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Research Article

Study the Socio demographic and Maternal Variables Affecting Survival of VLBW Infants in a Tertiary Care Hospital

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Abstract: In our study done as a prospective observational study over duration of 2 years consisted of all alive VLBW babies admit to our NICU and survived at discharge. 98 VLBW babies with an incidence rate of 0.9% were involved in study. Sociodemographic and maternal variables recorded in preformed proformas. In our study more than 90% of mothers with VLBW deliveries belonged to low socio-economic status. Maternal factors affecting survival of VLBW babies constituted Anemia during pregnancy (26%) was found to the most common association with VLBW. Multiple gestation membrane 21% was the second most common risk factor associated followed by Premature rupture of which is seen in 20%. The other significant risk factors were APH (8%), previous preterm (16%) and previous VLBW deliveries (14%).
Keywords: VLBW, NICU, Survival, Sociodemographic, Maternal variables, Anemia during pregnancy.

INTRODUCTION

Socio-economic state (SES) is a concept devised to measure some aspects of education, occupation, and social prestige of a person or a social group. Studies revealed that large numbers of social-economic variables are associated with the physical development of children. These variables are consisting of parental profession, income, education [1, 2], birth order [3], family sizes [4] and urbanization [5]. VLBW is more common in low socioeconomic status class of mothers. Low SES status in responsible poor knowledge about pregnancy related issues, pre conceptional weight gain, and maternal anemia, lack of accessibility to health services which in turn act as risk factors for VLBW and preterm deliveries.

There is no indicator in human biology, which tells us so much about the past events or future trajectory of life as the weight of the newborn at birth. During the last two decades the survival of VLBW infants has significantly increased due to advances in management and improvement in the care of high risk babies and introduction of NICU. Conditions that make the uterus an unfavourable environment for fetal development may result in growth restriction and physiological adaptations to the sub-optimal intrauterine environment may be important in determining the health and survival of fetus, and the newborn infant. The highest prevalence of VLBW deliveries is observed in Africa and South East Asia. The incidence of VLBW infants is same but the percentage of survival is increasing due to advance in perinatal care. The survival rate ranges between 43% in developing countries like Jamaica to more than 90% in developed world like Netherlands, in India it is 63%[6]. The etiology of very low birth weight is multifactorial, prematurity and low socioeconomic status of mother being a major cause.

METHODOLOGY

Source of Data

All VLBW babies weighing <1500 grams and delivered between 22 and 38 weeks gestational age.

Study Design

The Descriptive and Exploratory study of all VLBW infants admitted in NICU

Inclusion Criteria

All live born Very low birth weight babies (<1500 grams) admitted in NICU within 24 hours of delivery.

Exclusion Criteria

Following babies were excluded from our study:

1. Presence of lethal congenital anamolies.
2. Death within 12 hours of life.

The study was conducted at the Neonatal Intensive Care Units of our hospital. A total of 98 VLBW babies with a gestational age between 22 and 38 weeks were included in the study. The detailed case records of the mother were obtained from the available Obstetric case records. The maternal details like demographic profile, antenatal profile, medical complications during pregnancy, definite cause of preterm labor if any, treatment profile, intranatal care and delivery outcome were collected. Mothers were screened for the presence of high risk factors leading to premature delivery like anemia, pregnancy induced hypertension, eclampsia, ante-partum hemorrhage, PROM, history of preterm birth in previous pregnancies, multiple gestations, genital tract anomalies, polyhydramnios and oligohydramnios. History regarding administration of antenatal steroids was also taken. All women with preterm labor were evaluated for the presence of anemia and infections by going through their investigation reports.

Following delivery and admission in NICU, birth weight of the baby was recorded on a digital weighing machine (± 5 grams accuracy). Gestational age of the baby was recorded by the following; first day of last menstrual period, early first trimester USG scan and clinical assessment of the newborn using New Ballard scoring system. Data regarding mode of delivery and resuscitation details at the time of delivery was collected and recorded in a prewritten neonatal proforma. Babies were categorized as small for gestational age, appropriate for gestational age and large for gestational age based on birth weight. Babies with birth weight less than 10^{th} percentile for gestational age were labeled as small for gestational age (SGA) and those with birth weight more than 90^{th} percentile for gestational age were labeled as large for gestational age (LGA). Babies were weighed daily and data was recorded.

