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Pediatrics

A Comparative Study of Factors Influencing Low Birth Weight among Neonates Admitted in Government General Hospital, Kakinada

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Abstract **Original Research Article**

Birth weight is the single most important marker of adverse perinatal, neonatal and infantile outcome. A cross sectional study was conducted to analyse the risk factors for low birth weight among mothers who delivered low birth weight babies and Normal birth weight babies and their statistical significance.80 cases of mothers having low birth weight babies (Group A) and 40 cases of mothers having normal birth weight babies (Group B) in GGH Kakinada were included in the study. Factors like age, parity, height <145 cm, pre pregnancy weight <40 Kg, total weight gain during pregnancy, pregnancy induced hypertension (PIH), urinary tract infection (UTI), bleeding per vagina and premature rupture of membranes (PROM) were considered in this study. Among the factors effecting low birth weight PIH, UTI, Weight gain during pregnancy which are known factors influencing birth weight had statistical significance in this present study. Out of 80 cases (Group A) 61(76.25%) had correlation of birth weight with total weight gain during pregnancy with a P value of <0.02, 27(33.75%) of Group A had correlation of birth weight with PIH with a P value of<0.001 and 13(16.25%) of Group A had correlation of birth weight with UTI.

Keywords*:* Birth weight, perinatal, neonatal, infantile.

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INTRODUCTION

Most of the factors influencing low birth weight are preventable and created interest in the study of those factors. Low birth weight is also a major determinant of malnutrition during infancy. It is estimated that in a developing country, low birth weight infants have 2-3 times increased risk of mortality due to infections compared to normal birth weight babies .The neurodevelopmental sequelae of birth asphyxia are 3 times in low birth weight babies compared to their counter parts [1, 2, 4].

Prevention of low birth weight is possible by taking steps at various stages in the antenatal period [5]. A low birth weight new born May be a premature, term, small for dates, post term or multiple foetuses.

The known causes of prematurity include poor socioeconomic status, low maternal weight, acute and chronic systemic maternal disease, antepartum hemorrhage, cervical incompetence, maternal genital colonization, infections, cigarette smoking during pregnancy, threatened abortion, acute emotional stress, physical exertion, sexual activity, trauma, bicornuate uterus, multiple pregnancies and congenital malformations. Premature births are relatively common among very young and unmarried mothers. Inter-pregnancy interval of less than 13 months is associated with increased risk of giving birth to low birth weight (lbw) babies. Pre pregnancy maternal weight of less than 40 kgs & maternal height of less than 145 cms are associated with significant risk of low birth weight babies [1].

Pregnancy induced hypertension, toxemia of pregnancy and post maturity are important causes of foetal growth retardation [1]. Hypertension, chronic heart disease especially when associated with Cardiac failure, renal disease, Diabetes mellitus & sickle cell disease are associated with poor foetal growth. Malaria, tuberculosis, urinary tract infections and recurrent diarrhoea during pregnancy are recognised correlates of foetal growth retardation.

Aim & objectives

- To analyse the risk factors for low birth weight
- To probe whether those risk factors are present in the mothers of normal birth weight babies to any significant level.

MATERIALS & METHODS

It is a cross sectional study done on mothers with low birth weight babies & normal birth weight babies with sample size of 80 and 40 respectively and designated as Group A and Group B respectively. We recorded birth weight of neonate, weight and height of mothers, antenatal history, antenatal risk factors, Intrapartum history, PROM, past medical and surgical history and personal history.

Statistical methods adapted

The arithmetical mean, standard deviation, Chi-square test, coefficient of correlation, computation of Regression line, t-test were calculated for Group A & Group B. SPSS software used.

