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Assessment of maternal factors associated with low birth weight neonates

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Abstract
Birth weight is an important criteria for determining the neonatal survival. Low Birth Weight (LBW) is a sensitive indicator influenced by socio-economic conditions and indirectly measures the health of the mother and the child. Maternal risk factors associated with incidence of low birth weight infants was undertaken in government and private hospitals of Hubli-Dharwad and data was recorded by interviewing the mothers of LBW infants using pre structured questionnaire. The prevalence of low birth weight infants in government and private hospitals ranged from 6.56 percent to 17.12 percent. The major associated with risk factors were low socio-economic status (75.8%), joint family (61.2%), maternal weight less than 45 kg (70.20%), and gestational weight gain below 7kg during pregnancy (50.8%), anemia (86.4%) and primigravida (52.6%). The mean intake of all foods were lower (21-88%) than SDA (Suggested Dietary Allowance) except for fats and oils (133%).

Keywords: Birth weight, low birth weight, gestational age, maternal factors

Introduction
Birth weight plays very important role in the health of new-borns. Low birth weight (LBW) is defined as a birth weight of less than 2500 g, as per the World Health Organization (WHO, 2023) [14]. Annual estimates shows that that 14.7 percent of all births, or 19.8 million new-borns are low birth weight infants. (WHO, 2023) [14]. The prevalence of LBW in India estimated from nationally representative survey data is 17.29% (NFHS-5, 2021).
Maternal nutrition represents a major public health challenge because it affects not only women's health, but also that of future generation. Nutrient inadequacies during pregnancy can impair fetal growth, which can in turn increase risk for low weight at birth or small-for-gestational-age and preterm deliveries (Grieger and Clifton, 2015) [6]. This study was conducted to know prevalence of LBW and the maternal risk factors for infants.

Material and Methods
Twin cities Hubli-Dharwad were selected for assessing the prevalence of low-birth-weight babies. Four Government hospitals and two Private hospitals were selected from Dharwad and Hubli to know the prevalence of low birth weight in babies. The secondary data was collected from hospital records to know the number of deliveries and prevalence of low-birth-weight babies during the year 2018-20.
From secondary data from private and government hospitals five hundred mothers who gave low-birth-weight babies were selected to assess the risk factors contributing to low birth weight. Mothers were interviewed with the help of pre-structured questionnaire consisting of general and specific information's. Data pertaining to maternal anthropometry and haemoglobin was collected from hospital records, case files and mother cards. Socio - economic status of mothers of low birth weight infants was assessed using scale developed by Agarwal *et al.*, (2005) [1]. Diet survey was conducted by using 24 hour recall method.

Results and Discussion
Prevalence of low-birth-weight (LBW) neonates in selected hospitals of Hubli-Dharwad during 2018-19 is shown in Table 1. More number of deliveries found in GH1 (10131) followed by PH1 (6063). Infants with ranged from 6.56 percent (PH1) to 17.12 percent (GH2). Highest (17.12%) was observed in GH2 followed by PH2 (16.95%).

LBW incidences more in GH2 as majority of mothers may be from rural area belonging to poor socio economic background of surrounding rural areas and were dwelling in slum of Dharwad, followed by PH2 because it is a promising hospital for complicated cases for the surrounding districts. Lesser LBW cases noticed in PH1 (6.56%) because majority of mothers who delivered in this were from middle to high socio-economic families.

Extremely low birth weight was found in government hospital from 0.66 percent (GH2) to 4.29 percent (GH1).

