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Risk Factors for Low Birth Weight Babies in Healthy Literate Mothers Belonging To Middle Socio Economic Status: A Hospital Based Observational Study

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ABSTRACT:
BACKGROUND: Low birth weight(LBW) is an important cause of infant mortality and morbidity. There are various risk factors for LBW -- illiteracy, lower socio economic status and medical illness in the mother being a few of them.
OBJECTIVES: To look for the risk factors of low birth weight babies in literate, healthy mothers belonging to middle income socio-economic class
METHODS: The study was conducted in one of the busiest hospitals of Jorhat, Assam. It is a hospital based case-control observational study. Babies who fulfilled the inclusion criteria and born with birth weight < 2.5Kg were enrolled as cases and those ≥2.5Kg were enrolled as controls. Risk factors like parity, PIH, premature delivery, PROM, fetal distress, sex of the baby, maternal age, ethnicity, small for gestational age were studied in both the groups. Data was analysed statistically using SPSS.16
RESULTS: Total 1426 babies were enrolled in the study of which 1188(83.3%) were more than or equal to 2.5 kg, 226(15.8%) babies were low birth weight and 12(0.8%) babies were very low birth weight. Incidence of low birth weight was 16.7%(238 out of 1426). Parity(0.0.004), premature rupture of membrane(p=0.000), pregnancy induced hypertension(p=0.000), prematurity (p=0.000) and underweight for gestational age(p=0.000) had significant correlation with LBW babies whereas, sex of the baby (p=0.784), maternal age (p=0.104) and ethnicity (p=0.199) did not have any significant correlation with low birth weight babies.
CONCLUSION: Risk factors commonly associated with LBW like parity, premature rupture of membrane, pregnancy induced hypertension, prematurity and underweight for gestational age had significant correlation with low birth weight babies whereas, sex of the baby, maternal age and ethnicity did not have any significant correlation with low birth weight babies. The risk factors like parity, premature rupture of membrane, PIH, prematurity associated with low birth weight are independent of the risk factors like literacy, socioeconomic status, chronic illness of the mother. Therefore, proper antenatal and perinatal care is important in all pregnant women to prevent delivery of low birth weight babies and the adverse consequences associated with LBW babies.
KEYWORDS: LBW, Parity, PIH, Premature rupture of membrane, SGA, literacy, maternal age

I. INTRODUCTION:

Low birth weight is a term used to describe babies whose birth weight is less than 2.5kg. Low birth weight is an important cause of infant mortality and morbidity and thus, an important public health concern. Low birth weight babies are at increased risk of fetal distress, hypothermia, infection, breathing problems like respiratory distress syndrome, intraventricular haemorrhage, digestive problems like necrotising enterocolitis, feed intolerance, sudden infant death syndrome. Long term complications include cerebral palsy, blindness due to retinopathy of prematurity, deafness and developmental delay [1]. Low birth weight can be prevented by identifying the risk factors and by proper antenatal care. Women with medical illness were more likely to have low birth weight babies than healthy mothers[2]. Illiterate mothers and women from lower socioeconomic status were found to be an important predictor of low birth weight[3]. Few studies have been done till now to see the risk factors of low birth weight babies in healthy literate women with no medical illness prior to or during the course of pregnancy and not belonging to low income socio economic strata. So in this study we have tried to find out various determinants and incidence of low birth weight in healthy literate mothers belonging to middle income socio economic strata with no medical illness other than those arising as a complication of pregnancy itself.

II. OBJECTIVES:

1)   To look for the risk factors of low birth weight babies in literate, healthy mothers belonging to middle income socio economic class

III. MATERIALS AND METHOD:

Place of Study: the study was conducted in one of the busiest hospitals of Jorhat, Assam

Study Design: Hospital based case control observational study

Duration of Study : 2 years (November 2018 – October 2020)

Method of study: Babies are grouped into two categories – cases and controls. Maternal and neonatal care was given according to standard hospital protocol.

