Original Research Article

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Maternal, social and health factors influencing admission of newborns to the special newborn care unit at Kakinada, India

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ABSTRACT

Background: Substantial progress has been made in reducing under five mortality, infant mortality in the last two decades. We need to focus our attention in reducing neonatal mortality.

Methods: Setting and design was observational study in SNCU of Government General Hospital, Kakinada. Data collected using semi-structured questionnaire and Hospital Records of mother and newborn. Analysis was done using MS EXCEL2007 and SPSS 20 software. Sample size and time period was a convenient sample of 300 mothers were interviewed from Jan-June, 2018.

Results: The mean age of the mothers in the study is 23.39 ± 3.195 years and age at marriage is 19.12 ± 2.29 years. 79% of study population belong to lower social classes. Maternal risk factors-35.6 % are pre-obese or obese and 9.3% underweight, 11.3% had <4 antenatal visits, 87.33% (262) had anemia, 18.33% (55) had PIH. The mean birth weight of newborns was 2601 ± 0.93 grams. 58.3% are preterm and 38.3% (115) low birth weight. 46.33% (139) of newborn admissions were due to birth asphyxia, 27.33% (82) jaundice 9.66% (29) convulsions, 6.66% (20) congenital anomalies, 4% (12) sepsis.

Conclusions: Low income, low literacy and less no of antenatal visits showed an association with maternal anemia and LBW (statistically not significant). Upon regression analysis age of mother and gestational period were the only factors with statistical significance.

Keywords: Maternal factors, Newborn morbidity, Social factors, Special newborn care unit

INTRODUCTION

Infant mortality rate (IMR) and maternal mortality ratio (MMR) are two sensitive indicators of development that received focused attention in MDG's and SDG's resulting in lowering of IMR and MMR. However, further reduction in IMR is only possible, if interventions are made in reducing the neonatal deaths for which SNCU's have been established. The global Neonatal mortality rate fell from 37 deaths per 1,000 live births in 1990 to 18 in 2017. In 2017 alone, an estimated 6.3 million children

and young adolescents died, mostly from preventable causes. Children under age 5 accounted for 5.4 million of these deaths, with 2.5 million deaths occurring in the first month of life - approximately 7000 every day. The risk of dying was highest in the first month of life at an average rate of 18 deaths per 1000 live births globally in 2017 and 24 per 1000 live births in India. Infant mortality rate was 32 per 1000 live births compared to Global average of 29 per 1000 live births.² The number of live births in the country is estimated to be 27 million, which again

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constitutes 20 per cent of the total number of live births in the world.³

Establishing sick newborn care units (SNCU's) is one of the strategies under INAP to reduce IMR to less than 30 and NMR to less than 12 under SDG 3 by 2030.⁴

The three major causes of neonatal deaths world- wide are infections, pre- term birth and birth asphyxia. The classic risk factors for Low Birth Weight and preterm delivery are associated with unfavorable biological, social and environmental conditions, iron deficiency anemia and high blood pressure during pregnancy. Low birth weight, anemia, height of the mother, weight of the mother and antenatal checkups are all proxy indicators of socioeconomic status.

With the SDG target of bringing Neonatal Mortality Rate to less than 12 per 1000 livebirths, greater focus is required on the multitude of factors effecting newborn health. Hence, this study is aimed at assessing the Maternal, Social and health factors which form the major determinants of Newborn Health.

METHODS

An observational study of a convenient sample of 300 mothers whose children were admitted to SNCU of Govt general hospital Kakinada from January 2018 to June 2018. Data was collected using semi-structure pre-tested questionnaire and also from clinical records of mother and newborn. Permission taken from the Institutional ethics committee, Rangaraya Medical College, Kakinada.

Mothers whose children were admitted in SNCU were included and who were not willing to participate, were severely ill and unable to attend their children in SNCU were excluded. Informed consent was obtained after explaining the purpose of the study. Confidentiality was maintained by removing the names of the individuals and limiting the access of data. Analysis was done using MS EXCEL2007 and SPSS 20 software.