Table 1: Prevalence of low-birth-weight neonates in selected hospitals of Hubli-Dharwad

SL. No	Hospital	Total live birth	Birth weight			
			Normal (≥ 2.5 kg)	Low (< 2.5 kg)	Extremely Low (≤ 1 kg)	Total LBW
Government						
1.	GH1	10131(100)	8562(84.51)	1134(11.20)	435(4.29)	1569(15.49)
2.	GH2	3669(100)	3049(83.10)	596(16.24)	32(0.66)	628(17.12)
	Total	13800(100)	11611(83.14)	1730(1253)	467(3.38)	2197(15.92)
Private						
3.	PH1	6063(100)	5665(93.44)	341(5.62)	57(0.94)	398(6.56)
4.	PH2	956(100)	794(83.05)	152(15.90)	10(1.05)	162(16.95)
	Total	7019(100)	6459(91.24)	493(7.02)	67(0.95)	560(7.98)
	Grand total	20819(100)	18070(86.80)	2223(10.68)	534(2.56)	2757(13.24)

Figures in parentheses indicate percentage
GH- Government Hospital, PH- Private Hospital

Table 2: Socio demographic profile of mothers of the LBW, N=500

Characteristics of Mother	N	%
Age (years)		
15-19	104	20.80
20-24	261	52.20
25-29	114	22.80
30-34	15	3.00
35-40	06	1.20
Family type		
Nuclear	176	35.20
Joint	306	61.20
Broken	2	0.40
Extended	16	3.20
Occupation		
Home maker	448	89.60
Agriculture labour	30	06
Private job	21	4.20
Others	01	0.20
Literacy status of mother		
Illiterate	07	1.40
Primary	36	7.20
High School	148	29.60
PUC	211	42.20
Graduate	87	17.40
Post-graduate	11	2.20
Socio economic status of family		
Class IV Lower middle	79	15.80
Class V Poor	379	75.80
Class VI Very poor	42	8.40
Gravidity		
Primigravida	263	52.6
Second gravida	139	27.8
Third gravida	78	15.6
Fourth gravida	14	2.8
Fifth gravida	5	1.0
Sixth gravida	01	0.2
Total	500	100

Socio-demographic profile of mothers of low-birth-weight infants showed more number of mothers (52.2%) fell within the age group of 20-24 years, belonging to Hindu religion (71.6%) and were residing in joint family (61.2%). Majority of mothers were homemakers (89.6%) with education up to PUC (42.2%) and in primigravida (52.6%). Majority of mothers belonging to poor socio-economic status (75.8%), which indicates that low socio-economic status has direct relation with LBW incidences (Table 2), which reveal that poor economic status results in poor maternal nutrition which reflects in low birth outcome.

The similar findings were noticed by Chandra (2011) [3] in Belgavi in which the mean age of the participants was 23 years. And the same findings contradict with the study done in Nepal that shows a higher risk of delivering low birth weight babies by mother age less than 20 and more than 30 year (Sharma *et al.*, 2015 and Yadav *et al.*, 2011) [12, 15]. The changes might be due to regional variations.

Majority of the mothers 89.6 percent were housewives and 61.2 percent were staying in joint family. Literacy rate noted among them was 89.6 percent (Table 2). The similar results were observed by Chandra, (2011) [3]. Maximum percentage (55.43%) of women lived in a joint family. The association between type of family and low birth weight of newborns was found to be statistically significant with a p-value of 0.022.

Table 3: Anthropometric profile of mothers of low-birth-weight babies, N=500

Variable	N	%
Maternal height(cm)		
< 145	82	16.40
> 145	418	83.60
Maternal weight (Kg)		
< 45	351	70.20
≥ 45	149	29.80
Body Mass Index		
< 18.5	57	11.40
18.5 – 22.9	264	52.80
≥ 23	179	35.8
Weight gain (Kg)		
≤ 4	04	0.80
5-7	270	54.00
8-10	174	34.80
≥ 10	52	10.40
Total	500	100

Anthropometric profile of mothers of low-birth-weight infants. Maternal height revealed that 83.6 percent mothers had height more than 145 cm and 16.4 percent of mothers were less than 145 cm. With regard to maternal weight, majority of mothers (70.2%) had body weight less than 45 Kgs and (52.8%) of mothers have a BMI between 18.5 and 22.9 considered within the normal range. Majority (54%) gained between 5 to 7 Kgs, which was very less compared to normal weight gain during pregnancy (11-15 kg) and it shows their malnutrition and responsible for the incidences of LBW (Table 3).