All preterm babies were cared in open care radiant warmers. All sick babies were continuously monitored by pulse oxymeter. Babies were ventilated with neonatal ventilator or by using "Bubble CPAP" or Indigenous CPAP as and when required. Blood sampling was done and complete hemogram was obtained soon after the admission to NICU. Sepsis screening and blood culture samples were drawn before start or at change of antibiotics. Shock was diagnosed clinically and with NIBP and managed as per protocols. Babies were monitored on time to time basis for their activity and reflexes. Babies were monitored and managed for hypoglycemia and hypocalcaemia.

Respiratory distress syndrome was diagnosed clinically and based on chest radiography findings consistent with RDS together with supplementation of oxygen or mechanical ventilation therapy. BPD was diagnosed when the infant required oxygen supplementation beyond 28 days of life and showed abnormal radiological evidence. NEC was staged according to clinical and radiological criteria of Bell. Blue light was used for intensive phototherapy. Exchange transfusion was considered based on bilirubin levels and weight. Ryeles tube feeding was given to most of the babies once the baby was medically stable, mostly on the 3^{rd} day of life and enhanced rapidly once the baby started tolerating the feeds well.

Statistical Methods Applied

All variables were statistically analysed using SPSS version 16 for Windows.

Descriptive statistics

The Descriptives procedure displays univariate summary statistics for several variables in a single table and calculates standardized values. Variables can be ordered by the size of their means. In the present study descriptive statistics were calculated for individual statements as well as the total scores for each component.

Independent-Samples T Test

The Independent-Samples T Test procedure compares means for two groups of cases. Ideally, for this test, the subjects should be randomly assigned to two groups, so that any difference in response is due to the treatment (or lack of treatment) and not to other factors.

Contingency table analysis

The Crosstabs procedure forms two-way and multiway tables and provides a variety of tests and measures of association for two-way tables. The structure of the table and whether categories are ordered determine what test or measure to use.

2-way ANOVA (GLM-General Linear Model)

The GLM Univariate procedure provides analysis of variance for one dependent variable by one or more factors and/or variables. The factor variables divide the population into groups. Using this General Linear Model procedure, you can test null hypotheses about the effects of other variables on the means of various groupings of a single dependent variable. You can investigate interactions between factors as well as the effects of individual factors, some of which may be random. In addition, the effects of covariates and covariate interactions with factors can be included. All the statistical calculations were done through SPSS 16.0 (2007) for windows.

Definition of terminologies defined for the study:
Definitions [7]

Low Birth Weight (LBW) Babies: Babies with a birth weight of less than 2500 gm (upto and including 2499 gm) irrespective of the period of gestation. These include preterm small for dates and term babies.

Very low birth weight (VLBW) babies: Babies with a birth weight of less than 1500g (upto and including 1499 gm.).

Extremely low birth weight (ELBW) babies: Babies with a birth weight of less than 1000 gm (upto and including 999 gm).

Preterm: Preterm is defined as a baby with a gestational age of less than 37 completed weeks (upto 36 weeks or less than 259 days).

Term: Babies with a gestational age between 37-41 weeks are called as term babies (259-293 days).

Post term: Babies with a gestational age of 42 weeks or more are classified as post term babies (294 days or more).

Small for Dates (SFD) babies: Small for gestational age (SGA), Light for dates, intrauterine growth retardation (IUGR). Babies with a birth weight of less than 10th percentile for their gestational age are defined as SFD babies.

Appropriate-for-dates (AFD) /Appropriate-for-gestational age (AGA) babies: Babies with a birth weight between 10^{th} – 90^{th} percentiles for the period of their gestation.

Large-for-dates (LFD) babies (Large-for-gestational age (LGA), heavy-for dates): Babies with a birth weight of more than 90^{th} percentile for the period of their gestational age.

Perinatal Period: Perinatal period extends from the 28^{th} week of gestation (or more than 1000 gm) to the 7^{th} day of life (early neonatal).

Extended perinatal period: This term has been introduced recently. The period extends from 22^{nd} week of gestation (or more than 500 gm) to 7^{th} day of life.