RESULTS

Mean age of the mothers in the study population is 23.39±3.195 years. 63.66% (191) are in the age group of 20-24 years, 19.33% (58) in 25-29 years, 13.66% (41) in 15-19 years and 3.3% (10) more than 30 years of which 61% (183) of the study subjects were married between 15 to 19 years (Figure 1). Majority is Hindus. 79% (237/300) of study population belongs to lower social classes (BC/SC/ST). 65.33% (196) of the study subjects belong to upper lower socio-economic class (Figure 2). 53% (159) of study subjects have completed high school and diploma (Figure 3). 25% (75) of women had consanguineous marriage. The mean weight of mothers in the study is 54.96±10.7 Kg (range 33 - 95 Kg) (Figure 4). The mean height of mothers is 152.18±6.41 cms (Range 134 - 170 cms).

Antenatal education and services-94% -dietary advice, 86% - preparedness for delivery, 35.33% - danger signs during pregnancy and only 16.66% - family planning. 28.33% of women were accompanied by ASHA, 26% of women used Govt. Ambulance service to reach the place of delivery. 22% (46) had an adverse heath event during postpartum, 23% (143) had their previous child admitted to SNCU.

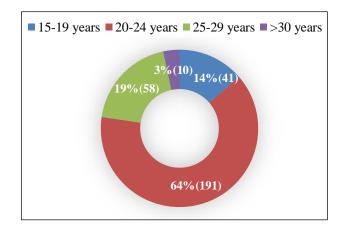


Figure 1: Age wise distribution of the study subjects (n=300).

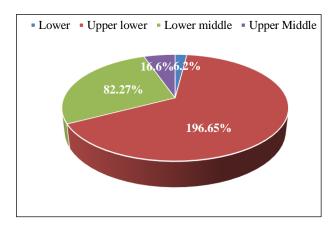


Figure 2: Distribution of study subjects based on socioeconomic status (n=300).

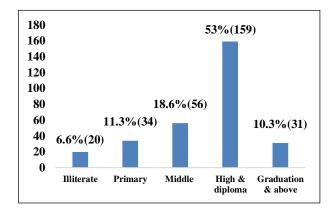


Figure 3: Distribution of study subjects based on education (n=300).

Table 1: Maternal factors vs birthweight of the baby.

Maternal factors	LBW	Normal birth weight	Total	P value			
	N (%)	N (%)					
Age of mother (in years)							
15-19	19 (46.3)	22 (53.7)	41				
20-24	78 (41.1)	112 (58.9)	190				
25-29	15 (25.9)	43 (74.1)	58	0.107			
≥30	3 (27.3)	8 (72.7)	11				
Z	115	185	300				
Income							
≤Rs. 5000	49 (47.1)	55 (52.9)	104				
Rs. 5001-12000	56 (36.1)	99 (63.9)	155	0.078			
Total	105	154	259				
Education of the mother							
Illiterate	5 (25.0)	15 (75.0)	20				
Primary	9 (26.5)	25 (73.5)	34				
Middle	24 (42.9)	32 (57.1)	56	0.167			
High & diploma	68 (42.8)	91 (57.2)	159	0.167			
Degree & above	9 (29.0)	22 (71.0)	31				
Total	115	185	300				
Gestational period							
Preterm (<37 weeks)	63 (36.0)	112 (64.0)	175				
Term (≥37 weeks)	52 (41.6)	73 (58.4)	125	0.325			
Total	115	185	300				
Spacing (mothers with more t	Spacing (mothers with more than one child) (n=128)						
≤2 years	31 (36.9)	53 (63.1)	84				
>2 years	13 (29.5)	31 (70.5)	44	0.405			
Total	44	84	128				
BMI							
Underweight	9 (32.1)	19 (67.9)	28				
Normal	66 (40.0)	99 (60.0)	165				
Pre obese	34 (40.5)	50 (59.5)	84	0.518			
Obese	6 (26.1)	17 (73.9)	23				
Total	115	185	300				
Anaemia							
Normal to mild anaemia	27 (27.8)	70 (72.2)	97				
Moderate to severe anaemia	88 (43.3)	115 (56.7)	203	0.010			
Total	115	185	300				

46.3% of children born to mothers of age group 15-19 yrs are of LBW, 41.1% among 20-24 yrs, 25.9% among 25-29 yrs, and 27.3% among mothers \geq 30 yrs (Table 1).

