Chapter 2

REVIEW OF LITERATURE
A literature review discusses published information in a particular subject area, and sometimes information in a particular subject area within a certain time period. Review of related literature is one of the major steps in any research study. A literature review can be just a simple summary of the sources, but it usually has an organizational pattern and combines both summary and synthesis (Carolina, 2005).

The present study was designed to identify association between Low Birth Weight baby and Socio-Economic, Obstetric & Medical, Nutritional status, and Pregnancy related problems. This is an important instrument to clarify epidemiological issues and to suggest the directions for health policy efforts.

Method

A three-step review was carried out using databases of journals indexed for Medline/Lilacs/Scielo/Cochrane published between 2005 and 2012 using specific criteria of inclusion. The first step selected 12 articles from 2,889 when searching for the keyword “Maternal Risk Factors”; the second step used the crossing of keyword “Low Birth Weight” with other pertinent keywords and terms resulting in 191 articles generating 7 more articles matching the criteria of inclusion. The third step was to analyze the references of articles in steps 1 and 2 (12 + 7 = 19), selecting 3 additional ones totalizing 22 selected articles (Konstantyner T, 2007).

This chapter reviews the literature on the maternal risk factors associated with Low Birth Weight (<2,500g) in Guntur Government Hospital, Andhra Pradesh, India. Present study focuses is on the maternal risk factors especially in the dimensions of on “Maternal Socio-Economic, Maternal Obstetric & Medical and Maternal Behavioral”. The studies were presented under the following headings.
2.1 Incidence of Low Birth Weight

2.2 Maternal Socio-Economic risk factors of Low Birth Weight

2.3 Maternal Obstetric and Medical risk factors of Low Birth Weight

2.4 Maternal Behavioral risk factors of Low Birth Weight

2.1 Incidence of Low Birth Weight

Status and Trends

In developing countries 15% of infants or more than 1 in 7, weigh less than 2,500 grams at birth. A total of 18 million newborns each year in the developing world weigh less than 2,500 grams at birth and more than half of them are born in South Asia, which has the highest incidence of Low Birth Weight by far, at 27%. India one of the countries with the highest incidence, has the highest number of low-birth weight babies each year: 7.5 million (Child organization).

![Fig-11:PMNS 2005: Primary Obstetric Cause Perinatal Deaths in Low Birth Weight Births (As calculated by PPIP)](image)

Trend analysis is difficult

Limited trend data, however, are available from MICS and DHS, covering 50 developing countries, or about 60 per cent of the developing world's population. A
population-weighted average for available survey points shows that the incidence of Low Birth Weight remained unchanged from the 1990s to 2010.

**Severity of Low Birth Weight**

Opinioned (Park. K, 2010) in his report that mother and child health is the key element of the rural health care program.

Major conclusions were (1) Antenatal care provides good health for pregnant women.(2) Low Birth Weight is acknowledged to be one of the most pressing problems in pre-conceptional care. (3) Premature infants are more likely to die early, and those infants who survive may become victims of illness, become victims of future adult diseases like diabetes and coronary heart diseases.

D.c.dutta (2009) observed that LBW infants have high perinatal morbidity and mortality rate that increases with decreasing birth weight; the risk of neonatal death is five times more likely than Normal Birth Weight infants to die later in the first year and account for 20% of post-neonatal death.

Anura V Kurpad (2010), conducted, “A study on the prevalence of Low Birth Weight”.

Researcher found that (1) It is high in Indian infants leading to high incidence in neonatal morbidity and mortality. (2) Most LBW infants in India and in most developing countries are a result of intrauterine growth retardation and a compromised maternal nutritional status. (3) Evidence shows that short teenage mothers with lower body weights and body mass indexes (BMIs; in kg/m2) have lighter placentas and smaller infants. (4) positive correlation is seen between maternal nutrition and low birth weight.
2.2 Maternal Socio-Economic Risk Factors of Low Birth Weight

Sex of the New born


The data demonstrated that (1) Maternal weight < 50 kgs at 3rd trimester, birth interval < 2 years and female sex of the new born were identified as the important risk factors of LBW in rural community. (2) The study disclose that Low Birth Weight can be prevented by measures like proper antenatal care, health & nutritional education, effective family planning services etc.

D Stevenson (2005), did, “A study to determine the differences in Very Low Birth Weight infants attributable to sex”. A sample of 812 Boys and girls weighing 501-1500 gm admitted to the 12 centers of the National Institute of Child Health and Human Development Neonatal Research.

The researcher found an evidence that (1) Boys were more likely to have been intubated (OR: 1.16) and to have received resuscitation medication (OR: 1.40). (2) Boys had a higher risk (OR > 1.00) for most adverse neonatal outcomes than girls. (3) Positive significance difference is seen in the sex of the infant and weight.

