COMPARATIVE STUDY OF RISK FACTORS IN THE INCIDENCE OF LOW BIRTH WEIGHT: A HOSPITAL BASED STUDY IN GOVERNMENT GENERAL HOSPITAL, VIJAYAWADA.

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ABSTRACT *In developing countries like india, 74 percent of india's population live in rural areas, most of the deliveries (70-90%) are conducted at home by traditional birth attendant and untrained relatives, where weighing facility does not even exist. The logistic problems such as a non availability of weighing machine is a big hurdle in recording the birth weight even though the deliveries are conducted by properly trained health personnel. As a result in many cases low birth weight babies remain undetected, which also reflects adversely upon the high risk approach to ensure better child survival. Hence it is imperative to identify the new born with low birth weight and to offer them adequate and need care instantly for survival.*

Thus the present study was conducted with an aim to find out an alternative simple, cheap, reliable, acceptable method for identification of low birth weight babies that can be used by a person with little training.

INTRODUCTION

The fact that birth weight is the single most important marker for adverse perinatal , neonatal and infantile out come and most of the factors influencing low birth weight are preventable, created interest in the study of those factors. There is no indicator in human biology, which tells us so much about the past events and future trajectory of life as the weight of infant at birth[1]. Low birth weight still remains a major health problem according to UNICEF, about 18 million infants are born with low birth weight globally every year.

Government of India, along with the strategies developed to achieve " Health for All" by the year 200, wished to decrease incidence of low birth weight to 10%. We have not achieved it even today. Infact incidence of low birth weight in the year 2013 is around 20% and about 5 to 7 percent in west. Over 80 percent of all neonatal deaths in both developed and developing countries occur among the low birth weight babies. Low birth weight is also a major determinant of malnutrition during infancy, because over 40% of low birth weight babies are malnourished at one year of age. In the developing countries, adverse perinatal and postnatal development of the child is associated with 3 interrelated conditions: Malnutrition, Infection and Unregulated fertility which are often due to poor socioeconomic and environmental conditions. Birth weight is an important determinant of success and duration of Brest feeding which is a well know protective asset against infant deaths in developed countries [2]. 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 weight babies. Neurodevelopmental sequelae of birth asphyxia are three times in low birth weight babies compared to their normal weight counter parts[3,4]. Low birth weight is the single most important factor determining the survival chances of the child. Many of them die during their first year. The infant mortality rate is about 20 times greater for all low birth weight babies then for other babies. The low birth weight, the lower is the survival chance. Many of them become victims of protein – energy malnutrition and infection. Low birth weight is thus an important guide to the level of care needed by individual babies. Low birth weight also reflects inadequate nutrition and ill-health of the mother. There is a strong and significant positive correlation between maternal nutritional status and the length of pregnancy and birth weight. A high percentage of low birth weight therefore points to deficient health status of pregnant women, inadequate perinatal care and the need for improved care of the newborn. Small for dates babies may remain stunned throughout life [5]. Small for dates babies are more vulnerable

to develop atherosclerotic coronary artery disease, hypertension and diabetes mellitus during adult life[6,3]. As babies with birth weight of less than 2000 gms are more vulnerable, they deserve priority in admission to the special care nursery. The affordability of people to put their low birth weight babies in special care nurseries is poor and that raises the morbidity and mortality among low birth weight babies. Prevention of low birth weight is possible by interfering at various stages in the antenatal period. Approach towards preventable causes will be benefited with the reward of normal weight babies rearing of whom is easier and the result will be a healthier society. Babies with the birth weight less than 2500 gms irrespective of the period of their gestation are classified as low birth weight babies. These include both preterm and term small for dates babies. Human placenta can generally sustain growth of the foetus upto 42 weeks beyond which it becomes too senile or dysfunctional to support growth. In developing countries, due to nutritional constraints plateau in intra uterine growth is reached around 38 wks. So post maturity is an important cause of placental dysfunction3.