OBSERVATIONS

Table-I: Relative proportions of maternal risk factors

Parameters considered	Among mothers of low birth weight babies (Group A) n = 80		Among mothers of normal birth weight babies (Group B) n = 40	
	Percentage	Frequency	Percentage	Frequency
Age below 20years	32.5%	26	35%	14
Above 35 years	1.25%	1	0	0
Primi parity	66.25%	53	80%	32
Para >4	0	0	0	0
Height <145cms	52.5%	42	12.5%	5
Prepregnancy weight in Kg<40	30%	24	2.5%	1
Total weight gain during pregnancy<7Kg	76.25%	61	2.5%	1
PIH	33.75%	27	5%	2
UTI	16.25%	13	0%	0
Bleeding per vagina	7.5%	6	2.5%	1
PROM	8.75%	7	0%	0

Table –II: Comparison of group mean values of parameters measured between Groups a (mothers of low birth weight babies) and Group B (mothers of normal birth weight babies)

Parameter	Group –A (n =80) Mean birth weight of babies is 2005 gm	Group –B (n = 40) Mean birth weight of the babies is 2847.5gm	"t" value	"p" value
Mean maternal age in years	20.78 S.D ± 3.45	20.1 S.D ± 2.15		
Mean maternal weight in kgs	44.58 S.D ±7.85	51.3 S.D + 7.0		
Mean maternal weight gain during pregnancy in kgs	6.75 S.D ± 0.70	9.15 S.D + 1.5	11.08	<0.001
Mean maternal height in cms	144.9 S.D ± 7.29	154.03 S.D + 6.0	6.60	<0.001
Mean parity	1	1		
Mean interval between pregnancy in months	18 months	22 months		

Table–III: Risk factors their chi square value and P value (chi square test)

Risk factors	X^2		P value	
	Group A	Group B	Group A	Group B
Maternal height	9.15	25.74	<0.05	<0.001
Weight gain during pregnancy	8.44	8.81	<0.02	<0.02
PIH	37.51	0.70	<0.001	<0.1
UTI	15.79	<0.001		

Frequency polygon

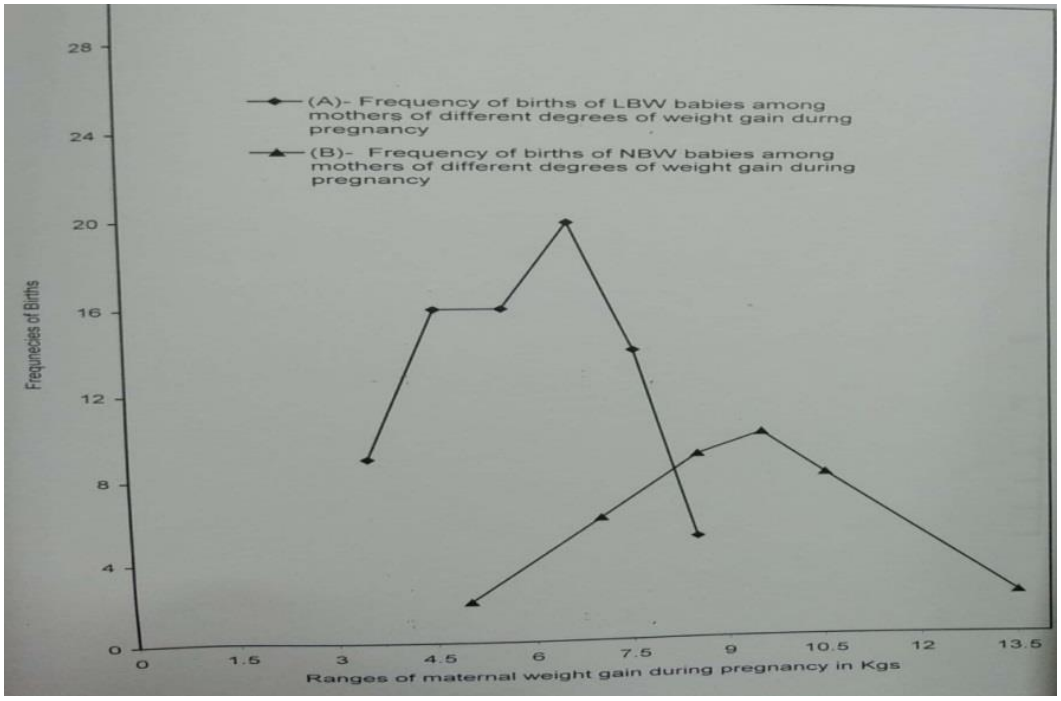

Fig-1: Comparison of frequencies of births for maternal weight gain ranges of LBW and NBW babies