The association between maternal underweight and LBW might be due to lack of nutrients and or medical illness of the women resulting in diminished foetal growth (Demelash *et al.* 2014) [5]. The risk of having LBW baby was 70 percent higher among women whose weight is less than 45 kg and 28 percent higher whose height is less than 150 cm. Maternal height and weight might affect intrauterine growth of the fetus. The underweight woman are more likely to deliver LBW babies two times more than normal-weight women. (Wataba *et al.*, 2006) [13] and (Dalal *et al.*, 2014) [4].

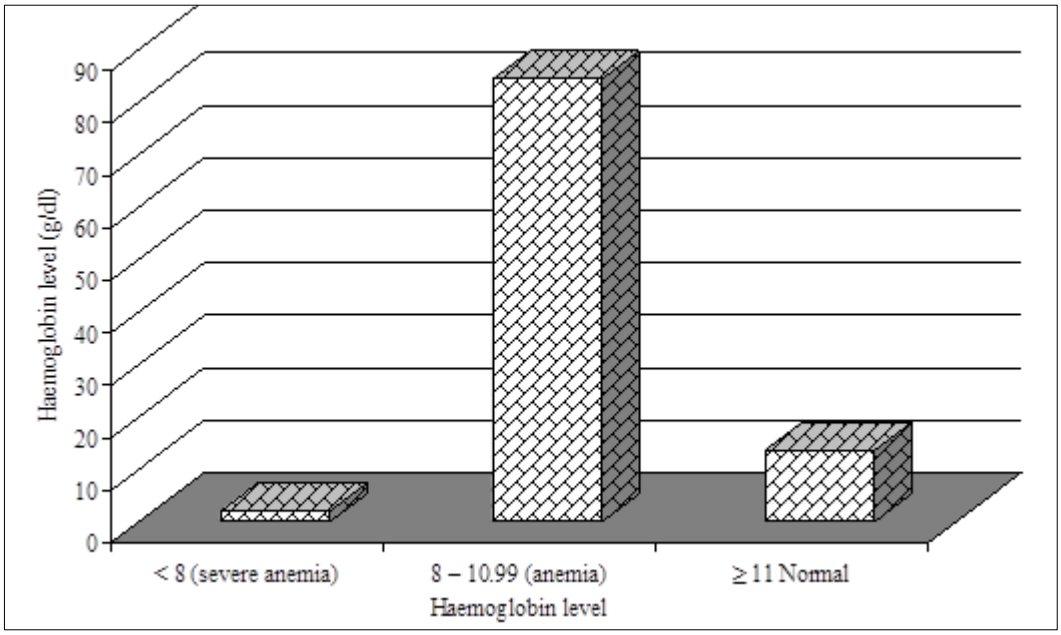

Fig 1: Haemoglobin status of mother of LBW

Mothers were classified for haemoglobin status according to NHM classification. (Fig 1). Majority of mothers were anaemic (84.4%), with haemoglobin levels between 8 and 10.99 g/dl and only 2 percent women were suffering from severe anemia and 13.6 percent were normal. Similar observations made by Kumari *et al* (2019) [9] and Jain *et al.*, (2020) [8].

Table 4: Food Consumption pattern of pregnant women, N=500

S. No.	Food Groups (gms)	SDA*	Intake (g/day)		
			Mean ± SD	% SDA	% Deviation from SDA
1.	Cereals and millets	270	218.56±23.32	80.74	19.26
2.	Pulses and legumes	60	47.33±11.67	78.0	22.0
3.	Green leafy vegetables	50	43.76±13.65	88.0	12.0
4.	Other vegetables	200	113.28±39.09	56.5	43.5
5.	Roots and tubers	100	50.16±2.60	50	50.0
6.	Fruits	200	54.44±18.99	27	73.0
7.	Sugar	20	12.76±4.79	63.80	26.20
8.	Milk and milk products	500	105.09±32.35	21	79.0
9.	Fats and oils	30	39.72±8.74	133	+33