MATERIALS AND METHODS

1. Electronic Weighing Machine: To measure the baby weight.
2. Infantometer: To measure the length of newborn.
3. Flexible , non stretchable measuring tape: To record Anthropometric data.
4. Stadiometer: To record height and weight of mothers.
5. Mercury Barometer type B.P Apparatus.
6. Stethoscope.
7. Microscope.
8. Glass slides.
9. Test tubes.
10. Spirit lamp.
11. Benedict's Reagent.
12. Acetic Acid.

Departments involved in work are NICU and OBG/GYN : SMC Vijayawada.

The present study was conducted in neonatal intensive care unit, department of pediatrics and labour room, department of obstetrics, Siddhartha medical college government general hospital, Vijayawada. Neonates delivered in labour room were included randomly for analyzing maternal, obstetric and foetal risk factors for low birth weight and their respective mothers were interviewed using pre-designed Proforma. Anthropometric data of low birth

weight babies was recorded. Maternal data of some normal birth weight babies is also collected for comparison.

Size of the sample and duration:
The present study included low birth weight of neonates and their mothers and normal birth weight neonates and their mothers. Anthropometric data of low birth weight babies was collected the data of 500 normal birth weight babies and their mothers and 500 low birth weight babies and their mothers were collected and analysed. The study was done from Jan 2013 to April 2015.

Sequence of study:
1. 500 low birth weight neonates, who were delivered in the labour room, obstetrics department, Siddhartha medical college Government General Hospital , Vijayawada, were taken up for study. Their anthropometric data was collected and their maternal parameters recorded.
2. 500 normal birth weight neonates were delivered in the obstetric department were taken up for study and their parameters recorded.

Methods of taking measurements
Taking anthropometry of new born
1. **Weighing the Neonate:** The neonate was weighed nude on electronic weighing machine within 1st hour of birth for accuracy of birth weight.

2. **Chest Circumference:** For measuring chest circumference the tape is placed at the level of the nipple in a plane at right angle to the spine and measurement is taken in the mid respiration.

3. **Mid arm Circumference:** The tape is placed firmly but without compressing the tissues around the upper arm at a point mid way between tip of acromion and olecranon process.

4. **Head Circumference:** The head circumference is measured by passing a tape over the occipital protuberance on the back, above the ears and the sides and supra orbital ridges in front.

Measuring the height of the mothers: Height of the mother was recorded using a stadiometer.

Weight of the mother:
Pre pregnancy (Conceptional) weight is equated to weight recorded at 12 weeks of gestation, considering negligible weight gain till 12 weeks of gestation. The weight gain from 12th week to term gestation represents the total weight gain during pregnancy. Pre pregnancy weight and weight gain during pregnancy are noted from obstetrical records. The weights were recorded by the post graduates in obstetrics department on a stadiometer.
• Age of the mother was noted.
• Socioeconomic status of the mother was noted. According to kuppuswamy's socio-economic status scale.

Methods Of Taking Other Data Like: Relevant history , Assessment of gestational age of new born, Classification of low birth weight babies, Small for gestational age(S.G.A), prematurity, Pregnancy induced hypertension(PIH), Anemia, Urinary tract infections(UTI) and Premature rupture of membranes(Prom).

SCORING SYSTEM FOR ASSESSMENT OF GESTATIONAL AGE AND PHYSICAL ASSESSMENT

CRITERIA	SCORE			
	0	1	2	3
PHYSICAL a)Skin Texture test by inspection and pinching	Very thin and gelatinous	Smooth medium thickness with superficial peeling	Thick with peeling and cracking over hands and feet	