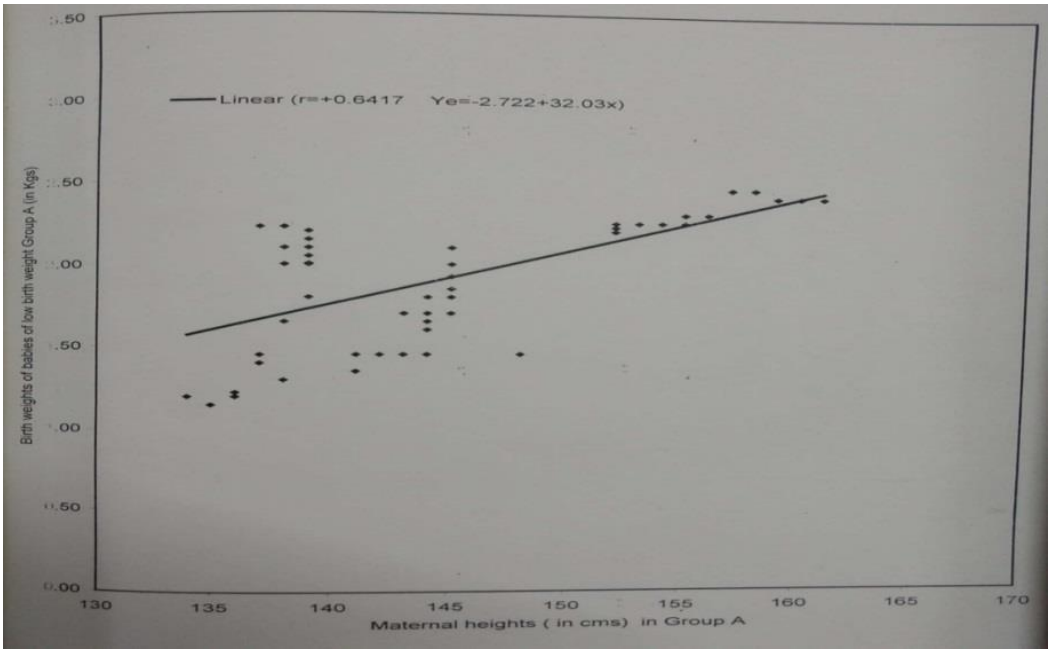

Fig-2: Scatter diagram with regression line showing relation between maternal height and birth weight of babies in Group A (n=80)

