced fetal loss. There remained no significant difference with respect to the nature of menstrual discharge; and total number of conceptions, live births and fetal loss between these two groups of mothers. Further, it is observed that adoption of family planning measures and ever use of oral contraceptives differed significantly between adolescent and young adult mothers. An appreciable section of the adolescent mothers adopted family planning measures (70.6%) and reported to have used oral contraceptives (66.2%) more frequently than young adult mothers.

Table 2 shows that a substantial proportion of adolescent mothers were acquainted with the probable causes (66.2%), symptoms (67.6%) and the preventive measures (91.2%) of anemia. Likewise, most of the young adult mothers (89.5%) were able to recognize the possible symptoms and preventive measures of anemia. Furthermore, young adult mothers perceived how anemia affects menstrual health and also the health of both fetus/neonates and mothers during pregnancy and lactation.

Perceptions towards anemia

Table 3 describes the perceptions of the participants about the probable causes, symptoms, susceptibility and the preventive measures of anemia. More than 40% of adolescent mothers perceived that anemia occurred due to severe blood loss during menstruation and poor dietary habits. Other factors cited by this group were , childbirth at an early age (36.8%) and at frequent interval (35.3%), and low birth spacing (26.5%). Young adult mothers also perceived that low birth spacing (78.9%), poor dietary habits (78.9%), childbirth at frequent interval (63.2%) and at an early age (57.9%), severe blood loss during menstruation (52.6%), and malaria (31.6%) were the probable causes of anemia.

It is further observed that a large number of young adult mothers perceived weakness (84.2%), paleness (78.9%), dizziness (73.7%) and weight loss (52.6%) as the symptoms of anemia. On the other hand, more than 60% of adolescent mothers perceived weakness as the symptom of anemia. Both the adolescent (21.1%) and young adult mothers (36.8%) perceived that lactating mothers would be more susceptible to anemia. Most of the young adult mothers perceived that anemia could be prevented by consuming vegetables and fruits (89.5%), and milk (52.6%); iron tablet supplementation (78.9%); delaying the ages at marriage (73.7%) and first conception (84.2%); maximizing the birth space (84.2%) and reducing parity (63.2%). On the other hand, a number of adolescent mothers responded that the consumption of vegetables and fruits (86.8%), iron tablet supplementation (39.7%),

delaying the age at marriage (41.2%) and first conception (50%), maximizing the birth space (36.8%) and reducing parity (57.4%) could prevent the incidence of anemia.

Table 4 documents the perceptions of the participants about the effects of anemia on menstrual health, pregnancy, fetus, neonates and breastfeeding. A number of young adult mothers perceived that anemia could increase the chance of still birth (31.6%), preterm delivery (31.6%), low birth weight (63.2%), and recurrent health problems of neonates (68.4%); shorten the duration of breastfeeding (31.6%); lower the secretion of breast milk (57.9%); skip the menstrual cycle (47.4%); lessen the menstrual discharge (63.2%); and develop the problems of giddiness (57.9%), blurred vision (36.8%) and weakness (36.8%). Similarly, several adolescent mothers perceived that anemia could shorten the duration of breastfeeding (25%); lower the secretion of breast milk (35.3%); skip the menstrual cycle (25%); lessen the menstrual discharge (38.2%) and increase the chance of low birth weight (25%).

Hemoglobin levels and anthropometric characteristics

Table 5 shows that the hemoglobin level failed to differ significantly between adolescent mothers and young adult mothers. Mothers of both groups had the mean hemoglobin level around 10g/dl. Further to say, majority of the mothers belonging to both groups were reported to be anemic (Figure 1).

Anthropometric characteristics reveal that WC and WHR were significantly higher among young adult mothers than that of adolescent mothers. However, HC and MUAC were found to be similar between these two groups of mothers (Table 5).