Cases: Babies with birth weight less than 2.5 Kg

Controls: Babies with birth weight more than or equal to 2.5Kg

Inclusion criteria:

1/ Mothers belonging to middle socio economic status

2/Women who had received primary education and above

3/ Healthy mothers

Exclusion criteria:

1/ Mothers with multiple pregnancies

2/ Neonates with life threatening congenital anomalies

3/ Mothers with diabetes

4/ Mothers with hypertension prior to onset of pregnancy.

5/ Mothers with any disease like Urinary tract infection or any other medical disease evolving during the course of pregnancy other than those as a complication of pregnancy itself (e.g PIH)

6/ Mothers with any chronic disease or on any long term medications

7/ COVID-19 positive pregnant women

8/ llliterate mother who did not have any primary education

9/ Mothers who were in lower(V) socio economic strata according to modified Kuppuswamy socio economic scale 2020

Neonates were enrolled at birth. Verbal consent was obtained from mothers. Institutional ethics committee clearance was obtained. Gestational age was calculated from maternal LMP or New ballard score was done if it was not available. Birth weight was taken in an electronic weighing scale with an accuracy of ±5 gm and appropriateness of weight, small for gestational age or large for gestational age was determined by plotting in Fenton's chart. Socio economic status was calculated using modified Kuppuswamy socio economic scale 2020.

Variables studied included

1/ Factors studied in cases and controls were

a)   Pregnancy induced hypertension (PIH)

b)   Parity

c)   Premature rupture of membrane(PROM)

d)   Fetal distress

e)   Premature delivery

f)   Gender of the baby

g)   Maternal age

h)   Ethnicity

i)   Appropriateness for Gestational Age

STATISTICAL METHODS : The data obtained was tabulated and analysed statistically using social science system version SPSS.16

IV. RESULTS AND OBSERVATIONS:
FIGURE 1: DISTRIBUTION OF BABIES ACCORDING TO THEIR BIRTH WEIGHT
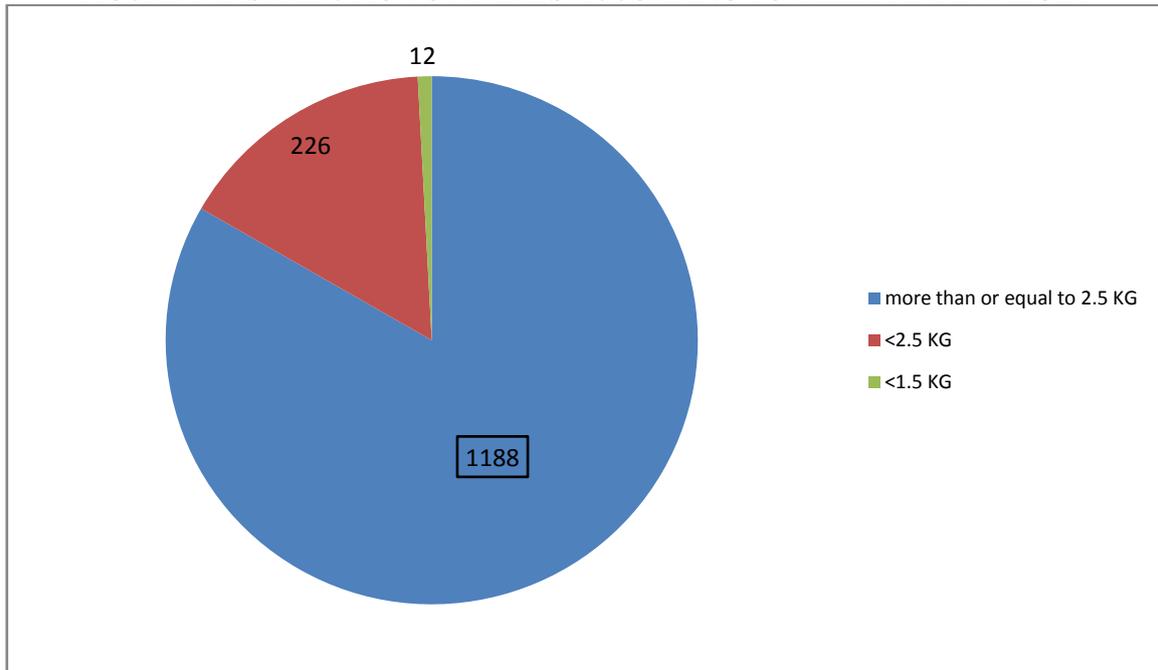
Total 1426 babies were enrolled in the study of which 1188(83.3%) were more than or equal to 2.5 kg, 226(15.8%) babies were low birth weight and 12(0.8%) babies were very low birth weight. Incidence of low birth weight was 16.7%(238 out of 1426). 748(52%) babies were male and 678(48%) babies were female.