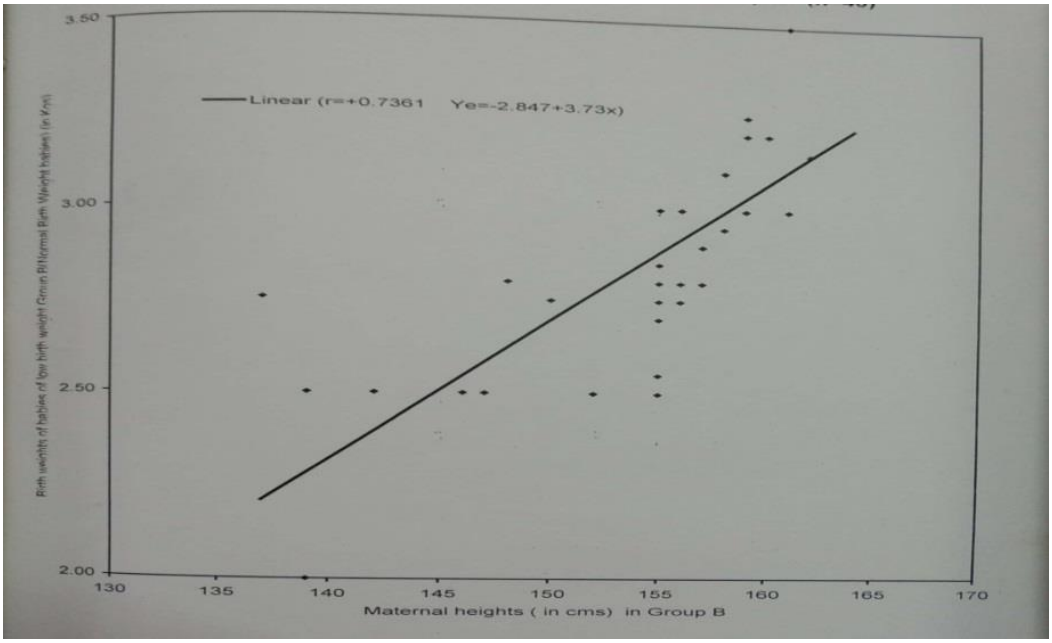

Fig-3: Scatter diagram with regression line showing relation between maternal height and birth weight of babies in Group B(n=40)

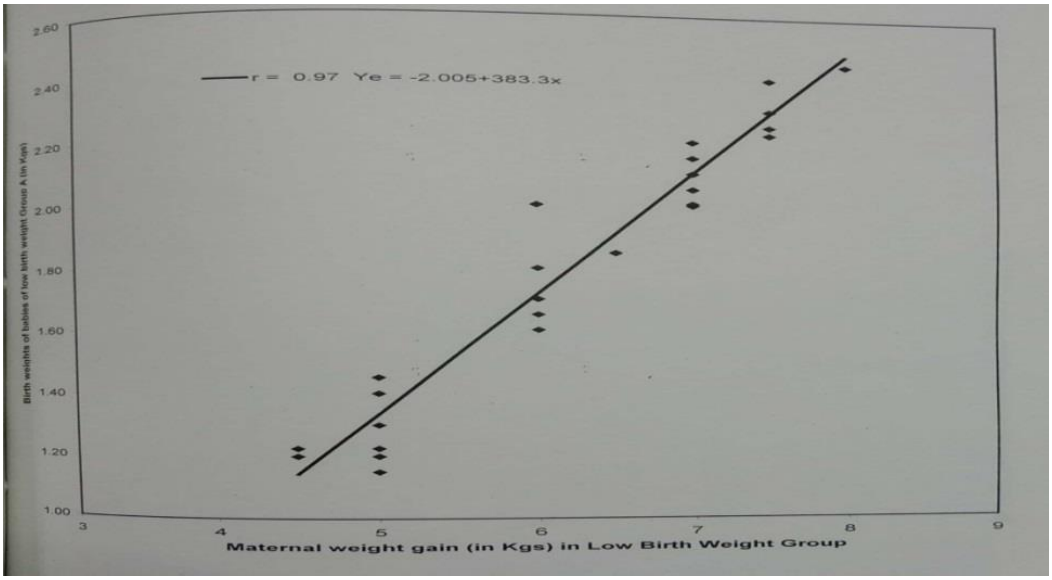

Fig-4: Scatter diagram with regression line showing correalation between total maternal weight gain during pregnancy and birth weight of babies in GroupA (n=80)