Perinatal Mortality Rate (PMR): It is defined as late fetal plus early neonatal (first week) deaths of babies weighing more than 1000 gm (or 28^{th} weeks of gestation or more) at birth per 1000 total births weighing over 1000 gm.

$$PMR = \frac{\text{Total perinatal deaths}}{\text{Total number of births}} \text{ X } 1000$$

$$EPMR = \frac{\text{Intermediate still births + Late still births + early neonatal deaths}}{\text{Total number of births}} \text{ x } 1000$$

Neonatal Period: Neonatal period extends upto 28 days of life. Early neonatal period refers to first 7 days or 168 hours of life while late neonatal period signifies period from 7 days to 28 completed days of life.

Neonatal Mortality Rate (NMR)

Early NMR: Neonatal deaths of babies weighing over 1000 g during first 7 days per 1000 live births.

Late NMR or unspecified NMR: Neonatal deaths of babies weighing over 1000 g during 28 days of life per 1000 live births

RESULTS

Distribution of babies based on parity

The table-1 shows distribution of parity of mothers and incidence of VLBW. A total of 99 mothers were included in the study of which 6 were twin pregnancy, 2 were triplets. VLBW were more common in primipara, they contributed about 55.6% of VLBW deliveries where as multipara contributed about 41.4%. Only 3 percent were grand multipara.

Interval between pregnancies

The table-2 shows that the average interval between previous pregnancy and present pregnancy was 2.3 years

Age of mothers

The table-3 shows that VLBW babies were common in the age group of 18-30 years (about 98%). Mean maternal age was 23.02 years

Educational status of mothers

Table-4 shows 41.4 percent mothers were illiterate, whereas 58.6% mothers were educated.

Employment status of mothers:

More than 90% of mothers in our study were either house wives or unskilled workers. Only 4% were professional skilled workers (Table-5).

Socio-economic status of mothers

Table-6 states that majority 90.0 belonged to class IV Kuppu swamy socio-economic class. As mothers who utilize our hospital service are from low socioeconomic status.

Status of pregnancy

91% of the mothers had antenatal visits. 9% of the mothers were unbooked cases in respective groups (Table-7).

Mode of delivery:

Most of the deliveries were vaginal deliveries. 90% by vaginal delivery (Table-8).

Maternal risk factors contributing to VLBW:

The maternal risk factors leading to VLBW deliveries are shown in the above table. Anemia during pregnancy 26% was found to the most common association with VLBW. Premature rupture of membrane 20% was the next most common risk factor associated . The other most significant factor associated is multiple gestation which is seen in 21% . The other significant risk factors are APH 8%, previous preterm 16% and previous VLBW deliveries 14% (Table-9).

Table 1: Parity and VLBW

Parity		
	No. of cases	**Percentage**
Primipara	55	55.6
Multipara	41	41.4
Grand multipara	3	03.0
Total	99	100

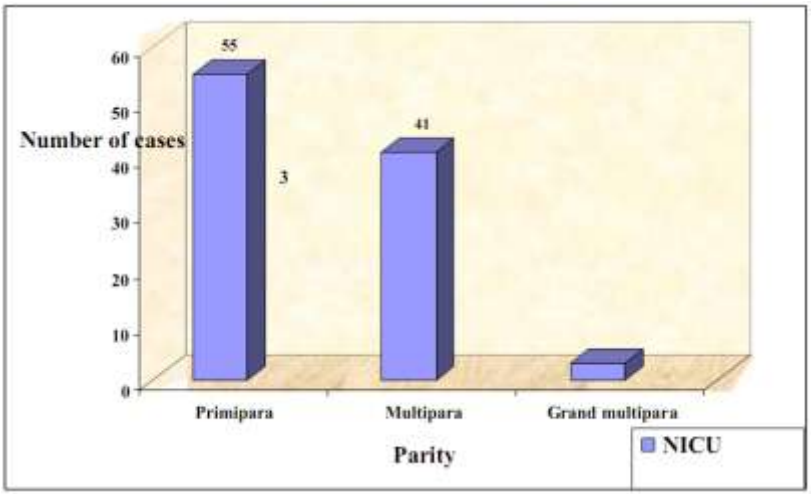

Fig-1: Parity and VLBW

Table 2: Interval between pregnancies

		No. of cases	**Mean**
INTERVAL	NICU	40	2.3500

Table 3: Age of mothers and incidence of VLBW deliveries

Age group (years)	NICU	
	No. of cases	**Percentage**
<18	0	0
18-30	95	96
31-35	3	3
>35	1	1
Total	99	100