FIGURE 2: DISTRIBUTION OF BABIES ACCORDING TO GESTATIONAL AGE
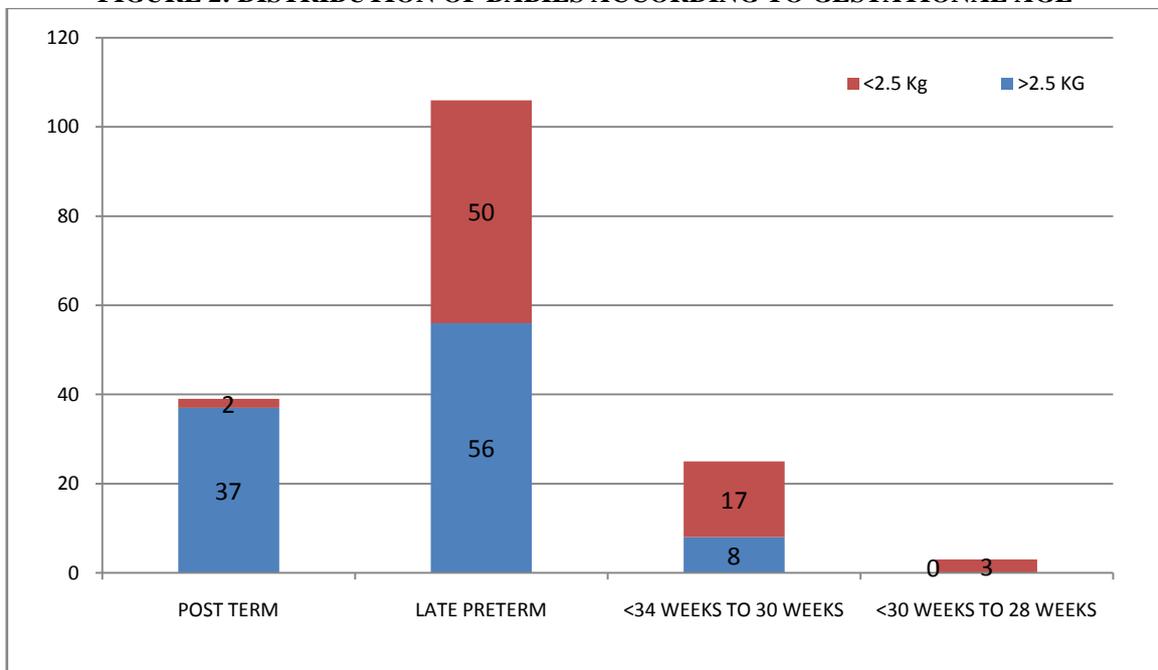
Out of the babies born during the study period 1254(88%) were term, 39(2.7%) were post term, 106(7.4%) were late preterm, 25(1.7%) were in the group less than 34 weeks to 30 weeks and 3(0.2%) babies were less than 30 weeks. 47%(50 out of 106) of late preterm, 68%(17 out of 25) of babies between < 34 weeks to 30 weeks , 100% babies less than 30 weeks were low birth weight