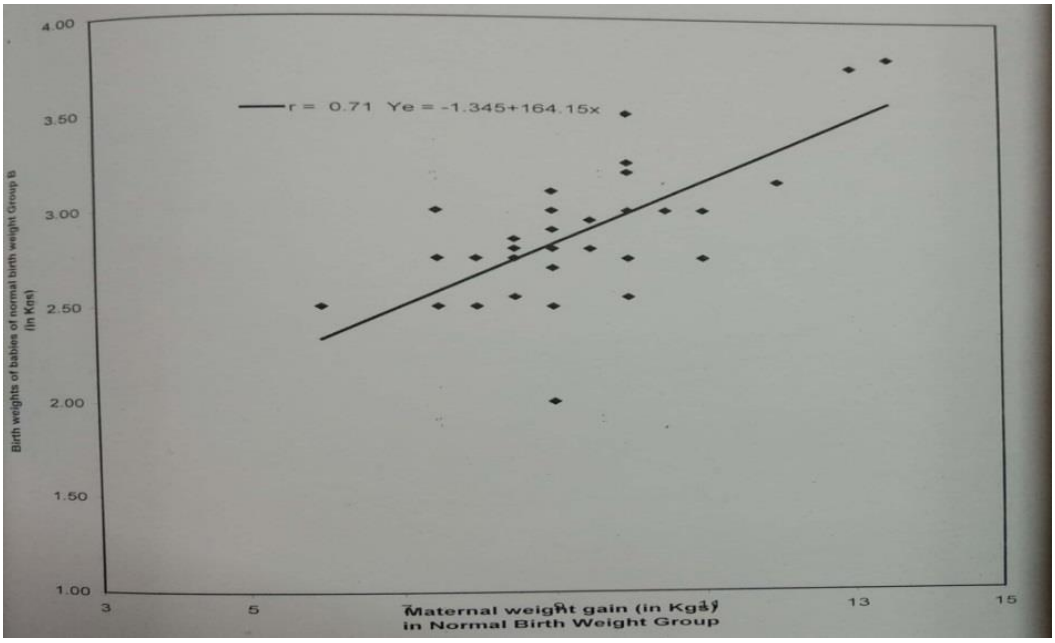

Fig-5: Scatter diagram with regression line showing correlation between total maternal weight gain during pregnancy and birth weight of babies in Group- B

RESULTS

The study was undertaken in two groups of women Group -A and Group – B depending on the birth weight of neonates. The relationships between birth weights of the babies & frequencies of various risk factors were analysed by Chi-square test.

The Chi-square value for relation between maternal height ranges and frequencies of birth weights of babies for Group A is 9.15 with 'p 'value of 0.05 which is significant ,for group B is 25.74 with a 'p' value of <0.001 which is highly significant .The Chi-square value for relation between birth weight of babies and Pregnancy induced hypertension is in Group A 37.50 and 'p' value is <0.001,which is highly significant .Relation between birth weight of babies and PIH in Group B is <0.1 which is insignificant.

The Chi-square value for relation between birth weight of babies and urinary tract infections in Group A is 15.79 and 'p' value is <0.001, which is highly significant .there are no cases of urinary tract infections in group B and hence the Chi-square is not determined .The Chi-square value for relation between birth weight & their frequencies in different maternal weight gain ranges in Group A is 8.44 and 'p' value is <0.02 which is significant. For Group B is 8.881 and 'p' value is <0.02 which is significant.

Where the parameters could be measured quantitatively that is maternal height, weight, total weight gain during pregnancy and also age, group mean values of the same for the both the groups A & B are represented in Table II .The significance or otherwise the differences in parameters of the 2 groups of mothers is verified by 't' test .The 't' values and respective 'p' values are shown in table II comparing the mean values of both groups. The results show statistically highly significant p <0.001 for weight gain difference and P value <0.001 for maternal heights which is also significant in the two groups

For ready comparison of relative proportions of risk factors within a group and to value compare the same between the 2 groups, the relative proportions of risk factors considered individually are presented in numbers and percentages. The significance of variation of neonatal birth weight if any with measured values each of maternal height ,weight and weight gain during pregnancy were tested for both groups by determining coefficient of correlation (r) values and presented by means of scatter diagrams with regression lines.