b) Lanugo	Nil or scanty	Abundant Lunugo	Thinning Lunugo at places	Scanty Lunugo with areas of baldness
c) Plantar creases Assess after stretching the skin	Nil	Faint red marks over anterior half of sole	Deep indentations over anterior 1/3rd to ½ of sole	Deep indentations throughout the sole
Brest nodule test by holding the breast tissue between thumb and finger	Nil	Breast tissue less than 5 mm on one or both sides	Breast tissue 5-10 mm	Breast tissue more than 10 mm diameter
d) Ear firmness Assessed by palpation	Pinna feels soft and easily folded into bizarre shapes	Soft but some recoil is present	Some cartilage felt along the edge and recoil is instant	Pinna firm with definite cartilage throughout and instant recoil
e) Genitalia (MALE)	Neither testis in scrotum	At least one testis in the inguinal canal and can be pulled down into the scrotum	At least one testis is present in the scrotum	
FEMALE	Labia majora widely separated and labia minora protruding	Labia majora partly cover labia minora	Labia majora completely cover labia minora	
NEUROLOGICAL a)Posture: Observe with infant quiet and in supine position	Arms and legs extended	Beginning of flexion of hips and knees, arms extended	Stronger flexion of legs and some flexion of arms	Legs flexed and abducted while arms completely flexed
b) Arm recoil in a supine infant. The flexed forearm is extended by pulling at hand then released.	No recoil or only random movements	Arm returns to incomplete flexion or sluggish response	Arm briskly returns to full flexion	
Popliteal angle**with infant in a supine position, the thigh is held in the knee chest position by supporting the thighs with examiner's left hand. The leg is then extended by gentle pressure with examiner's finger placed behind the ankle and popliteal angle is measured. Index finger placed	1800	1800 - 1500	1500 - 1200	1200 - 900

c) Head lag with the infant lying supine position, the bay is grasped at hands and slowly pulled towards sitting position. During the procedure, the position of the head in relation to trunk is observed.	Complete Head lag	Partial Head lag	Able to maintain head in line with the body	Brings head anterior to the body
d) Glabellar tap. Tap sharply at glabella (midpoint between eyebrows) and look for closure of the eyes.	Absent	Weak response	Brisk response	

Physical Score = 0-16, Neurological Score = 0- 13, Combined Total Score = 0-29.

RESULTS

Table 1 : Prevalence Of Low Birth Weight

Total Deliveries	10,842
No. of low birth weight babies	2716

The prevalence is 25.05%.

Distribution of low birth weight out of 500 low birth weight babies taken up for study 198 (39.6%) were premature and 302 (60.4%) were small for gestational age.

Relation between birth weight and maternal age : 267 (53.4%) out of 500 mothers of low birth weight babies, 226 (45.2%) out of 500 mothers of normal birth weight babies were aged < 20 years.

Relation between maternal Height and birth weight: 303 (60.6%) out of 500 mothers of low birth weight babies were < 145 cm in height, where as only 90 (18%) out of 500 mothers of normal birth weight babies were < 145 cm in height. So the association between low birth weight and maternal height of < 145 cm was found to be statistically significant.

Maternal weight and birth weight: 64(12.8%) out of 500 mothers of low birth weight babies and 5(1%) out of 500 mothers of normal birth weight babies were found to have preconceptional weight < 40 kg. the association between low birth weight and preconceptional maternal weight < 40 kg was found to be statistically significant.

Maternal weight gain during pregnancy and birth weight: maternal weight gain < 7 kg was found in 119(23%) out of 500 mothers to low birth weight babies and 7(1.4%) out of 500 mothers of normal birth weight babies. The association between low birth weight and maternal weight gain of < 7 kg during pregnancy was found to be statistically significant.

Birth weight and parity: 295 mothers of low birth weight babies and 403 mothers of normal birth weight babies were primis grand multiparity was found in 3 mothers of low birth weight babies and 3 mothers of normal birth weight babies.

Birth weight and Hb% of mothers during pregnancy: out of 472 mothers of low birth weight babies all (100%) are anaemic where as 89 (20.05%) mothers of normal birth weight babies are anaemic. The association between anaemia (Hb% <10gms%) and birth weight of babies was found to be statistically significant.

Birth weight and severe anaemia of mothers: The relation between severe anaemia (Hb% ,7gms%) and birth weight of babies was observed, 118 (25%) out of 472 mothers who gave birth to low birth weight babies were found to have severe anaemia where as mothers of normal birth weight babies not found to have severe anaemia. The association between severe anaemia in mothers (Hb% <7 gm%) and low birth weight of babies was found to be statistically significant.