TABLE 1: COMPARISON OF MATERNAL AND FETAL FACTORS IN NORMAL AND LOW BIRTH WEIGHT BABIES

VARIABLES	SUBGROUPS	<2.5 KG n=238	≥2.5 KG n=1188	P value
PARITY	PRIMIPARA	158(66%)	669(56%)	**0.004**
	MULTIPARA	80(34%)	519(44%)	
PREMATURE RUPTURE OF MEMBRANE	PROM POSITIVE	71(30%)	189(16%)	**0.000**
	PROM NEGATIVE	167(70%)	999(84%)	
PIH	PRESENT	48(20%)	78(6.5%)	**0.000**
	ABSENT	190(80%)	1110(93.5%)	
GENDER OF BABY	MALE	123(51.6%)	625(52.6%)	0.784
	FEMALE	115(48.4%)	563(47.4%)	
MATERNAL AGE	≤19 YEARS	1(0.4%)	10(0.8%)	0.104
	20- 25 YEARS	55(23.1%)	261(22%)	
	26 – 30 YEARS	90(37.8%)	506(42.5%)	
	31- 35 YEARS	62(26%)	320(26.9%)	
	>35 YEARS	30(12.6%)	91(7.6%)	
PREMATURITY	TERM	162(68%)	1131(95.3%)	**0.000**
	PRETERM	76(32%)	57(4.7%)	
ETHNICITY	ASSAMESE	199(83.6%)	995(83.7%)	0.199
	TEA TRIBE	12(5%)	35(2.9%)	
	OTHERS	27(11.3%)	158(13.2%)	
APPROPRIATENESS OF GESTATIONAL AGE	AGA	48(20.2%)	1126(94.7%)	**0.000**
	SGA	190(79.8%)	42(3.5%)	
	LGA	0	19(1.5%)	

Analysis of the data showed parity(0.0.004), premature rupture of membrane(p=0.000), pregnancy induced hypertension(p=0.000), prematurity (p=0.000) and underweight for gestational age(p=0.000) had significant correlation with low birth weight babies whereas gender of the baby (p=0.784), maternal age (p=0.104) and ethnicity (p=0.199)did not have any significant correlation with low birth weight babies.

In our study 158 (66%) low birth weight babies were born to primi-gravid mothers and 80 (34%) were born to multiparous mothers.

Premature rupture of membrane (PROM) had significant correlation with low birth weight babies. 30%(71 out of total 238) mothers who delivered low birth weight babies had premature rupture of membrane as compared to 16% (189 out of total 1188) mothers who delivered babies more than or equal to 2.5 kg.

Pregnancy induced hypertension (PIH) had significant correlation with low birth weight babies(p=0.000). 20%(48 out of total 238) mothers who delivered low birth weight babies had PIH as compared to 6.5% (78 out of total 1188) mothers who delivered babies more than or equal to 2.5 kg.

In our study we did not find gender of the baby having any significant correlation with low birth weight. 51.6%(123 out of total 238) low birth weight babies were males and 48.4% (115 out of total 238) were females. Whereas , 52.6%(625 out of total 1188) babies with weight ≥2.5 KG were males and 47.4% (563 out of total 1188) were females.

Parity of mothers was found to have significant correlation with low birth weight babies (p=0.004%). Out of the mothers who delivered low birth weight babies 66%(158 out of total 238) were primigravid and 34% (80 out of total 238) were multiparous .Whereas out of the mothers who delivered babies with birth weight more than or equal to 2.5 kg 56%(669 out of total 1188) were primigravid and 44% (519 out of total 1188) were multiparous..

We did not find maternal age having any significant correlation with low birth weight babies (p=0.104%).Out of the mothers who delivered low birth weight babies 0.4%(1 out of total 238) were ≤19 years, 23.1% (55 out of total 238) were between 20 to 25 years, 37.8% (90out of total 238) were between 26 to 30 years, 26% (62 out of total 238) were between 31 to 35 years and 12.6% (30 out of total 238) were more than 35 years old. Similarly, out of the mothers who delivered babies with weight more than or equal to 2.5 kg 0.8%(10 out of total 1188) were ≤19 years, 22% (261 out of total 1188) were between 20 to 25 years, 42.5% (506 out of total 1188) were between 26 to 30 years, 26.9% (320 out of total 1188) were between 31 to 35 years and 7.6% (91 out of total 1188) were more than 35 years old.