Frequency polygon shows graphically the frequency distribution of birth weights of babies among mothers with different degrees of weight gain during pregnancy. Frequency distribution polygon line-A reveals highest number of births of low birth weight babies for the mothers who gained weight between 6-7 Kgs. As per the frequency distribution polygon line-B, among normal birth weight baby group, most mothers gained weight between 9-10 Kgs.

DISCUSSION

The present study, explores the role of the following risk factors in the birth of low weight babies. The risk factors considered in this study are maternal age, parity, interval between pregnancies, height, weight gain during pregnancy, pregnancy induced hypertension, urinary tract infection, bad obstetric history, bleeding per vagina, premature rupture of membranes and heart disease in the mother.

Different workers studied variable combinations of risk factors. Sushma Malik et al got good statistically significant correlations for age, parity, antenatal clinic visits (ANC), height and weight. Nural Amin et al correlation was found with parity and pre-pregnancy weight, but no correlation with maternal age, cast and educational status. Siddhis Hirve *et al.* showed correlation with parity, age, inter pregnancy interval, anaemia with Hb level < 9g/100ml, pre-pregnancy weight below 40 kgs, height less than 145 cms and gestational duration less than 37 weeks. J.S. Deshmukh *et al*. found good correlation with parity, birth interval, Hb level, weight gain, and height & tobacco exposure and low socio economic status. D.K. Agarwal *et al.* studied exclusively on the effect of weight gain during pregnancy and the results were statistically significant. Theodore Kamaladoss *et al*. also studied the effect of parity age and pre pregnancy weight. They got statistically significant result with pre pregnancy weight. Mothers with gestational weight <50kgs had low birth weight babies. K. Dhall *et al*. focussed their attention on the effect of pregnancy induced hypertension on birth weight. They also got good correlations with maternal age <20yr, parity, maternal height and pre-pregnancy maternal weight.

Correlations could not be established in the present study with maternal age, pre pregnancy weight and parity. Significant relationships are established between birth weight of babies and maternal height, weight gain during pregnancy, pregnancy induced hypertension and urinary tract infections.

Short stature affects the birth weight of the baby through its effect on the volume of the pelvis. A small woman is likely to have a small pelvis, but at the same time, she is likely to have a small infant, Thomas, in a study of 362 primi gravid women, found the average weight of the offspring to be significantly lower (278g) in women with small pelvis than those with medium to large pelvis. In the present study 80 mothers of L.B.W neonates were studied (Group A) for significant risk factors. It is evident that in this group 52.5% or 42 women are below 145cms height. For the same parameter in group 'B' the number of women is only 5 and their percentage is 12.5. Chi-square values of 9.15 and 25.74 for group 'A' and Group 'B' respectively. Which are statistically significant with their 'p' values being <0.05 and <0.001 respectively. This means that occurrence of relation between maternal height & baby weight in both the groups is not by chance and it is truly significant statistically. The significance of variation of neonatal birth weight with maternal height is tested by correlation coefficients (r) values, since both parameters could be measured. They are +0.6417 and +0.7361 respectively for Group 'A' and Group 'B' which are significant. Thus by all means, it is statistically proven in this study that short stature is of considerable significance for low birth weight. The previous studies with the same correlation had already been mentioned. Kraemer in his widely reviewed article quoted from several studies reported a significant association between maternal height and birth weights of babies [15]. K. Dhall & Bagg's study gave significant correlation between maternal height and birth weight of babies [12].

The present study like in the work of D.K. Agarwal *et al*. showed significant correlation between maternal weight gain during pregnancy and birth weight of babies [6]. D.K. Agarwal *et al*. showed exclusively on relation between weight gain during pregnancy and perinatal and infant mortality which were the results of LBW in most cases. They say pre-pregnancy maternal nutrition and weight influenced weight gain during pregnancy [1]. In support of their findings, they quote the work of Edwards *et al*. [13]. Edwards *et al.* observed that even if underweight women have adequate total weight gain as well as adequate rates of gain in each trimester, their rates of incidence of LBW is still two fold over women with normal pre pregnancy weight. But in this study significant correlation is there with maternal weight gain during pregnancy, but not with pre pregnancy weight. 76.25% of women that is 61 out of 80 women in Group-A gained weight less than 7kgs, whereas in Group B the number of women gaining weight less than 7kgs is only one that is 2.5%(Table I). The group mean value of weight gain during pregnancy for group A is 6.75 S.D +/- 0.7, whereas for group B it is 9.15 S.D. +/- 1.5(Table 2).