Maternal Age

John L.Kiely (1995), made, “A study on maternal risk factors associated with Low Birth Weight”. Study design was hospital based retrospective case control study.

The findings were (1) The females less than 17 years of age and women more than 34 years of age are at an increased risk of preterm delivery. (2) Increased maternal age is an independent risk factor. (3) Majority of adolescent mother’s come disproportionately from disadvantaged and minority populations. (4) Positive relationship between adolescent pregnancy and LBW may be confounded by poverty and other social factors.
J.S. Deshmukh (1998), conducted, "A case control study on the prevalence of Low Birth Weight and its association with maternal factors".

He found that anaemia, low socio-economic status, short stature, short birth interval, tobacco exposure, low maternal age, low body mass index, and primiparity are significantly risk factors for Low Birth Weight.

Ziedeh SM (2002), conducted, "A case control study to compare the maternal outcomes of nulliparous women".

He found that (1) 35 years and older at the time of delivery with nulliparous women 25-29 years old. (2) The result showed that women aged 35 years and older were considerably more likely to have pregnancy-included hypertension, preterm delivery and Low Birth Weight which was statistically significant (p: 0.001).

Pevalin DJ.et al (2003), studied, "A study on the relationship between the age risk factor that are associated with adverse birth outcomes". Using a representative national sample.

The researcher found that poor socio-economic factors, such as family disputes, low social support, young age, mother’s education below primary and income inadequacy were significantly increased the risk of an adverse birth outcome in the present study.

Vilius Grabauskas (2004), did, "A study on Maternal socio economic factors associated with Low Birth Weight".

The researcher suggest that (1) The young women (<20 years) and older (35 years and older) maternal age, living in rural area and unemployment before pregnancy and during pregnancy increased the risk to deliver Low Birth Weight baby. (2) The study confirmed that above findings especially maternal unfavourable socio-economic factors leads to increased the risk of delivering preterm baby.

Afshan Bhatti (2010), conducted, "A study on the age (19–34 years) association between cases and controls".
The major findings were (1) The difference of age distribution was statistically insignificant between cases and controls. (2) Proportions of primiparous women were high in cases and statistically significant association found with Low Birth Weight.

**Vytautas Basys (2010),** Studied, “The prevalence of low birth weight among adolescent girls”.

He found an evidence that (1) Many adolescent girls between 15 and 19 get pregnant. (2) About 16 million women 15–19 years old give birth each year. (3) The average adolescent birth rate in middle income countries especially India is more than twice as high as that in high-income countries, with the rate in low-income countries being five times as high.

**Jocelyn E Finlay (2012),** studied, “A study on the association between maternal age at first birth and infant mortality”. Data were collected by cross-sectional analysis of nationally representative household samples of low- and middle-income countries.

The data demonstrated that in (1) The sample of women who had their first birth between the ages of 12 and 35, the risk of poor child health outcome is lowest. (2) Women who have their first birth between the ages of 27 and 29. (3) Major conclusions were the first-born children of adolescent mother’s are the most vulnerable to infant mortality and poor child health outcomes. (4) Increasing the age at first birth in developing countries especially in India may have large benefits in terms of child health.

**Maternal Education**

**Aldona Gaizauskiene (2004),** conducted, “A study on maternal education associated with adverse birth outcomes”. During the data collection mother’s were grouped into three categories according to their educational level: primary or basic, secondary, and university education.
The researcher analysis revealed that living in rural area with low education level combined with unemployment before pregnancy and during pregnancy increased the risk to deliver Low Birth Weight baby.


Major conclusions were (1) Observed that health awareness and use of maternal healthcare services have shown a shift in the last two decades due to increase in the education of women. (2) There is a clear move from home to institutions and from traditional to professional providers for both antenatal and delivery care. (3) Antenatal care from health professionals, especially doctors, increased, and the percentage of women who availed of antenatal care at home from traditional birth attendants (TBAs) reduced sharply. (4) The percentage of women who did not avail of any antenatal care fell from 12.2% to 5.2 % during this period. (5) Thus the reduction in the incidence of Low Birth Weight decreases and women increases her literacy level.

J.E. SIZA (2008), made, “A study to examine social determinants associated with Low Birth Weight”.

The researcher concluded that (1) Mother’s without formal education were 4 times more likely to give birth to LBW neonates than those who had attained higher education (OR: 3.6 (2.2-5.9)). (2) Analysis of study indicate that decrease in Low Birth Weights of newborns as maternal educational level increased ($\chi^2$ for linear trend: 42.7; P< 0.01). (3) Maternal education can improve reproductive health during pregnancy.

Lisa Kercher (2008), did, “A study on maternal education increases, the risk of LBW decreases”.