Prematurity had significant correlation with low birth weight babies(p=0.000). 32%(76 out of total 238) low birth weight babies were premature as compared to 4.7% (57 out of total 1188) babies who were more than or equal to 2.5 kg.

We did not find ethnicity to have any significant correlation with low birth weight babies (p=0.199%). Out of the mothers who delivered low birth weight babies 83.6%(199 out of total 238) were from Assamese speaking communities, 5% (12 out of total 238) were from tea tribes and 11.3% (27 out of total 238) were from other communities. Whereas out of the mothers who delivered low birth weight babies 83.7%(995 out of total 1188) were Assamese, 2.9% (35 out of total 1188) were from tea tribe community and 13.2% (158 out of total 1188) were from other communities.

Underweight for gestational age had significant correlation with low birth weight babies(p=0.000). 79.8%(190 out of total 238) low birth weight babies were small for gestational age as compared to 3.5% (42 out of total 1188) babies who were more than or equal to 2.5 Kg.

TABLE 2: COMPARISON OF MATERNAL AND FETAL FACTORS IN NORMAL AND LOW BIRTH WEIGHT BABIES

VARIABLES	SUBGROUPS	<2.5 KG n=238	≥2.5 KG n=1188	P value
FETAL DISTRESS	PRESENT	45(19%)	148 (12.4%)	**0.008**
	ABSENT	193(81%)	1040 (87.6%)	

We found that fetal distress had significant correlation with low birth weight in babies(p=0.008). 19%(45 out of total 238) low birth weight babies had fetal distress as compared to 81% (193 out of total 1188) babies who were more than or equal to 2.5 Kg.

V. DISCUSSION:

In our study we have tried to find out various determinants and incidence of low birth weight in healthy literate mothers belonging to middle income socio-economic strata with no significant medical illness. Total 1426 babies born during the study period were enrolled in the study out of which 238 were low birth weight. Incidence of low birth weight was found to be 16.7%. The incidence of low birth weight in our study matches the present prevalence of low birth weight in India [4]. Nijamuddin khan et al in their study have mentioned that the prevalence of LBW has decreased from 20.4% to 16.4% (95% CI 16.1 -16.8%). It is found that globally 15%- 20% of all births are low birth weight [5].

In the study population 0.8%(12 out of 1426) of total babies were very low birth weight and 5% (12 out of 238) were low birth weight. According to recent study percentage of very low birth weight among low birth weight babies was found to be 20% [6]. Less percentage of very low birth weight in our study population may be attributed to good antenatal care, literacy of mothers and stable socio-economic status of the mothers.

In our study 748(52%) babies were male and 678(48%) babies were female. As per Census 2011 in India there is 943 females per 1000 males. That is 51.5 % of the population is males and 48.5 % is females[7]

Preterm babies are babies born before 37 weeks of pregnancy or fewer than 259 days of gestation. Late preterm are babies born between 34 weeks to < 37 weeks of gestation[8]. Out of the babies born during the study period 1254(88%) were term, 39(2.7%) were post term, 106(7.4%) were late preterm, 25(1.7%) were in the group less than 34 weeks to 30 weeks and 3(0.2%) babies were less than 30 weeks. 47%(50 Out of 106) of late preterm, 68%(17 out of 25) of babies between < 34 weeks to 30 weeks , 100% babies less than 30 weeks were low birth weight.

In our study 18.2%(260 out of 1426 babies) had premature rupture of membrane(PROM). The incidence of PROM ranges from 5% to 10% of all deliveries[9] . Premature rupture of membrane (PROM) had significant correlation with low birth weight. We found that 30%(71 out of total 238) mothers who delivered low birth weight babies had premature rupture of membrane as compared to 16% (189 out of total 1188) mothers who delivered babies more than or equal to 2.5 kg. Kang Sook Lee et al in their study have found 14.5% of low birth weight babies had premature rupture of membrane[10]. 70% cases of PROM occur in term pregnancies but in referral centres upto 50% cases may occur in preterm deliveries[9]. The proportion of PROM was higher in our study. This can be attributed to stress, anxiety and problems faced by pregnant women during the COVID-19 pandemic during the study period.