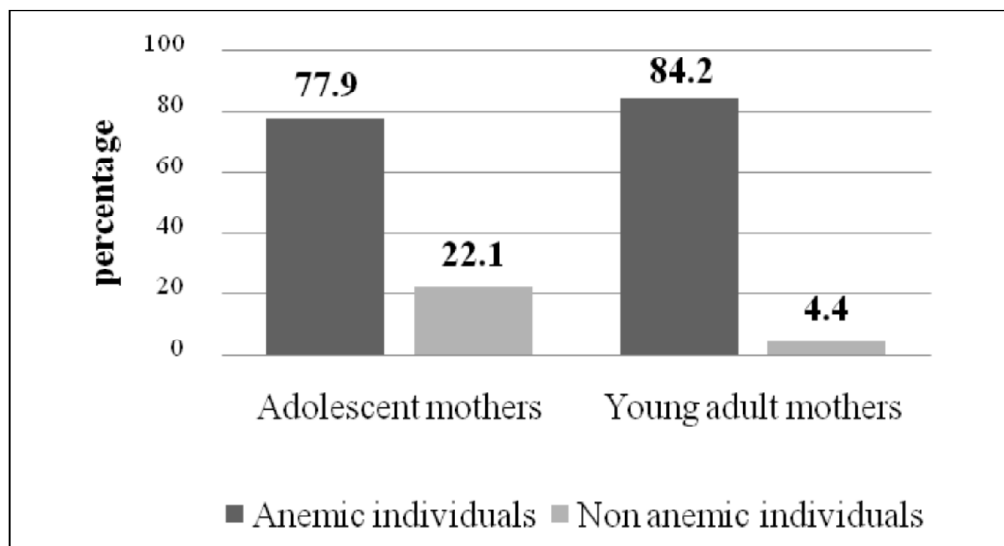


Figure 1: Incidence of anemia among adolescent and young adult mothers

Multivariate analyses

Table 6 describes the results of multiple linear regression analysis. It is observed that all the independent variables failed to show significant association with hemoglobin level. However, the unstandardized coefficients indicate the trend of relationship of the hemoglobin level with its associated factors. For example age of the participants at the time of interview, educational levels of spouses (below 5th standard), working status of the self, occupational types of husbands (small scale business), ages at menarche and first conception, total number of conception, and ever use of oral contraceptives were inversely associated with the hemoglobin level. On the other hand, monthly household income, WHR and MUAC were positively associated with the hemoglobin level, thereby indicating that the hemoglobin level was likely to be lower with decrease in monthly household income, WHR and MUAC.

DISCUSSION

Initially, we attempted to record the perception of both adolescent mothers and young adult mothers towards anemia. Later, we compared the hemoglobin level between these two groups of mothers. Additionally, we aimed to find out the association of hemoglobin level with socio-demographic, reproductive and anthropometric characteristics of these mothers.

Results showed that most of the young adult mothers could identify the possible symptoms, causes, and preventive measures of anemia, and also about the way anemia affects menstrual characteristics and health of fetus/neonates and mothers during pregnancy and lactation. Less than half of adolescent mothers were acquainted with the probable causes, symptoms and the preventive measures of anemia. Thus, it appears that young adult mothers have a better perception towards anemia than adolescent mothers. Perhaps, increasing age developed an improved perception among young adult mothers. However, other studies conducted in several states of India (Bentley and Griffiths 2003, Bash, 2013) reported that women belonging to lower socio-economic status had poor knowledge about nutrition and they often misperceived the occurrence of anemia. Lower educational attainment possibly failed to develop the level of awareness regarding anemia among these women. The Government of India has targeted to combat the problems of anemia by providing iron supplementation to women, but they have not organized intervention programs that would impart a specialized training for women on adopting healthy foods and balanced nutrition to prevent the risk of anemia (Upadhyay *et al.*, 2011, Bash, 2013). Such intervention programs could improve the knowledge and perception about anemia and reduce its prevalence among women as found in a longitudinal study conducted in eight developing countries (Galloway *et al.*, 2002).

Our study further implied that hemoglobin level failed to differ significantly between adolescent and young adult mothers. The mean hemoglobin level of both the groups was around 10 mg/dl that is below the reference level provided by

WHO (2011). Thus, the incidence of anemia was noticeably high in both the groups. Consistent with the study findings, two other studies, independently conducted on the adolescent girls of urban slum and young adult mothers of rural areas reported that a substantial proportion of women from both the groups had reduced level of hemoglobin (Ahmad *et al.*, 2010, Kulkarni *et al.*, 2012). One comparative study conducted in rural areas of West Bengal showed that adolescent mothers had significantly lower level of hemoglobin than young adult mothers (Banerjee *et al.*, 2009). Mothers who got married during the period of adolescence and became pregnant before 20 years of age mostly suffered from severe anemia Banerjee *et al.*, 2009. Moreover, it was documented that married women of varying age were more likely to be anemic than their unmarried counterparts (IIPS and ORC Macro, 2007), thus eventually increased the rate of maternal mortality in India (MoHFW, 2013).