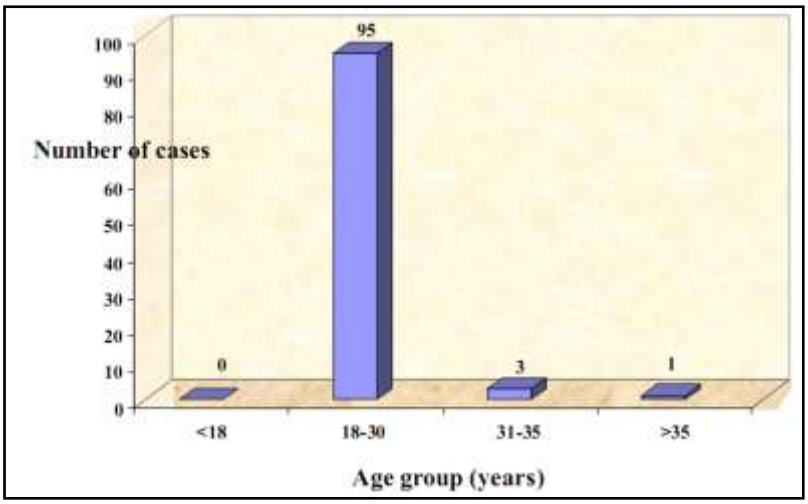

Fig-2: Age of mothers and incidence of VLBW deliveries

Table 4: Educational status of mothers

Educational status		
	No. of cases	Percentage
Illiterate	41	41.4
Primary school	20	20.2
Secondary school	35	35.4
Graduation	3	3
Total	99	100