The researcher rejected (1) The hypothesis that maternal education acts indirectly by modifying the health behavior of women in terms of prenatal care
initiation, consumption of food over the pregnancy period. (2) The results consider that maternal education as a surrogate for socioeconomic status or income.

**Maternal Weight**

D.V. Mavalankar (1994), conducted, “A retrospective study to examine the relationships between maternal weight, height and poor pregnancy outcome” in Ahmedabad, India.

He concluded that (1) Maternal height and weights were compared between 611 mother’s who were admitted in the postnatal wards. (2) Majority of the mother’s anthropometric measurements especially weight and height were much lower in the population compared to western standards. (3) Low weight and height were associated with increased risk of perinatal death, prematurity.

Wang CS, Chou P (2001), studied that, “A study on low maternal weight gain during pregnancy is the principal risk factor for Low Birth Weight”. He argued that pre-conceptional weight< 45kgs and infrequent antenatal visits during pregnancy this behavior in the adolescent mother’s is influence significant association with Low Birth Weight.

Sartaj Ahmad (2008), did, “A study on the highest prevalence of Low Birth Weight”. The researcher reported that the prevalence of Low Birth Weight among mother’s aged < 18 years (42.86%), weight of the mother plays an important role in determining the birth weight of neonate. Maximum prevalence was observed among mother’s with pre pregnancy weight was less than 40 kg seen in 80.96%. He found that gestational weight is the important indicator in the elimination of poor birth outcomes.

Sumithra Muthayya (2009), studied, “The maternal nutritional factor associated with the Low Birth Weight”. This prospective pregnancy cohort study was carried out in Bangalore, India.
Present study analysis confirmed that (1) A low maternal weight and poor weight gain in the second trimester to be important predictors of IUGR. (2) Low maternal body weight had an association with higher risk of IUGR of marginal significance (OR: 1.62; CI: 0.83-3.15; P: 0.09). (3) Supplementation during pregnancy was associated with increase in maternal weight gain and mean birth weight. (4) Proportionate weight gain during pregnancy is associated in the reduction of low birth weight. (5) There is a significance difference between the birth weight and maternal weight.

J. D. Deshpande (2012), conducted, “A study to estimate the incidence of LBW associated with maternal risk factors” at tertiary care hospital.

The major conclusions were (1) The magnitude of the Low Birth Weight problem at Pravara Rural Hospital (tertiary care hospital) Loni was 23.68%. (2) Percentage of LBW among higher order pregnancies was 66.6%. Spacing less than one year was responsible for 46.2% of LBW babies. (3) The Majority of LBW cases was seen in mother’s with weighing 41-50kg was 52.77% of LBW babies who had practiced spacing more than two years.

Maternal Height

S.P. Zodpey (1998), studied, “The maternal risk factors significantly associated with Low Birth Weight”. Variables included in the study were socioeconomic status, parity, maternal height, pregnancy weight gain, tobacco exposure and anemia.

He documented that mother’s who were less than 140 cm in height were more prone to have Low Birth Weight and this findings are in conformity with earlier observations.

Samiran Bisai (2010), conducted “A study on socio demographic risk factors associated with Low Birth Weight”.

The researcher revealed that (1) Maternal height had the strongest significant impact on neonate size. The analysis showed that 12.9% (birth weight) and 16.1%
(birth length) of variation. (2) The proportion of LBW was 75%, 52.3% and 25% among short (height < 145 cm), average (146-155 cm) and tall (> 155 cm) mother's with (p < 0.01) respectively. (3) Short mother's had 2.74 and 9.0 fold greater risk of delivering LBW baby than average and tall mother's. (3) Finally he suggested that pre-conceptionally mother's should be screened to exclude the risk factor.

Vipin Chandra Kamathi (2012), did, “A study Maternal height has a direct effect on the weight of the newborn”.

The researcher found that (1) The maternal short stature (< 145 cm) is identified as an independent risk factor for Low Birth Weight. (2) The study found an association between maternal height (< 150 cm) with increased risk of LBW.

Gestational Age

Mohsin M (2006), made, “A case control study to determine the influence of neonatal and maternal factors on premature birth and Low Birth Weight” in New South Wales, Australia.

They found that gestational age < 37 weeks of gestation was one of the cardinal important marker of Low Birth Weight for both the singleton and multiple births.

J.E. SIZA (2008), conducted, ”A descriptive retrospective cross-sectional study on gestational age was conducted by the researcher found strong association between Low Birth Weight and gestational age”.

The researcher found that (1) There is significance difference between the gestational age below 37 weeks (OR: 2; CI: 1.5-2.8) contributing to 42% of LBW deliveries in the study population. (2) Malnutrition strongly influences the gestational age leading to Low Birth Weight.