The period of gestation \geq 37-42 weeks is considered as term, and below 37 wks as preterm (include -extreme, early and late preterm). 41.7% (125/300) had delivered at term and 58.3% (175) preterm (<37 weeks)⁹.

The mean birth weight of newborns in the study is 2601 ± 0.93 grams. (range- 0.75 Kg to 5 Kg). 61.7% (185/300) had a birth weight \geq 2500 grams as compared to 38.3% (115) <2500 grams.

mean birth weight is 2.5 kg for children born to mothers married before 19 years as compared to 2.7 kg for those after 19 years (p=0.026) (Table 2).

47.1% of LBW's babies are observed among families having income \leq 5000 rupees per month as compared to 36.1% having income 5001 to 12000. (p value =0.078, df=1) (Table 1). The mean birth weight with income <5000 Rs per month is 2.45 \pm 0.73 kg as compared 2.62 Kg \pm 0.82 kg with income 5001 to 12000Rs/month. (p-0.083) (Table 2).

The mean birth weight of babies born to women with \leq 40 Kg (n=22) is 2.4 kg±0.77 kg, 41-50 Kg (n=98) is 2.67 kg±0.82 kg, 51 to 60 Kg (n=95) is 2.52 kg±0.82 kg and

>60 kg (n=85) is 2.57 kg \pm 0.70 kg, (p value=0.540) (Table 2). The mean birth weight of babies born to short statured mothers (\leq 145 cms) is 2.79 \pm 0.85 kg, mothers with the height of 145 to 154cms is 2.55 \pm 0.81 kg and for more than 155cms height is 2.57 \pm 0.73 kg (p value=0.348) (Table 2).

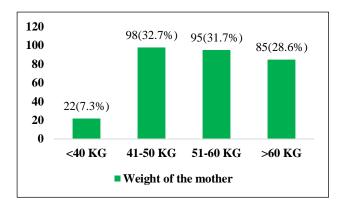


Figure 4: Distribution of study subjects based on weight (n=300).

A regression analysis done on Gestation period, height, weight, age and hemoglobin levels of mother showed 11% variability (R square=0.11), age of the mother and gestational period showed statistical significance. There was a significant association for Preterm births with birth asphyxia (p=0.03) and LBW (p=0.028). Spacing less than 2 yrs with preterm (p=0.013) and Moderate to severe anaemia with LBW babies (p=0.010) with neonatal jaundice (p=0.009).

Gestational period when calculated excluding data with 10% above SD, the mean birth weight for the pre terms is 2.3 kg (SD=0.63) and 2.5 kg (SD=0.77) for infants born at term (p=0.028) (Table 2).Among 128 study subjects having more than one child, 65.6% (84) are having spacing <2 years had 36.9% (31) LBW babies compared to 34.4% (44) are having spacing for >2 years had 29.5% (13) LBW (p value=0.405, df=1) (Table 1). Preterm was 52.4% (44) among those with <2 years of spacing as compared to 75% (33) with spacing >2 years (p value=0.013, df=1).

Table 2: Comparison of mean birthweight based on maternal factors.

Comparison of mean birthweight based of	on age of mother				
Age of the mother (in years)	Mean birth weight (kgs)	n=300	P value		
15-19	2.42 ± 0.82	41			
20-24	2.56±0.79	190	0.221		
25-29	2.73±0.74	58	0.221		
≥30	2.75±0.71	11			
Comparison of Mean Birthweight based on age of marriage					
Age of the mother at marriage (years)	Mean birth weight (kgs)	n=300	P value		
≤19	2.50±0.77	186			
>20	2.71±0.79	114	0.026		
Comparison of Mean Birthweight based	on income				
Income	Mean birth weight (kgs)	n=259	P value		
≤Rs. 5000	2.45±0.73	104	0.083		
Rs. 5001-12000	2.63±0.82	155	0.083		
Comparison of Mean Birthweight based	on gestation Period				
Gestational period	Mean birth weight (kgs)	n=271*	P value		
Preterm (<37 weeks)	2.36±0.63	147	0.028		
Term (≥37 weeks)	2.55±0.77	124	0.028		
Comparison of Mean Birthweight based	on severity of anemia				
Anaemia	Mean birth weight (kgs)	n=300	P value		
Normal to mild anaemia	2.81±0.75	97	0.001		
Moderate to severe anaemia	2.47±0.78	203	0.001		
Comparison of Mean Birthweight based	on weight of the mother				
Mothers' weight (kgs)	Mean birth weight (kgs)	n=300	P value		
<40	2.4±0.77	22			
41-50	2.67±0.82	98	0.540		
51-60	2.52±0.82	95	- 0.540		
61 and above	2.57±0.70	85			
Comparison of Mean Birthweight based	on height of mother				
Mothers height (cms)	Mean birthweight (kgs)	n=300	P value		
≤144	2.79±0.85	26			
145-154	2.55±0.81	170	0.348		
≥155	2.57±0.74	104			