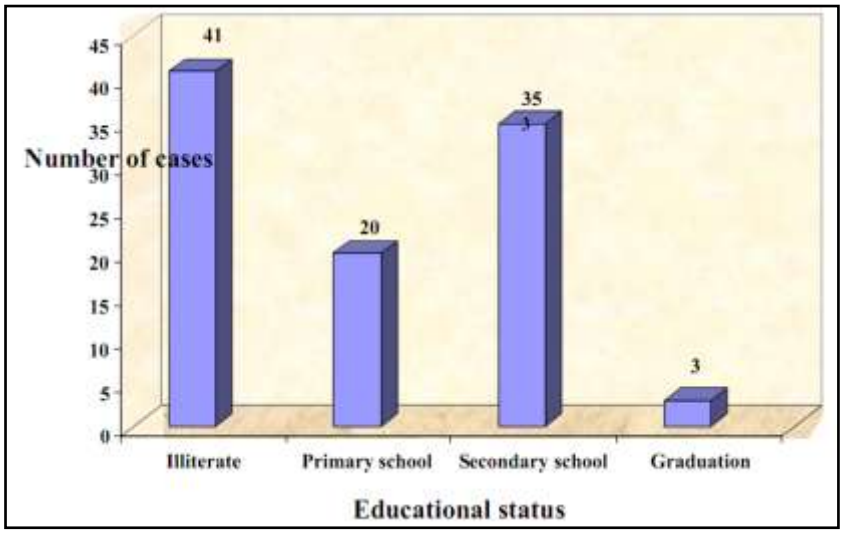

Fig 4: Educational status of mothers

Table 5: Employment status of mothers

Employment status		
	No. of cases	Percentage
Employed	4	4
Unemployed	95	96

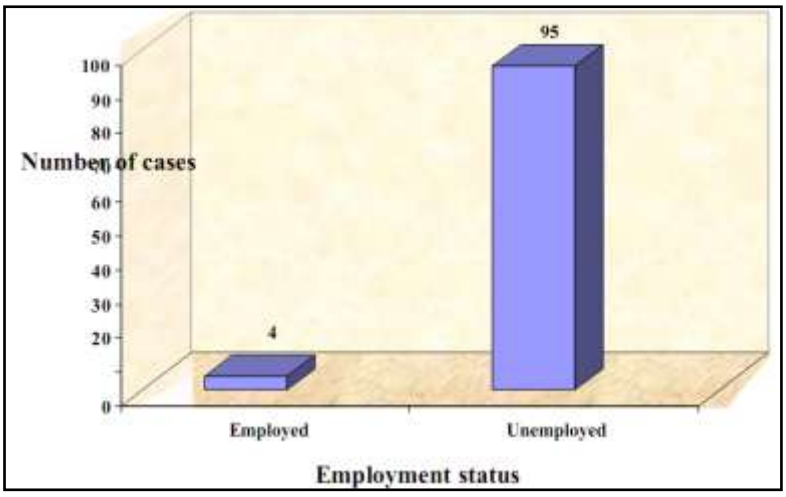

Fig 4: Employment status of mothers

Table 6: Socio-economic status of mothers

Social class		
	No. of cases	Percentage
I	0	0
II	0	0
III	6	6.1
IV	90	90.9
V	3	3
Total	99	100

p= 0.380

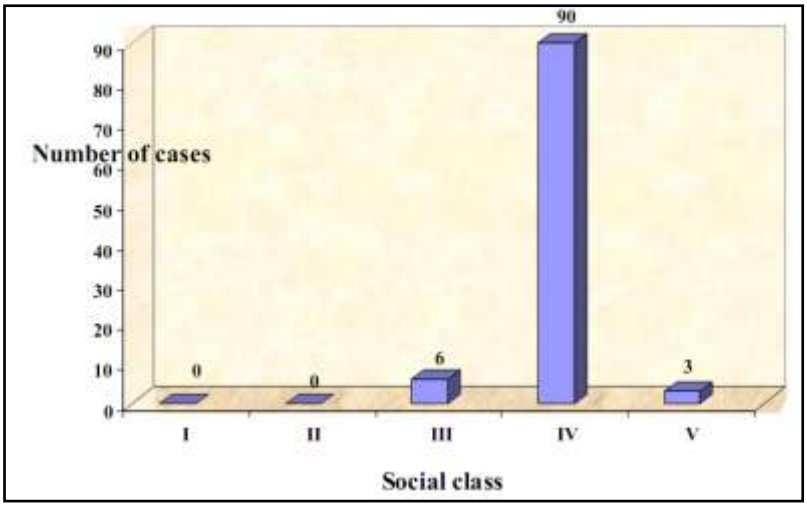

Fig 5: Socio-economic status of mothers

Table 7: Status of pregnancy – booked/unbooked

Status		
	No. of cases	Percentage
Booked	90	90.9
Unbooked	9	9.1
Total	99	100

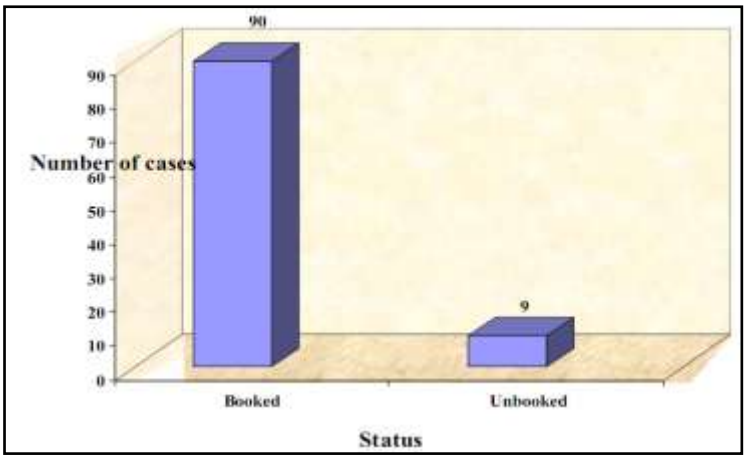

Fig-6: Status of pregnancy – booked/unbooked

Table 8: Mode of delivery

Mode of delivery		
	No. of cases	**Percent**
Vaginal delivery	89	90
LSCS	10	10
Total	99	100