Earlier studies revealed that socio-economic status significantly predicted the hemoglobin level of women in developing countries (Sirdah *et al.*, 2014, 2008, Pala and Dundar, 2008, Bharati *et al.*, 2009, Alene and Dohe, 2014). However, our study failed to show any significant association between haemoglobin level and sociodemographic characteristics. It is evident that people belonging to economically poor families could not afford nutritious foods because of its expense (Ward *et al.*, 2013). Moreover, lower educational attainment was responsible for developing poor knowledge about anemia and its causes. Hence, low standard of education and family income could raise the rate of anemia among women. Our study further indicated that a reduction in the hemoglobin level was likely to occur with the increase in the age of the participants. This finding corroborates with the study conducted on a group of adolescent girls residing in rural areas of Tamil Nadu (Rajaratnam *et al.*, 2000). Heath *et al.* (2001) is of the opinion that the chance to become anaemic becomes high with increase in age because of the elevation in the volume of menstrual blood.

It was found from earlier literature that hemoglobin level became lower with increase in ages at menarche and first conception; and total number of conception. Later onset of menarche seems to be associated with poor nutritional status and subsequently reduced level of hemoglobin among adolescent girls (Brabin *et al.*, 2001, Rajaratnam *et al.*, 2000, Raghuram *et al.*, 2012, Viveki *et al.*, 2012). It seems that vaginal bleeding associated with consecutive child births and the prolonged lactating phase could increase the loss of iron and other nutrients in mothers and subsequently develops the risk of anemia. Our study further showed that hemoglobin level remained lower if mothers ever used oral contraceptives. However, a reverse trend was noticed in other study as the estrogen component contained in oral contraceptive pills suddenly elevates the hemoglobin level in women (Blum *et al.*, 1983). One of the studies conducted on women aged 15-45 years in the same region (West Bengal) showed positive association of hemoglobin level with WHR, but not with MUAC (Sinha and Halder, 2015). However, other studies implied that hemoglobin level became reduced while MUAC remained lower (Makhoul *et al.*, 2012, Alene and Dohe, 2014). Therefore, the decline in both

WHR and MUAC could result in the development of under nutrition that is indicative of the incidence of anemia. Our study indicated a similar trend of association between anthropometric traits and hemoglobin level, despite remaining non-significant.

Thus, we conclude that both adolescent and young mothers had reduced hemoglobin level. The young adult mothers despite having an improved perception towards anemia than adolescent mothers, failed to show elevated hemoglobin level compared to its counterpart. This probably indicates that at least for these study groups, the perception towards anemia did not determine the hemoglobin level. A skewed sample size of this study probably failed to identify the factors associated with low hemoglobin level. In Indian context, estimating hemoglobin levels and its concomitants for adolescent and young mothers are extremely relevant because of the sociocultural context (such as, early age at marriage and first conception) of this country. Despite some limitation inherent in the study, the authors feel that more studies should be undertaken addressing this issue, so that government can develop effective strategies to ameliorate the problem of anemia among the Indian women.

Table 1: Socio-demographic, reproductive and menstrual characteristics of the participants (n=87)