Wilcox AJ and Skjnerven R (2008), studied, “The effect of gestational age on birth weight and perinatal mortality” in a retrospective hospital based study. (1) He found that gestational age is a powerful predictor of birth weight and perinatal
survival. (2) Concluded that the multiple etiological factors such as illiteracy, low income and less use of supplement related to gestational age.

Consanguinity


The researcher found an evidence that (1) There were difference in the anthropometric measurements especially in the height and weight of the newborns. (2) The positive significance differences in the anthropometric measurements as related to consanguinity were seen only in the lower socio-economic class.

**L Jaber (1997)**, Conducted, “A study to examine the reproductive consequence of parental consanguinity”. A sample of 600 families selected retrospectively through infants routinely seen in the local well baby clinic in Arab community.

The study findings were (1) There exists a significant incidence of death higher in the consanguineous group (p< 0.01). (2) No significant increase in fetal loss between the inbreed and outbreed. (3) There were no differences in the anthropometric features except for LBW (p< 0.01) discussion highlights the consanguineous marriages are a prominent public health problem in developing countries.

**Pratibha Nair (2009)**, studied the “Consanguinity practiced in several global communities with variable rates depending on religion, culture, and geography”.

She found that there were significant differences in the reproductive health parameters in the countries like Arab and India populations. (1) Parental mortality is high. (2) Incidence of congenital malformation in the neonates. (3) Postnatal complications of the mother’s. The research found that there was significant association between consanguineous marriages and Low Birth Weight.
Sirikul Isaranurug (2009), studied the impact of “Consanguinity in developing countries due to social, cultural and economic reasons including traditions”.

The data demonstrated that the majority of the people (60%) were found to be consanguineous, which is consistent with other community based studies in Pakistan and India.

Ghina Mumtaz (2010), conducted a study to assess “The association between consanguinity and preterm birth (PTB)”. A sample of 19 hospitals in Lebanon were studied using case control design.

The findings were (1) Association between Low Birth Weight and consanguineous marriages is significant. (2) Positive relationship with increase the risk of spontaneous abortions.

A case control study was conducted by J Perinatol (2012) determines whether “Consanguinity adversely influences pregnancy outcome in South India”. The sample of study consists 601 women with singleton births.

The major conclusion were (1) Overall 24.1% of 601 women were consanguineous. (2) Non-consanguineous couples had fewer stillbirths (p= 0.017). (3) Miscarriages were higher in the cases 4.1% compare to controls 1.8%. They found that consanguinity significantly increases pregnancy loss and birth weight.

Family Income

Karim et al. (1997), studied “Low Birth Weight deliveries were more common among mother’s with low income and low educational attainment”.

He found that (1) Teenage mother’s were independently associated with low maternal weight and had low family income (OR: 2.3, 1.8, p< 0.01) compared to the middle group of maternal age. (2) Low Birth Weight was comparatively higher among babies born to mother’s who were belonging to family with income < Rs. 2,000 per capita compared with >Rs. 2,000 per capita.
This study reveal significant negative correlation between the income and education of the mother and incidence of Low Birth Weight. There were no significant difference among the mother’s with low income and low education.

A case control study conducted by FC Barros (2011), evaluates “The importance of maternal socio-economic factors associated with the risk of Low Birth Weight”. A sample of 851 Low Birth Weight babies (<2.5) was cases and 851 newborns with Normal Birth Weight (≥2.5) as controls.

The researcher found evidence maternal age, primary or basic education, being single, divorced or widowed, low income, living in rural area and unemployment before pregnancy and during pregnancy increased the risk to deliver Low Birth Weight baby in univariate analysis. He concluded that maternal unfavorable socio-economic factors increased the risk to deliver Low Birth Weight baby.

Nitin Solanki (2012), conducted, a study to “Quantify the effect of maternal anthropometry, education age of the mother at time of delivery”.

The major conclusion were (1) Maternal age< 20 years (p: 0.02). (2) Education (p: 0.009). (3) Socio-Economic status (p: 0.001) was significantly associated with Low Birth Weight. However, adjusted odds ratio was found significant for only BPL status and preterm.

Occupation

Nancy E. Adler (2002), studied, “The effects of socio-economic status (SES) that underlies three major determinants of health: health care, environmental exposure and health behavior”.

The study reveal that (1) Chronic stress associated with lower Socio Economic Status may increase morbidity and mortality. (2) Her finding suggest that reducing SES disparities in health will require policy initiatives addressing the components of socio-economic status (income, education, and occupation) as well as the pathways by which these affect health.
Matteo Bonzini (2007), explored, that “Occupational activities are suspected of having an adverse impact on outcomes of pregnancy”.

Researcher found an evidence five common occupational exposures prolonged working hours, shift work, lifting, standing and heavy physical workload had impact on the reproductive health and preterm baby. Researcher argued that heavy work during pregnancy eventually leads to fetal growth retardation. This assessment was based on the relative risk (RR) associated with the risk factor, its prevalence in the general population and the likelihood that it might vary importantly according to occupational exposures.