Our study showed pregnancy induced hypertension (PIH) to have significant correlation with low birth weight babies(p=0.000). 20%(48 out of total 238) mothers who delivered low birth weight babies had PIH as compared to 6.5%% (78 out of total 1188) mothers who delivered babies more than or equal to 2.5 kg. Latifah A Rahman et al in their study have also found a strong association of PIH with LBW babies. Incidence of PIH was 5 times higher in low birth weight babies[11]

We did not find gender of the baby having any significant correlation with low birth weight. 51.6%(123 out of total 238) low birth weight babies were males and 48.4% (115 out of total 238) were females.

Whereas 52.6%(625 out of total 1188) babies with weight ≥2.5 kg were males and 47.4% (563 out of total 1188) were females. Previous studies have found that the prevalence of LBW babies was higher in female babies[4]. But we did not find any association of gender with low birth weight. From this we may draw the inference that the association of gender of the baby with low birth weight may be influenced by other factors like geographical area, race and ethnicity.

We did not find maternal age having any significant correlation with low birth weight babies (p=0.104%).Out of the mothers who delivered low birth weight babies 0.4%(1 out of total 238) were ≤19 years, 23.1% (55 out of total 238) were between 20 to 25 years, 37.8% (90out of total 238) were between 26 to 30 years, 26% (62 out of total 238) were between 31 to 35 years and 12.6% (30 out of total 238) were more than 35 years old. Whereas out of the mothers who delivered babies with weight more than or equal to 2.5 kg 0.8%(10 out of total 1188) were ≤19 years, 22% (261 out of total 1188) were between 20 to 25 years, 42.5% (506 out of total 1188) were between 26 to 30 years, 26.9% (320 out of total 1188) were between 31 to 35 years and 7.6% (91 out of total 1188) were more than 35 years old. Previous studies have found thatmothers at younger and older age range are at increased risk of having LBW[12]. Fraser et al in their study has found mothers under 20 years were at increase risk of having LBW child. But their study population was limited to Utah[13]. So the association of maternal age with low birth weight can be influenced by race and ethnicity.

Prematurity has been found to have a significant correlation with low birth weight babies(p=0.000). In our study 32%(76 out of total 238) low birth weight babies were premature as compared to 4.7% (57 out of total 1188) babies who were more than or equal to 2.5 kg. Low birth weight is strongly correlated with prematurity[14]

We did not find ethnicity to have any significant correlation with low birth weight babies (p=0.199%). Out of the mothers who delivered low birth weight babies 83.6%(199 out of total 238) belonged to the Assamese speaking communities, 5% (12 out of total 238) belonged to tea tribes and 11.3% (27 out of total 238) were from other communities. Similarly, out of the mothers who delivered normal birth weight babies 83.7%(995 out of total 1188) were Assamese, 2.9% (35 out of total 1188) were from tea tribe community and 13.2% (158 out of total 1188) were from other communities. Richard –Edwards et al in their study have found ethnicity to have association with low birth weight. Low birth weight babies were higher in African American women as compared to white mothers[15]. But in our study we did not find ethnicity to have any correlation with low birth weight in our population.

Small for gestational age is birth weight less than 10th centile for gestational age. Large for gestational age is birth weight more than 90th centile for gestational age Small for gestational age had significant correlation with low birth weight babies(p=0.000)in our study. 79.8%(190 out of total 238) low birth weight babies were small for gestational age as compared to 3.5% (42 out of total 1188) babies who were more than or equal to 2.5 kg. This showed that most of the babies who were low birth weight had intrauterine growth restriction. In our study, 79.8% low birth weight babies were small for gestational age and 32% of low birth weight babies were preterm. Thus, IUGR was a major cause of low birth weight babies. Existing literature has shown that the risk of being low birth weight was five times higher among preterm babies as compared to term babies. The incidence of IUGR among term babies was 3.79% while the incidence was 19.84% among preterm babies[16]. A study in Auckland showed that Indian mothers were at higher risk for SGA babies. This can be attributed to pregnancy induced hypertension during pregnancy[17].