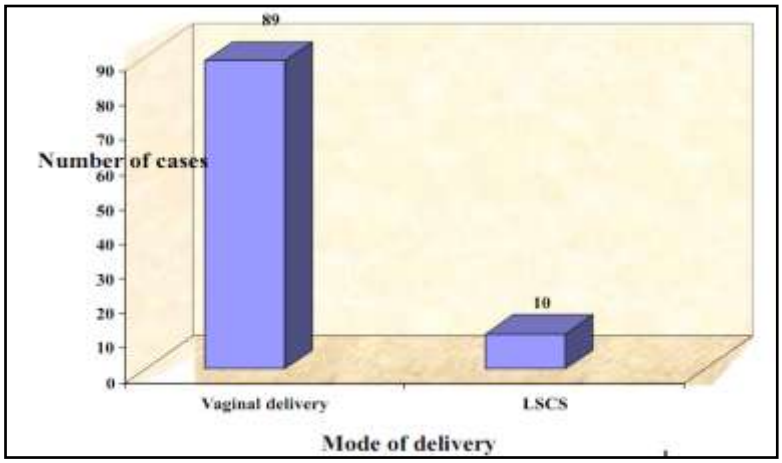

Fig-7: Mode of delivery

Table 9: Maternal risk factors contributing for VLBW deliveries

Risk factors		
	No. of cases	**Percentage**
Anemia	25	26.3
Ante-partum haemorrhage	8	8.2
Pre eclampsia	29	29.3
Badobstetric history	5	5.1
Previous VLBW deliveries	14	14.1
Previous preterm deliveries	16	16.2
Multiple gestation	21	21.42
ANC	95	96
PROM	20	20.4
Poly hydramnios	2	2
Oligohydramnios	9	9.2
MSAF	2	2
Drug intake	8	8
Breech	7	7.2
Compound presentation	1	1