Prakeshkumar Shah (2009), made, “A study on Potential risk factors at work” from University College Dublin, Ireland. A sample of 676 women who were working at the time of their first prenatal visit and delivered a single baby. Potential risk factors at work were defined as high physical work demands and working long hours (40 hours or more per week). There were significant differences between the high physical work demands and Low Birth Weight.

Chumnijarakij T, et al (2010), did, a study on “Labourer and farming occupation are risk factors for Low Birth Weight compared to commercial occupation”.

The researcher found that (1) The working women without income have 1.17 times the risk of Low Birth Weight as housewives. (2) There is a 1.3 times greater risk of Low Birth Weight than for mother’s who do not have to travel to work. (3) This concludes that there is positive significant difference between labourer and farming occupation compared to commercial occupation as a risk factor for Low Birth Weight.


He found that (1) Physical activity and the job pressure of the women during her pregnancy are the important ones and also less studied. (2) Several maternal
occupational groups involving more job strain had a significantly higher risk of Small Gestational Age (SGA) birth. (3) Results showed significant and strong associations between high physical work demands and Low Birth Weight.

Yu-Chengn (2011), studied, “The effect of shift work exposure on childbearing and birth weight”. Study design was retrospective case control studies this study reveals significant positive relation associated with decreased childbearing and lighter birth weight in women working in this semiconductor manufacturing factory. Concluded that pre-conceptional evaluation for mother’s with persistent day-night rotating shift work exposures are especially necessary to prevent adverse birth outcomes.


The researcher found that there was a positive relationship between long periods of standing and long working hours per week during pregnancy seem to negatively influence intrauterine growth.

Type of Family

Meena Siwach (2009), did, a study on maternal social factor associated with incidence of Low Birth Weight. The sample consisted of 300 mother’s from nuclear and extended families.

The researcher found that (1) 52% of the Low Birth Weight neonates were from joint families. (2) 12% from nuclear families. (3) The incidence of higher number of neonates with more than Normal Birth Weight were born in the nuclear family.

Gagan Agarwal (2012), conducted, “A case control study was evaluate the impact of maternal social factors on the birth weight of new born”.

He found that (1) Overall prevalence of LBW neonates was 32.3%, majority (71.42%) of mother’s was living in rural areas and 52.39% of the mother’s belonged
to joint families, 52.39% of the mother’s were illiterate. (2) Majority of mother’s (76.19%) were housewives and their socio-economic status was IVth class (47.61%). (3) The correlation between maternal socio-economic factors and the incidence of Low Birth Weight was statistically significant.

**Water**

R. Hong (2008), studied, “Infant mortality with various factors, such as mother’s education, age at childbirth, delivery status, health status, household safe source of drinking-water”. The study was conducted on a sample of 800 mother’s. A standardized questionnaire was developed and adopted for this study. The researcher found that overall 87% of normal weight babies were born in households with safe sources of drinking-water. Household lack of access to safe drinking-water in household has a significant effect on the risk of infant mortality.

Dharmalingam (2010), studied, relationship between “Mother’s nutritional status and socio-biological aspects in determining the birth weight”.

He supported the concept that (1) Mother’s nutritional status is the most important determinant of newborn children’s birth weight. (2) Safe drinking water, use of antenatal care and iron deficient anaemia were also significant contributors to Low Birth Weight. (3) There is a significant relationship between mother’s nutritional status and the prevalence of Low Birth Weight.

Cohort study was conducted by Elizabeth Brainerd (2012) to examine the impact of fertilizer agrichemicals in water on infant and child health using data on water quality combined with data on the health outcomes of infants and children from the 2005-06 DHS of India.

The results indicate that children exposed to higher concentrations of agrichemicals during their first trimester experience worse health outcomes on a variety of measures amongst the most vulnerable groups-children of uneducated poor women living in rural Andhra Pradesh.
2.3 Maternal Obstetric & Medical Risk Factors of Low Birth Weight

Parity

_Bhuiyan SU (2004)_ conducted, “A study on the comparison association between maternal biological factors and Low Birth Weight”. The present study was conducted on a sample of 800.

The researcher found that (1) There is a significance difference between the maternal parity and Low Birth Weight. (2) It is important to note that over one in five of the maternal deaths (22%) were in the age group 15-19 years, in their first pregnancy. (3) Overall, across all age groups slightly more of the deaths were among the primi group (33 out of 72) than multi-parity (28) or grand parity (11). (4) However available information indicates that most of the women who died were illiterate and most of them were housewives.