Variables	Adolescent mothers (n=68)		Young adult mothers (n=19)		t/chi square value	p value
	n	%	n	%		
Socio-demographic characteristics						
Mean age of the participants at interview (years) (\pm sd)	17.62 \pm 1.21		23.74 \pm 1.32		19.087	0.000
Educational levels of the participants						
Non-literate	33	48.5	3	15.8	17.815	0.001
Below 5 th standard	20	29.4	2	10.5		
Between 5 th and 12 th standard	15	22.1	14	73.7		
Educational levels of husbands						
Non-literate	38	55.9	1	5.3	27.135	0.000
Below 5 th standard	16	23.5	2	10.5		
Between 5 th and 12 th standard	14	20.6	16	84.2		
Working status of the participants						
Non working	9	13.2	18	94.7	46.089	0.000
Working	59	86.8	1	5.3		
Occupational types of husbands						
Skilled manual labor	67	98.5	12	63.2	22.252	0.000
Small scale business	1	1.5	7	36.8		
Mean monthly household income (in Indian rupees) (\pm sd)	6566.17 \pm 445.55		9578.94 \pm 2480.40		1.951	0.054
Reproductive and menstrual characteristics						
Mean age at menarche (years) (\pm sd)	12.72 \pm 1.24		12.95 \pm 1.26		0.700	0.486
Duration of menstrual discharge (days) (\pm sd)	3.91 \pm 1.39		4.16 \pm 1.34		0.687	0.494
Length of menstrual cycle (days) (\pm sd)	30.46 \pm 5.70		30.05 \pm 2.41		0.300	0.765
Nature of menstrual discharge						
Heavy	10	14.7	4	21.1	5.125	0.077
Normal	17	25.0	9	47.4		
Scanty	41	60.3	6	31.6		
Mean age at marriage (years) (\pm sd)	14.40 \pm 1.40		20.05 \pm 1.95		14.165	0.000
Mean age at first conception (years) (\pm sd)	15.00 \pm 1.41		21.63 \pm 1.46		17.943	0.000
Total number of conceptions						
One	41	60.3	15	78.9	-	-
Two	23	33.8	4	21.1		
More than two	4	5.9	-	-		
Total number of live births						
One	52	76.5	16	84.2	-	-
Two	13	19.1	3	15.8		
More than two	3	4.4	-	-		
Fetal loss						
Yes	10	14.7	1	0.05	3.157	0.076
No	58	85.3	18	99.95		
Gestational length of the last pregnancy (weeks) (\pm sd)	37.58 \pm 2.87		36.89 \pm 1.94		0.980	0.330
Birth weight of the last child (kg) (\pm sd)	2.40 \pm 0.63		2.87 \pm 0.41		3.053	0.003
Adoption of family planning measures						
Yes	48	70.6	8	42.1	5.253	0.022
No	20	29.4	11	57.9		
Ever use of oral contraceptives						
Yes	45	66.2	5	26.3	9.654	0.002
No	23	33.8	14	73.7		

Table 2: Type of responses about the perception of anemia (n=87)

<i>Type of responses</i>	<i>Adolescent mothers (n=68)</i>		<i>Young adult mothers(n=19)</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Probable causes of anemia				
Know	45	66.2	1	5.3
Don't know	23	33.8	18	94.7
Symptoms of anemia				
Know	46	67.6	17	89.5
Don't know	22	32.4	2	10.5
Effects of anemia on menstrual health				
Know	36	52.9	16	84.2
Don't know	32	47.1	3	15.3
Effects of anemia on pregnancy				
Know	31	45.6	15	78.9
Don't know	37	54.4	4	21.1
Effects of anemia on fetus and neonates during pregnancy				
Know	29	42.7	15	79.0
Don't know	39	57.4	4	21.1
Effects of anemia on breastfeeding				
Know	40	58.8	16	84.3
Don't know	28	41.2	3	15.8
Vulnerable groups to anemia				
Know	22	32.4	10	52.6
Don't know	46	67.6	9	47.5
Ways to prevent anemia				
Know	62	91.2	17	89.5
Don't know	6	8.8	2	10.5

Table 3: Perceptions of the participants about the probable causes, symptoms, susceptibility and preventive measures of anemia (n=87)

<i>Perceptions about anemia</i>	<i>Adolescent mothers (n=68)</i>		<i>Young adult mothers (n=19)</i>	
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>
Probable causes of anemia				
Poor dietary habits	28	41.2	15	78.9
Malaria	3	4.4	6	31.6
Intestinal parasite	7	10.3	3	15.8
Childbirth at early age	25	36.8	11	57.9
Childbirth at frequent interval	24	35.3	12	63.2
Low birth spacing	18	26.5	15	78.9
Severe blood loss during menstruation	30	44.1	10	52.6
Symptoms of anemia				
Dizziness	27	39.7	14	73.7
Paleness	26	38.2	15	78.9
Weakness	42	61.8	16	84.2
Irregular heartbeat	7	10.3	2	10.5
Weight loss	13	19.1	10	52.6
Loss of appetite	5	7.4	4	21.1
Groups susceptible to anemia				
Children	3	4.4	-	-
Adolescent	4	5.9	3	15.8
Pregnant women	10	14.7	4	21.1
Lactating mothers	15	22.1	7	36.8
Non-pregnant women of reproductive age (15-49 years)	1	1.5	2	10.5
Elderly	1	1.5	-	-
Different ways to prevent anemia				
Consumption of vegetables and fruits	59	86.8	17	89.5
Consumption of red meat	10	14.7	5	26.3
Iron tablet supplementation	27	39.7	15	78.9
Drinking milk	17	25.0	10	52.6
Maximizing the birth space	25	36.8	16	84.2
Delaying the age at first conception	34	50.0	16	84.2
Delaying the age at marriage	28	41.2	14	73.7
Lower parity	39	57.4	12	63.2