Birth weight and PIH: 83(16.2%) mothers of low birth weight babies had pregnancy induced hypertension where as only 15(3%) mothers of normal birth weight babies had pregnancy induced hypertension. The association between low birth weight and pregnancy included hypertension was found to be statistically significant.

Birth weight and UTI: In the present study 38(7.6%0 mothers of low birth weight babies found to have urinary tract infection where as incidence of urinary tract infection as not observed in mothers of normal birth weight babies.

Other risk factors associated with LBW: 31 mothers of low birth weight babies had previous history of low birth weight babies. 23 mothers of v had premature rupture of membranes. 13 mothers of low birth weight babies had bleeding per vigainum.

Table 2: Relative Proportions of Maternal Risk Factors.

S. NO	Parameter	Low birth weight babies		Normal birth weight babies	
		Frequency	Percentage	Frequency	Percentage
1	Age <20 Years	267	53.3%	226	45.2%
2	Height <145 cm	303	60.6%	90	18%
3	Preconceptional weight < 40 kg	64	12.8%	5	1%
4	Weight gain during pregnancy <7 kg	119	23.8%	7	1.4%
5	Maternal anaemia (Hb% <10gms%)	472	100%	34	7.8%
6	P.I.H	83	16.6%	15	3%
7	U.T.I	38	7.6%	0	0%

Table 3: Relationship between chest circumference and low birth weight.

Chest circumference (cms)	No. of low birth weight babies	Mean birth weight (kgs)
<25	85	1.1935
25.1 – 26	15	1.65
26.1 – 27	107	1.95
27.1 – 28	169	2.05
28.1 – 29	92	2.14
29.1 – 30	32	2.3
>30	0	

Cut off point of chest circumference for grouping the babies < 2kg was found to be < 27cm. correlation coefficient "r" value for chest circumference 0.744.

Table 4: Relation between mid arm circumference and low birth weight.

Mid-arm circumference (cms)	No. of low birth weight babies	Mean birth weight (kgs)
9.1 – 9.5	3	2.4
8.5 - 9	183	2.25
8.1 – 8.4	118	2.15
7.5 - 8	26	1.9
7 – 7.4	115	1.65
6.5 – 6.9	20	1.4
6 – 6.4	28	1.1
5 - 6	7	0.8
Total	500	

Cut off point of mid arm circumference for grouping the babies < 2kg was found to be < 8cm. correlation coefficient "r" value for chest circumference 0.615.

DISCUSSION

S.No	Author	Prevalance of low birth weight
1	K.S.Nagi, S.D.Kandpal, M.Kukreti. (l998)7	23.8%
2	Trivedi et al 8	20.37 %
3	Kamaladas et al 9	24.6%
4	Mukesh K.Sharma, Dinesh Kumar, Anju Huria, Pratiksha Guptha — Chandigarh (2OO7)10	23.8%
5	A Kolkata based study Paul B, saha I, Das Guptha A, Choudari RN.	26.5%
6	National Family Health Survey-3	21.5%
7	Present study in Government General Hospital, Vijayawada. (Jan 2013-April2015)	25.05%

The overall prevalence of low birth weight in our study is 25.05%. It is closely co-relating with prevalence of Kamal Das et al study (24.6%). The prevalence of low birth weight according to NFHS-3 was 21.5%. In the present study preterm babies account for 3 9.6% of total low birth weight babies which was similar to Deshmukh et al[11] study (4 1.2%) where as Mukesh et al study reported higher proportion of preterm (47.8%). In the present study all the mothers of low birth weight babies are anaemic and 25% of them were having severe anaemia (Hb% <7gms%). Other studies reported lesser incidence anaemia in mothers of low birth weight babies (Lt col G. Singh et al 18%, S.Ganesh Kumar et al[12]36%, Deshmuk et al 54%). In the present study 16.6% of mothers of low birth weight babies had pregnancy induced hypertension. Other studies show comparatively lesser incidence of pregnancy induced hypertension among the mothers of low birth weight babies. In the present study maternal height of <145cm was found in 60.6% of mothers of low birth weight babies which was similar to Deepa H Valankar[13] studies. Other studies (Hirve ss, Ganatra B.R-29.5%, Ganesh Kumar et al 18%) reported lesser value when compared to present study. In the present study 12.8% mothers of low birth weight babies were found to have preconceptional weight <40kg which was lesser than other studies (Ganesh Kumar et al 33%, Munesh K. Sharma et al 50%, K.S. Negi et al 47.7%). In the present study maternal weight gain of <7kg during pregnancy was found in 23% of mothers of low birth weight babies which was statistically significant. Deshmukh et al also reported similar association. In the present study among the mothers of low birth weight babies 53.4% were aged <20 years which was higher when compared to previous studies. (G.Ganesh Kumar et al 14%, Lt col G.Singh et al 36.4%). But the value is more when compared to study of Deepa H Velankar (67%).