_Zimmer-Gembeck MJ and Helfand M (2006)_ studied, “A retrospective observational study on women receiving comprehensive prenatal care”. A sample of 3703 low income African, American, Latina and white women. He found that age, race/ethnicity, psychosocial and parity were associated with Low Birth Weight during pregnancy.

_Sumedha M. Joshi (2009)_ studied, “Bio-logical maternal risk factors associated with Low Birth Weight babies”.

The researcher found that (1) Primi-para mother’s had 23% of Low Birth Weight babies. (2) Out of the para 2-4, the percentage of Low Birth Weight was between 34-37%. (3) The percentage of Low Birth Weight in para 5 and 6 increased to 55% and 67% . (4) He found that parity and Low Birth Weight were co-related. Incidence of Low Birth Weight increased with an increased in parity.

Birth Interval

_Oduntan S (1999)_ made, a study on “Maternal obstetric associated with Low Birth Weight”.
The researcher found that (1) A short birth weight interval was associated with increased incidence of LBW. (2) The lowest proportion of LBW babies was found in mother’s who waited at least 12 months after the previous delivery before becoming pregnant again. (3) A significant positive relationship exists between a short birth interval between the pregnancy and incidence of Low Birth Weight.

Conde-Agudelo (2006), studied, on “Birth spacing and perinatal outcomes”. The study design adopted in the present research was cohort, case-control and cross-sectional studies.

The researcher found that (1) An inter-pregnancy interval of <6 months was associated with increased risks of preterm birth (AOR: 1.40). (2) Small gestational age birth (AOR :1.26) compared with inter-pregnancy intervals of 18 to 23 months. (3) Intervals of 6 to 17 months and longer than 59 months were also associated with a significantly greater risk for preterm births. The study results suggest that inter pregnancy interval is associated with LBW.

Antenatal visits

Prasad L (1995), studied, “Case control study on bio-medical risk factors associated with Low Birth Weight baby”. Samples were taken from Zonal Hospital, Nepal. These results show antenatal visits< 4 times had 5.7 times more risk of Low Birth Weight comparing to mother’s who had regular antenatal checkups.

Koroukian SM and Rimm AA (2001), made, “A study on importance of antenatal care during pregnancy”. The researcher found the adequate use of prenatal care in the reduction of Low Birth Weight.

The major conclusions were (1) Antenatal care is an important component of maternal health and covers a range of issues, including nutrition, education, tetanus vaccine and services for monitoring of potential complications. (2) The set of antenatal care interventions can contribute directly or indirectly to reducing maternal deaths. (3) World Health Organisation recommends at least four antenatal checkups with trained health personnel during a normal pregnancy.
Douglas and Morregaard (2005), studied, “Association between poor prenatal care and incidence of Low Birth Weight babies” conducted in India.

The researcher found the significant association between prenatal care and incidence of Low Birth Weight. (1) The mean birth weight was 150gm higher in the booked group compared to the unbooked category. (2) Antenatal care and delivery under safe and hygienic condition are measures for reducing maternal mortality. (3) Therefore ANC (taking of syrup, tetanus injection) can be used as a preventive approach.

Azubuike JC (2010), made, A “Birth weight had a positive correlation with the frequency of antenatal care visit” at Dhaka, Bangladesh.

The researcher found that (1) Three antenatal care visits were quite effective in reducing the proportion of Low Birth Weight infants. (2) Anti-malarial drugs and prophylaxis, as well as iron and folic acid supplementation that are usually given during antenatal care in developing countries has been shown to reduce the incidence of LBW by 16%. (3) The illiterate or poorly educated are more likely not to receive antenatal care than the educated.

Fariha Anjum (2011), did, “A study on benefits of antenatal visits to reduce prevalence of Low Birth Weight”.

The researcher found (1) There was a positive correlation between the Low Birth Weight and antenatal visits (p< 0.001). (2) Antenatal visits of the pregnant mother’s are very important as they provide chances for monitoring the fetal well being and allow timely intervention for feto-maternal protection. (3) The present study signifies optimal antenatal care for all expectant mother’s.

TT Immunization

Hasnain S (2007), did, “A study on causes of low Tetanus Toxoid (TT) vaccination coverage in pregnant women”. Design of the study was mixture of qualitative methods were adopted at primary health care in Lahore district, Pakistan. A sample of 362 women who had delivered during previous three months.
He found that (1) 87% of the sample recalled receiving 2 doses of TT. (2) The main reasons for non-vaccination was poor knowledge about the importance of TT (32% of women). (3) The According to the managers and primary health care medical officers, the main reasons for low coverage were lack of awareness about the importance of vaccination among the public and misconceptions about TT vaccination.

Pankaj Vohra (2008), reported, “Tetanus Toxoid (TT) vaccine is given during your pregnancy to prevent tetanus to you as well as your baby”.