The statistical significance is reinforced with significant Chi-square values, correlation coefficients and't' test 'p' values. Chi-square value is 8.44 with a significant p-value of <0.02 in Group -A. chi-square value is 8.81 with a significant p value of <0.02 in Group-B for relation between birth weight of babies to maternal weight gain during pregnancy. So in both groups the effects of weight gain during pregnancy on birth weight of the baby was established. The correlation coefficients (r) are +0.97 and +0.7, which are highly significant and suggest a positive correlation between maternal weight gain during pregnancy and birth of babies.

Pregnancy induced hypertension is the single largest cause of smallness for dates as the result of changes in the placenta [8,9]. Chi-square test with value of 37.5 and 'p' value <0.001 is statistically high for Group A. Chi-square test is not significant for group B with chi-square of 0.7 and insignificant 'p' value. That means the two women with P.I.H in groupB didn't give birth to low birth weight babies and that not giving rise to low birth weight babies is not statistically significant. Most of the women in the present study were primiparous 66.26% that is 53 out of 80. Primiparity is a well-known predisposing factor for P.I.H[10,11].

Infections of the urinary tract are the most common bacterial infections during pregnancy [14].

Bacteruria has been thought by some investigators to cause preterm labour and in turn, increased neonatal morbidity and mortality. In this study 13 out of 80 women in group A that is 16.25% had urinary tract infections whereas in group B there are none. The chi square value 15.79 with its corresponding 'p' value of <0.001 is highly significant in group A. Women <20 yrs of age are 26 out of 80 that is 32.5% in group A they are 14 out of 40 in group B that is 35%.

Primiparous woman were 53 out of 80 i.e. 66.25% in group A, where as they were 32 out of 40 i.e. 80. % in group B. As most of the women studied were primiparous, the sample was inadequate to study effect of interval between pregnancies on birth weight.

The most characteristic feature in placenta previa is the occurrence of haemorrhage without any warning and associated pain.6 cases of bleeding per vaginum simulating placenta previa clinically were observed in group A, that is 7.5% were observed, whereas there was only 1 case that is 2.5%.

There were 7 cases of premature rupture of membranes, that is 8.7% in group A and none in group B. there were 8 cases of bad obstetrics history among 80 mothers in group A and 2 cases among 40 in group B. there were 2 cases of heart disease as evidenced by heart murmur in group A, but there are none in group B. All these are statistically insignificant by chi-square test.

The overall view is the percentages of each of the risk factors were more in the group 'A' mothers when compared to Group 'B' mothers. Conversely presence of one or more of these risk factors is responsible for LBW babies Group 'A'.

Summary and Conclusion

The aim of this work is to study correlation between birth weights of babies and the various risk factors in the mothers. For this purpose two groups of women group A that is mothers of low birth weight babies and group B that is mothers of normal weight babies are studied. On comparison between Group A and Group B, the risk factors were found prominent in Group A. Statistically significant correlations were obtained between birth weight of babies and heights of mothers, weight gain during pregnancy, pregnancy induced hypertension and urinary tract infection.

Most of the literature available was to establish relation of birth weight babies with maternal age, parity, height, weight and weight gain during pregnancy. Socio economic factors and educational status were also considered.

In this present study due importance is given also to the role of pregnancy complications like pregnancy induced hypertension, urinary tract infections, bleeding per vaginum, bad obstetric history etc and statistical significance were also derived. The study got the authenticity with the incorporation of 't' test between study group and control group.

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