*Suggested Dietary Allowance (SDA)

Table 4 represents the mean food intake of mothers of low-birth-weight infants. The mean cereal intake of mothers was deviated from SDA by 80.74 percent, pulses (22%), green leafy vegetables (12%), other vegetables (43.5), roots and tubers (50%), fruits (73%), sugar (26.20%), and milk and milk products (79%). The mean food intake was found to be lower than SDA (Standard Dietary Allowance) in the mothers except fats and oils which was more than 30 percent SDA. The lower intake of food results into maternal malnutrition which reflects in LBW outcome. Sarika (2020) [11] also noted less intake of food compared to RDA.

Table 5: Correlation between risk factors for LBW with dietary intake of pregnant women, N=500

SL. No.	Independent variables	Cereals	Pulses	GLV	OV	Roots &Tubers	Fruit	Sugar	Milk products	Fats and oils
I	Socio – economic parameters									
1	Age	.022	-.016	.015	.021	-.049	-.036.	-.007	.025	.050
2	Education	.032	.086	.050	.034	.041	-.091*	-.119**	-.028	-.010
3	Income	-.066	.050	.058	-.044	.015	.167**	-.235**	-.057	-.028
II	Maternal parameters									
1	Age at Marriage	.106*	.059	.041	-.025	-.035	-.043	-.042	.038	.057
2	Height (cm)	.008	-.052	-.074	.141**	.041	.177**	.314**	.038	.098*
3	Weight (Kg)	.262**	.186**	.128**	-.007	.031	-.016	-.162**	-.008	.127**
4	Weight gain (Kg)	.137**	.109*	.174**	.055	-.003	-.078	-.144**	-.116**	.033
5	Hb levels (mg)	.017	.014	.089*	-.057.	-.002	-.001	-.006	-.015	.001

**significant at the 0.01 level (2 tailed), *Significant at the 0.05 level (2 tailed)

The results pertaining to the relationship of the selected independent variables like risk factors for LBW i.e. socio economic characters and maternal parameters with that of dependent variables with dietary intake of pregnant women is

presented in Table 6. In order to study the relationship between the dependent and independent variables, the correlation coefficient was computed for each independent variable. The values of correlation coefficient (r) were then tested for their statistical significance.

The socio-economic status for LBW with respect to consumption of fruits by pregnant women's family income had positive and significant relationship with at 1 percent level of probability while, education had positive and significant relationship at 5 percent level of probability. With respect to consumption of dietary sugar both education and income had positive and significant relationship at 5 percent level of probability.

Further with respect to maternal risk parameters like age at marriage showed a positive and significant relationship with consumption of cereals at 1 percent level of probability. Again, height of the mother showed a positive and significant relationship with consumption of other vegetables, fruits and sugar at 1 percent level of probability and with respect to consumption of fats and oils height had a positive and significant relationship at 5 percent level of probability.

With respect to weight of the women and consumption of cereals, pulses, green leafy vegetables, sugars and fats & oils showed a positive and significant relationship at 5 percent level of probability. The weight gain of the pregnant women was also influenced by consumption of cereals, green leafy vegetables, sugar and milk & milk product positively at 1 percent level of probability and consumption of pulses was positively correlated at 5 percent level of probability. Hb levels which forms one of the important risk factors was influenced only by consumption of green leafy vegetables at 5 percent level of significance positively.

Conclusion

The findings of this study showed that various socio-demographic and maternal variables were risk factors for LBW. Low socio-economic status, literacy, family type, maternal low weight, and short height, maternal under nutrition, anemia, have increased the risk of LBW baby. Therefore, prevention strategy should be designed to tackle these multiple risk factors for LBW in this area. Through ANC, it is possible to identity a woman who is at risk of having a LBW baby. Giving necessary suggestions such as the need for additional balance diet and provision of iron folic acid tablets for the anemic can be easily facilitated. These activities would not only prevent occurrence of LBW but also prevent problems associated with LBW such as child morbidity and mortality, thereby helping the nation.

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