The researcher found that (1) Antibodies formed in the body, after the vaccination, are passed on to your baby and protect her for a few months after birth. (2) TT also helps prevent premature delivery. (3) In the first pregnancy, women is recommend at least two doses of the TT vaccine. (4) The WHO also recommends that a third vaccine be given six months after the second one to provide protection for at least five years.

Simon Cousens (2010), studied, “Preventable cause of neonatal mortality globally”. He found that immunization of pregnant women with at least two doses of tetanus toxoid is estimated to reduce mortality from neonatal tetanus by 94% (95% CI: 80–98%).

Presentation of delivery

Zeynel Albayrak (2006), made, significant differences in the method of delivery. The researcher found that (1) Delivery by way of caesarean section was seen more frequently in Low Birth Weight infants and this indicated once more that Low Birth Weight infants were more prone to morbidity and mortality. (2) The rate of caesarean section was much higher in the Low Birth Weight births (32.3%) than in the Normal Birth Weight births (21.6%). (3) There were significant differences in the method of delivery and presentations of neonates between LBW and NBW groups.
Durie DESciscione (2011), conducted, “A study to analyze the relationship between mode of delivery and neonatal outcomes in infants< 1,500 g in a vertex presentation”. In this study research design was a retrospective cohort study of singleton, vertex-presenting infants weighing< 1,500 g. A sample of 402 mother’s (42.9%) underwent caesarean delivery. The researcher found that Low Birth Weight was high in the caesarean group compare mother’s who delivered vaginally (0.79).

Previous Obstetric History

Mavalankar DV, et al (1994), Studied, “A case control study to identify and quantify risk factors for small gestational age births in Ahmedabad city, India”.

The researcher suggested that quantity risk factors for SGA were poor maternal nutritional status (weight< 51 kg) anemia, hypertension during pregnancy, primi parity, lack of antenatal care and poor obstetric history were significantly associated (p: 0.001).

Brown JS Jr (2008), did, “A study on the association between previous abortion and Low Birth Weight (LBW) and preterm birth (PTB)”.

He found that (1) There were significant differences with a history of abortions and the incidence of Low Birth Weight. (2) Compared with women with no history of abortion, women who had one, two and three or more previous abortions were 2.8 times more likely to have LBW, respectively. (3) The previous abortion is a significant risk factor for LBW and PTB, and the risk increases with the increasing number of previous abortions. Practitioners should consider previous abortion as a risk factor for LBW and PTB.

D. Gandhimadhi (2010), studied, “Obstetric history as primary risk factor for preterm Low Birth Weight”.

The researcher found that there was a significant association between previous spontaneous abortions and increased incidence of preterm Low Birth Weight in the current pregnancy. The proportion of spontaneous abortions≥ 1 in cases (20.2%) was significantly higher than that in controls (0%) (P< 0.0001).
Mohammad Zafar Idris (2010), made, a study on “Low Birth Weight and its association with maternal health correlates”. At Queen Mary Hospital, K.G. Medical College, Lucknow.

He found that (1) The overall incidence of Low Birth Weight was 32.2% and mean birth weight 2669.7gms 447 S.D. (2) High incidence of LBW was found to be significantly associated with maternal complications of current pregnancy, past obstetric history, maternal diseases.

Anemia

N.G.Bennet (2000), studied, “The levels of hemoglobin level in the pregnant mother’s in India”. The sample was divided into three groups mother’s with Hb < 8 gm, < 10 gm, <12 gm.

The researcher found an evidence that there was statistical significance relationship between the mother’s with anaemia and Low Birth Weight. The lower incidence of LBW was seen at a hemoglobin concentration of 9.5 and 10.5 g/dl. This is widely regarded as indicating anemia in the pregnant women.

Lindsay H Allen (2000), did, “A study on iron deficiency anemia in pregnancy is a risk factor for preterm delivery”.

The researcher found an evidence there is a strong positive correlation between the development of iron deficiency of anemia and Low Birth Weight.

Verhoef FH, et al (2001), conducted, “A study to access the contribution of maternal health, nutritional status and obstetric history and prematurity”. The present study suggest that obstetric risk factors are significantly associated with primiparity (RR 1.9), short maternal stature (RR 1.6) and anemia (Hb, 8 g/dl) at first antenatal visit (RR 1.6).

A report by Andhra Pradesh Human Development (2007) the state was also relatively better than all-India with respect to anaemia. The major conclusions were (1) 17.3% of women in Andhra Pradesh had iron-deficiency anaemia whereas it was
as high as 53% for all-India. (2) But on other aspects of anaemia the state was not much better than the country as a whole. (3) About 79% of children aged 6 to 35 months, and 62 and 56.4 per cent of ever married and pregnant women in the age of 15 to 49 years were found to be anemic whereas for all-India the corresponding figures were 79.2, 56.2 and 57.9%.