Parity is defined as the number of previous deliveries after 20 weeks of gestation. Parity of mothers was found to have significant correlation with low birth weight babies (p=0.004%). Out of the mothers who delivered low birth weight babies 66%(158 out of total 238) were primigravida and 34% (80 out of total 238) were multipara .Whereas out of the mothers who delivered babies with birth weight more than or equal to 2.5 kg 56%(669 out of total 1188) were primigravida and 44% (519 out of total 1188) were multipara. Prakash Shah et al in their study have also found nulliparity to be strongly associated with low birth weight and multiparity was not associated with increased risk of low birth weight[18]. Studies done earlier have cited that lower birth weight among first born infants may be a direct consequence of physiological conditions associated with nulliparity. It has been hypothesised that the first pregnancy primes the body and with each subsequent pregnancy the body becomes more efficient[19]. But it is equally important to maintain a gap of 3 years between two subsequent pregnancies to deliver a healthy baby.

In our study we found that fetal distress had significant correlation with low birth weight babies(p=0.008). 19%(45 out of total 238) low birth weight babies had fetal distress as compared to 81% (193 out of total 1188) babies who were more than or equal to 2.5 kg. Fetal distress was an important cause of emergency Caesarean section and premature deliveries. G Singh et al in their study have found the incidence of fetal distress was high in low birth weight babies but their result was not statistically significant[20].

Previous studies have shown that incidence of low birth weight was higher in illiterate mothers, women with chronic medical diseases and mothers belonging to lower socio-economic strata. So in this study we have excluded the illiterate mothers, mothers with any medical disease during or prior to the onset of pregnancy,

women on any long term medications and mothers belonging to lower socioeconomic group. Our study is the first study which was done in healthy subjects with no medical illness other than the complications arising as a consequence of pregnancy itself. We have found that among the factors which were most commonly associated with low birth weight parity, premature rupture of membrane, pregnancy induced hypertension, prematurity and underweight for gestational age had significant correlation with low birth weight babies whereas, gender of the baby, maternal age and ethnicity did not have any significant correlation with low birth weight babies. However, the incidence of very low birth weight was very low as compared to previous studies.

Our study has one limitation, that is, a little less than half of our study period was during the COVID 19 pandemic. The anxiety, stress of the pandemic and relatively decreased antenatal care during the pandemic might have an impact on the maternal and fetal health. But more than half of our study period was prior to the start of the pandemic and we believe that it has minimized the effects of the pandemic on our study as the results are similar to most other studies done previously.

VI. CONCLUSION:

Illiteracy, chronic medical diseases and lower socio-economic status is most commonly associated with low birth weight. In our study we tried to find out whether the risk factors associated with low birth weight will have similar association in healthy, literate mothers belonging to middle socio-economic strata with no illness during or prior to the onset of pregnancy. We have found that among the factors which were most commonly associated with low birth weight, parity, premature rupture of membrane, pregnancy induced hypertension, prematurity and underweight for gestational age had significant correlation with low birth weight babies whereas gender of the baby, maternal age and ethnicity did not have any significant correlation with low birth weight babies. Thus, the risk factors like parity, premature rupture of membrane, PIH, prematurity, small for gestation age associated with low birth weight are independent of the risk factors like literacy, socioeconomic status, chronic illness of the mother. However, the incidence of very low birth weight was very low as compared to previous studies. Intrauterine growth restriction was most commonly associated with low birth weight. So proper antenatal and perinatal care is required in all pregnant women to prevent delivery of low birth weight babies and the adverse consequences associated with LBW babies. Nevertheless, the importance of literacy among mothers, healthy livelihood and good nutrition and care cannot be overlooked as it can prevent low birth weight to a great extent and have a significant impact on reducing infant mortality and morbidity.

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