SURROGATE INDICATORS FOR IDENTIFYING LOW BIRTH WEIGHT

As low birth weight is associated with high neonatal mortality and morbidity and the non availability of weighing machine was a big hurdle in recording the birth weight in rural areas, mid arm circumference and chest circumference can be used to identify infants with low birth weight with a fair degree of accuracy. A mid arm circumference <8.7cm and chest circumference <30cm were used as cut off values to identify birth weight <2500gms. In India, a birth weight of 2000grns or less has been recommended as criterion for admitting infants into special care neonatal units. A mid arm circumference of <7.5cm and chest circumference of <27.5cm have a good predictive value in identifying this risk group. In the present study we tried to find out the cut off points for chest circumference and mid arm circumference to identify birth weight <2000gms and compare with other studies.

In the present study the cut off point of mid arm circumference to identify birth weight <2000gms is <8cm which was similar to that found in kapoor et al[14] study, where as it was <7.5cm in the study conducted by Bhargava et al[15]. In present study the cut off point for chest circumference is found to be <27cms, the value is less than the cut off point found by bhargava et al (<27.5cm) and kapoor et al

(<28cm). In different studies estimates of cut off point for mid arm circumference to identify new born weighing < 2000gms varied between 7.5 and 8.5cm and cut off point for chest circumference varied between 27 and 27.5cm.

 A chest circumference of < 29.5 to 30cm and mid arm circumference < 8.5 to 9cm are found to be cut off points for identifying new born with birth weight below 2500gms in different studies. Kapoor et al reported higher correlation coefficient identify low birth weight circumference (r=O.744) had circumference (r=O.6 15), that chest circumference (r0.8 164) had than mid arm circumference (r=O.75 10) to babies. In the present study showed chest has higher correlation coefficient than mid arm. All studies including the present study show that chest circumference and mid arm circumference were good predictors of birth weight. These measurements can be taken easily even by paramedical workers to detect the neonates at risk, so that they can be given special care and neonatal mortality and morbidity can he reduced.

CONCLUSION:

Low birth weight is the dominant risk factor for infant mortality and morbidity. The present study was done to know the prevalence of low birth weight babies and the various risk factors contributing to Low birth weight. The overall prevalence of Low birth weight in our study was 25.05%. The factors observed to be significantly associated with low birth weight in our study include maternal age < 20 years, maternal height < 145 cms, preconception weight < 40kg, maternal weight gain < 7kg during pregnancy and anaemia.

The results of this study suggest that for reducing the Low birth weight, maternal health programme should focus on maternal nutrition and nutritional education to facilitate better weight gain during pregnancy and discourage pregnancy at early age. Early identification of anaemia and antenatal iron folic acid supplementation services should be strengthened through good antenatal care.

The present study had identified cut off point of chest circumference <27 cms and mid arm circumference < 8 cms for babies weighing < 2000 gms. Chest circumference is a better surrogate marker for low birth weight than mid arm circumference. These simple and reliable indicators for Low birth weight can be introduced into existing system of health care for usage by paramedical workers to detect Low birth weight babies, so that they can be given special care and thus neonatal mortality and morbidity can be reduced.

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