Table 4
Perceptions about the effect of anemia on menstrual health, pregnancy, fetus and neonates and breastfeeding among the participants (n=87)

Perceptions about the effects of anemia	Adolescent mothers (n=68)		Young adult mothers (n=19)	
	n	%	n	%
Effects of anemia on menstrual health				
Delay in age at menarche	7	10.3	4	21.1
Prolonged menstrual cycle	11	16.2	4	21.1
Skipping of menstrual cycle	17	25.0	9	47.4
Scanty menstrual discharge	26	38.2	12	63.2
Effects of anemia on pregnancy				
Age at conception (increase)	1	1.5	-	-
Age at conception (decrease)	1	1.5	-	-
Gestation period (increase)	5	7.4	1	5.3
Gestation period (decrease)	3	4.4	1	5.3
Swelling of hands and feet	8	11.8	3	15.8
Blurred vision	8	11.8	7	36.8
Giddiness	9	13.2	11	57.9
Varicose vein	3	4.4	-	-
Weakness	1	1.5	7	36.8
Effects of anemia on fetus and neonates				
Low birth weight of neonates	17	25.0	12	63.2
Recurrent health problems of neonates	12	17.6	13	68.4
Preterm delivery	12	17.6	6	31.6
Miscarriage	8	11.8	5	26.3
Still birth	7	10.3	6	31.6
Effects of anemia on breastfeeding				
Low secretion of breast milk	24	35.3	11	57.9
Shortens the duration of breastfeeding	17	25.0	6	31.6
Delays the flow of milk after birth	7	10.3	4	21.1

Table 5: Hemoglobin level and Anthropometric characteristics of the participants (n=87)

Variables	Adolescent mothers (n=68)	Young adult mothers (n=19)	t value	p value
	mean±sd	mean±sd		
Hemoglobin level (g/dl)	10.63±1.79	10.68±1.32	0.132	0.895
Waist circumference (cm)	65.33±7.47	70.13±11.47	2.181	0.032
Hip Circumference (cm)	82.14±6.35	84.15±8.09	1.151	0.253
Waist-hip ratio	0.79±0.04	0.83±0.08	2.599	0.011
Mid upper arm circumference (cm)	22.52±2.61	23.42±3.43	1.231	0.222

Table 6: Results of multiple linear regression analysis showing the factors predicting the hemoglobin level of the participants (n=87)

Dependent variables	Independent variables	Unstandardized coefficients	t value	p value	CI at 95%	
					lower	upper
Hemoglobin level	Age of the participants at the time of interview (years)	-0.107	0.508	0.613	-0.528	0.314
	Educational levels of the participants					
	Below 5 th standard	-0.086	0.165	0.870	-0.959	1.132
	Between 5 th and 12 th standard	0.256	0.427	0.671	-1.454	0.941
	Educational levels of husbands					
	Below 5 th standard	-0.263	0.458	0.649	-0.883	1.409
	Between 5 th and 12 th standard	0.446	0.742	0.461	-0.753	1.645
	Working status of the participants					
	Working	-0.207	0.296	0.768	-1.604	1.189
	Occupational types of husbands					
	Small scale business	-1.197	1.253	0.214	-3.104	0.709
	Monthly household income (in Indian rupees)	0.077	1.879	0.065	-0.044	1.900
	Age at menarche (years)	-0.078	0.429	0.669	-0.442	0.286
	Age at marriage (years)	0.194	0.847	0.400	-0.263	0.651
	Age at first conception (years)	-0.037	0.155	0.877	-0.515	0.441
	Total number of conception	-0.251	0.528	0.599	-1.199	0.697
	Gestational length of the last pregnancy (weeks)	0.019	0.242	0.810	-0.136	0.173
Ever use of oral contraceptives	-0.121	0.262	0.794	-1.043	0.801	
WHR	0.350	0.071	0.943	-1.166	3.465	
MUAC	0.106	1.085	0.282	-0.088	0.300	

WHR= waist hip ratio, MUAC= mid upper arm circumference

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