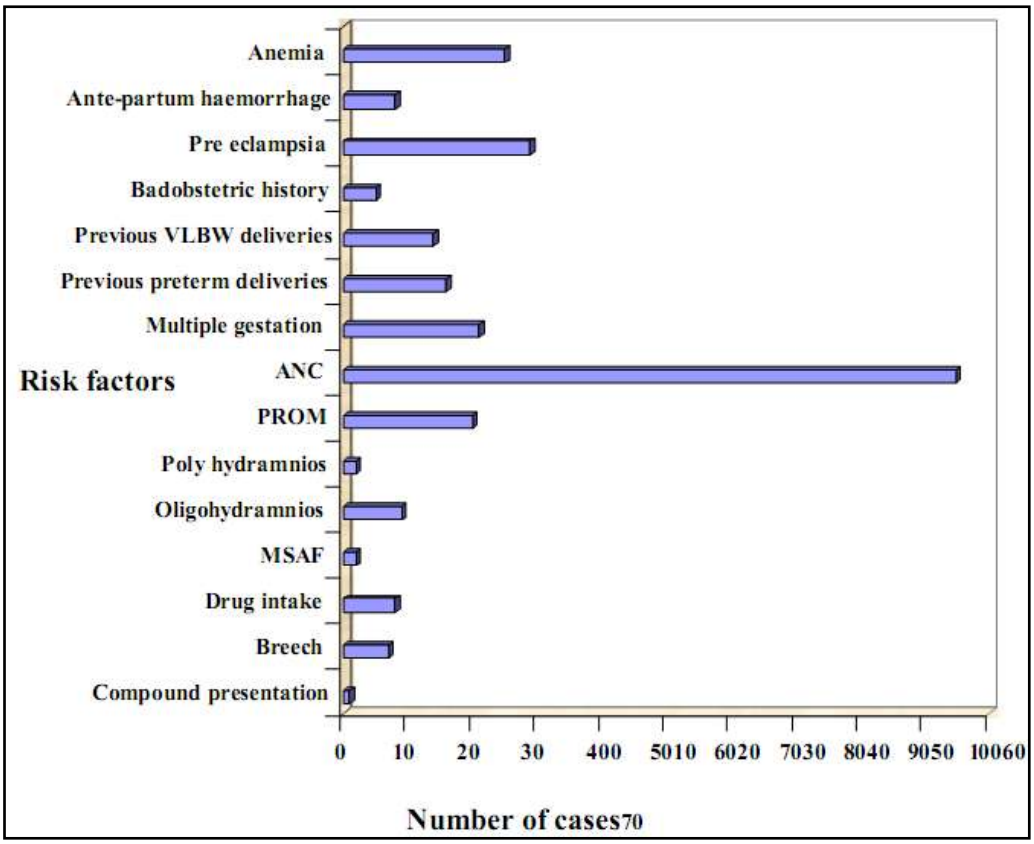

Fig-7: Maternal risk factors contributing for VLBW deliveries

DISCUSSION

The category of very low birth weight (VLBW), that is infants born at less than 1,500 grams, is well recognized to represent a population of infants, primarily premature infants, who are at increased for acute and chronic impairments related to their immaturity. The incidence of very low birth weight in India is estimated to be 4.5%. (SEAR NPD REPORT 2007-08) [8]. our study has an incidence of 0.85%. Low birth weight is more common in early and late reproductive life. Birth weight increases with increase in parity up to 5 then it again decreases. In our study the mean maternal age is 23.02±3.7 majority of mothers were in the age group of 18 to 25 years. VLBW is more common in low socioeconomic status class of mothers. Low SES is responsible poor knowledge about pregnancy related issues, pre conceptional weight gain, and maternal anaemia, lack of accessibility to health services which in turn act as risk factors for VLBW and preterm deliveries. In our study more than 90% of mothers with VLBW deliveries belonged to low socio-economic status. This may not represent true fact as mothers who patronize our hospital mostly belong to low SES.

It is, nevertheless, likely that low socioeconomic status may be a social "cause" of other nutritional, toxic, anthropometric, or infectious factors that may themselves be causal determinants. As with maternal age, indirect causal effects may be important for intervention. The most easily modifiable aspect of socioeconomic status is maternal education, although, in the long term, family income could also be influenced. The potential importance of socioeconomic status is to be considered. The effect of maternal education on birth weight is heterogeneous and reaches up to 220g (or 6% increase from baseline) for the group most directly affected by the reform. In our study 41.4% of mothers were illiterate. Several studies relating the effect of mother's age and parity on birth weight indicate that parity is the more important factor of the two [9]. In our study 55.6% VLBW deliveries was seen in primigravida women. Anaemia in pregnancy is a common problem and 50% pregnant women in developing countries are suffering from anaemia. In our study anemia was present in 26.3% of mothers. PROM is one of the leading identifiable causes of prematurity. Rupture of membranes before 37 completed weeks of pregnancy can result in preterm birth in about 30% cases, which in turn is an important cause for VLBW. In our study PROM was an important maternal risk factor, it was associated with 20% of cases.

Various fetal complications of APH are premature baby, low birth weight, intrauterine death, congenital malformation and birth asphyxia [10]. Recent large epidemiological studies report an incidence ranging from 5.9 to 6.5 per 1000 singleton births and 12.2 per 1000 twin births. In our study 8.2% of mothers with VLBW deliveries had antepartum haemorrhage. Hypertension during pregnancy is the major cause of chronic placental insufficiency leading

to chronic fetal hypoxia, IUGR, prematurity and perinatal deaths. In our study preeclampsia was a risk factor and was found in 29.3% of mothers. History of previous preterm deliveries increases the risk of preterm and VLBW deliveries. In our study it was associated with 16.2% cases. Multiple gestations is associated with VLBW babies and preterm deliveries. It was seen in 21.24%cases in our study.

CONCLUSION

Management of VLBW babies continue to be a challenge to Paediatricians as survival is directly associated with their birth weight and inversely associated with illness severity and gestation. The factors leading to VLBW delivery in developing countries like India are modifiable and preventable. In our study total survival rate of VLBW babies was 69.39% with a mortality rate of 30.61%.

Improved maternal education, nutrition, socioeconomic status will have a positive impact on survival rates. Deliveries of high risk pregnancies at tertiary facilities should be advocated. Improved maternal transport protocols which promote in-utero transport of patients, early use of full course of antenatal steroids and support for regionalized transport teams can further improve neonatal outcomes. A continuing audit of these measures should be encouraged and the results should be made available to all health care workers working in obstetrics and neonatology.

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