The mean systolic blood pressure of the mother at the time of interview is 110.88±12.67 mmHg. The mean diastolic blood pressure is 75.05 mmHg with an SD of 7.20 mmHg. 12% (36) have normal hemoglobin as compared to 88% (264) of the study population who are anemic. Mild anemia accounts for 20.66% (62), moderate anemia-64.66% (194), severe anemia-2% (6). 10 18.33% (55) have PIH, 5% (15) have Hypothyroidism, 2.33% (7) have infections, 3.33% (10) have APH, 2.33% (7) have Convulsions and 3%(9) have GDM (Figure 5).

68.81% of mothers married by age of <19 years had moderate to severe anemia as compared to 65.8% >20 years (p value=0.612, df=1) (Table 3). 75% (63) of mothers had moderate to severe anemia with birth spacing <2 years as compared to 65.9% (29) who had spacing of >2 years (p value=0.277, df=1) (Table 3). The social factors like education, income and ante natal visits have no influence on Hb status of the mothers.

Table 3: Social	factors of the	mother versus	severity of	f anemia.
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Casial factors of the mother	Mode to severe anaemia	Normal to mild anaemia	Total	P value	
Social factors of the mother	N (%)	N (%)			
Age of the mother at marriage					
≤19	128(68.8)	58 (31.2)	186		
20 and above	75 (65.8)	39 (34.2)	114	0.586	
Total	203	97	300		
Income (n=259)					
≤5000Rs (n=104)	75 (72.1)	29 (27.9)	104		
5001-12000 Rs (n=155)	108 (69.7)	47 (30.3)	155		
Total	183	76	259		
Education of the mother					
Illiterate	16 (80.0)	4 (20.0)	20	0.120	
Primary	25 (73.5)	9 (26.5)	34		
Middle	42 (75.0)	14 (25.0)	56		
High and diploma	104 (65.4)	55 (34.6)	159	0.120	
Degree and above	16 (51.6)	15 (48.4)	31		
Total	203	97	300		
Antenatal visits					
<4	26 (76.5)	8 (23.5)	34	0.244	
≥4	177 (66.5)	89 (33.5)	266		
Total	203	97	300	_	
Spacing (mothers with more th	nan one child)				
≤2 years	63 (75.0)	21 (25.0)	84		
>2 years	29 (65.9)	15 (34.1)	44	0.277	
Total	92	36	128		

Analysis in our study shows that anemia has a significant influence on the birth weight of child. Among women with normal or mild anemia (n=171) LBW was 27.8% and mean birth weight 2.81 kg±0.75kg compared to 43.3% LBW (1.7) and 2.47 Kg±0.78 kg mean birth weight among women with moderate to severe anemia.(2.5) (p value significant-0.010, df=1) (Table 2).

The reason for admission of the newborns to SNCU is preterm 58.33% (175), LBW 38.33% (115), Birth asphyxia 46.33% (139), jaundice 27.33% (82), convulsions 9.66% (29) and congenital anomalies 6.66% (20) (Figure 6).

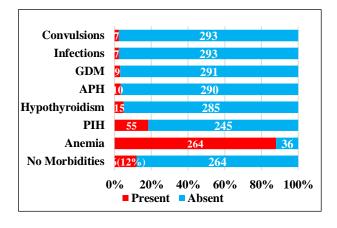


Figure 5: Incidence of antenatal morbidities among study subjects.

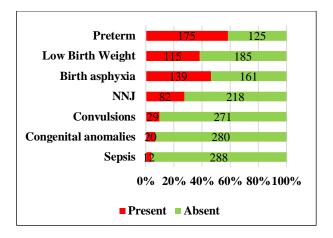


Figure 6: Incidence of neonatal morbidities among study subjects.

DISCUSSION

Of the total babies 58.33% were preterm, 38.33% have low birthweight, 46.33% of newborns have birth asphyxia, 27.33% have Jaundice, 9.66% have convulsions and 6.66% have congenital anomalies. In the study done by Rakholia et al in Uttarakhand, 21.9% were admitted with respiratory distress, 12.9% admitted with Jaundice, 60% were low birth weight and 50% preterm. In the study done by Saini et al in Jalandhar, Punjab, Hyperbilirubinemia (7.0%) was the leading cause of neonatal morbidity followed by birth asphyxia/trauma (4.04%), sepsis (3.99%), and respiratory distress (3.9%).

47.1% of LBW's babies observed among families having income <5000 rupees per month as compared to 36.1% among Rs.5001 to 12000 group (p value =0.078, df=1). Study done by Radhakrishnan et al in Kerala showed that maternal low economic status was a principle determinant of low birth weight. A study done by Melissa et al showed a clear graded association between income quintile and low birth weight in the United States. The mean birth weight of babies born to short statured mothers (<144 cms) is 2.79±0.85 kg as compared to mothers with the height of 145 to 154cms is 2.55±0.81 and >155 cms height is 2.57±0.73 kg (p value=0.348, df=2). In a study done by Senja Masalin et al in Finland, showed that a significant increase in offspring birthweight was noted only in extreme height categories.

68% of babies born to mothers with BMI≤18 is having normal birth weight as compared to 60% with normal BMI, 59.5% with pre obesity and 74% with obesity (p value=0.518, df=3). Study done by Heather et al showed that moderate to severe obesity had increased risk of PIH and venous thromboembolism, this study did not find any difference for preterm or very preterm birth. ¹⁶

In this study, 12% (36) have normal hemoglobin, 88% (264) of the study population are anemic. In a study by Singh et al. Tomar et al prevalence of anaemia among pregnant women was 55.9%.¹⁷

43.3% of LBW babies in women with moderate to severe anaemia (p value significant-0.010, df=1) in this study. A study done by Haider et al showed that mean Hb did not show any significant association with low birth weight. Severe anemia (hemoglobin <8 gm/dl) is associated with the birth of small babies (from both preterm labor and growth restriction). Jha et al in their study observed that anemia (Hb<10 g/dl) was associated with a significantly increased risk of low birth weight (<2500 g). In a study done by Levy et al in Soroka University medical center showed maternal anemia was an independent risk factor for both preterm delivery and low birth weight.

Anitha et al in their study showed multivariate analysis revealing biologically acceptable predictors of birthweight of a baby are maternal height (p<0.001), parity (p<0.001) gestational age (p<0.001), pregnancy induced hypertension (p=0.05) and history of low birthweight in the previous pregnancy (p=0.05). 21

The mean birth weight for the pre terms is $2.3 \text{ kg} \pm 0.63$ as compared to $2.5 \text{ kg} \pm 0.77$ among those born at term, (p=0.028). In a study done by Garcia et al, indian infants had the lightest, unadjusted mean birth weights followed by Bangladeshi, Pakistani and White British infants. Association was found between primipara and preterm delivery in Indian mothers. 22

Incidence of birth asphyxia and meconium aspiration is 41.1% in preterm babies as compared to 53.3% among term babies (p value=0.03, df=1). Study done by Fischer et al showed that there is a linear relationship of increase in meconium aspiration syndrome with gestational age.²³

Birth asphyxia was present to an extent of 40.2% among babies born to mothers with mild to normal anemia as compared to 49.3% with moderate to severe anemia (p value=0.141, df=1). A study done by Willemien et al perinatal anemia causing moderate to severe perinatal asphyxia is associated with a higher risk for neonatal mortality.²⁴

CONCLUSION

Low income, low literacy level, early age of mother at marriage, a smaller number of antenatal visits and spacing less than 2 years showed an association with maternal anemia, and LBW.

Recommendations

Measures for improving socioeconomic conditions, education of women, marriage after 20 yrs, proper spacing between children would improve neonatal health.

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Ethical approval: The study was approved by the Institutional Ethics Committee of Rangaraya Medical College, Kakinada

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