In a study conducted by Anu Ram Mohan (2012), on the influence of vegetarian diet on the risk of developing anaemia among Indian women.

Researcher suggest initiatives for addressing diet-related iron-deficiency anaemia. (1) After controlling for individual-level factors and daily consumption of meat, fish, and eggs was associated with lower odds of being moderately anemic. (2) The studies revealed that economic characteristics such as being from higher wealth quintiles and rural residence reduced the odds of having iron-deficiency anaemia among Indian women. (3) Large-scale cohort and intervention studies are urgently required to further define the influence of vegetarianism on iron deficiency anaemia in India.

Preeclampsia

Balwant Rai (2008), reported, that preeclampsia is a common hypertensive disorder of pregnancy, affecting 5-10% of pregnancies and contributing significantly to maternal and perinatal morbidity and mortality. It has been recently studied that women were at higher risk for preeclampsia if they had severe periodontal disease at delivery.

Hypertension

Gray RH (1992), conducted, “A study to assess the risk factor for preterm and term Low Birth Weight (LBW)”. Present study adopted hospital based case control study in Ahmedabad, India. A sample of 673 term LBW, 644 preterm LBW cases and 1,465 controls.
He found that poor obstetric history, lack of antenatal care, anaemia and hypertension were statistically significant independent risk factors for both term and preterm LBW (p = 0.05).

**Vahe Badalyan (2000)**, did, “A matched case-control study on gestational hypertension in Argentina”.

He found that (1) Pregnancy-induced hypertension (classified as gestational hypertension, preeclampsia, or severe preeclampsia-eclampsia) may increase the risk of Low Birth Weight. (2) Gestational hypertension, preeclampsia and eclampsia increased odds of giving birth to small for gestational age infants (OR: 1.8). (3) There was strong association between maternal hypertension and Low Birth Weight. Several other studies revealed maternal hypertension as a risk factor for Low Birth Weight.


The researcher found that the pregnant women with complications during pregnancy such as anemia and pregnancy induced hypertension have a higher risk of delivering Low Birth Weight babies that women of uncomplicated pregnancy.

**Diabetes**

**Shefali (2010)**, conducted, “A comparative study on pregnant women attending Dr. Mohan's Diabetes Specialties Centre, a tertiary care centre for diabetes in Chennai in India”. A sample of 30 were recruited from the ongoing population on Chennai Urban Rural Epidemiology Study (CURES).

The researcher found that (1) Women with pre-gestational diabetes mellitus had significantly higher fasting plasma glucose (p< 0.001) and fructosamine (p< 0.001) levels compared to Gestational diabetes mellitus. (2) There was statically significant difference between pre-gestational diabetes mellitus and gestational diabetes mellitus was statistically significant (p: 0.04). (3) The study emphasizes the
fact that strict glycemic control is important during pregnancy to prevent Low Birth Weight babies.

The Australian institute of health AIHW reported Canberra (2010), women with diabetes have worse pregnancy outcomes compared to non-diabetic mother’s with and those with pre-gestational diabetes far worse than those with gestational diabetes. Diabetes is known to adversely affect women and their babies during pregnancy, labour and delivery. The report explores these differences in Australian mothers and their babies. Mother’s with pre-existing diabetes were more likely to have hypertension and longer stay in hospital than mother’s with GDM or without diabetes in pregnancy.

2.4 Maternal Behavioral Risk Factors of Low Birth Weight

Folic Acid Supplementation

W. L. Burland (1971), conducted, “A case control study on Foliate deficiency, detected by measuring serum and red cell levels, was seen within a group of Low Birth Weight infants”.

The researcher suggest that it is an evident from the study that foliate should be given from birth to all infants of Low Birth Weight, but its form, the route, dosage and duration of treatment merit further investigation.

A. C. Kendall (1974), Did, “A experimental double-blind randomized trial of 50 µg folic acid given from 2 weeks to 6 months to 130 infants of birth weight less than 2.5 kg”. He suggested that infants in this series were receiving adequate amounts of folic acid in their normal diet and did not require supplements.

Lingxia Zeng (2001), made, “A case control study on rural populations in China antenatal supplementation with iron-folic acid was associated with longer gestation and a reduction in early neonatal mortality compared with folic acid”.

The researcher found that (1) Multiple micronutrients were associated with modestly increased birth weight compared with folic acid. (2) The results suggest
that there was no significant reduction in early neonatal mortality. (3) Pregnant women in developing countries need sufficient doses of iron in nutrient supplements to maximize reductions in neonatal mortality.

According to WHO(2007), report “A case control study on iron and folic acid deficiency in women during pregnancy on in An'chra Pradesh, India”.

He found that (1) There was a significant association with improvement in antenatal care though mother’s taking Iron and Folic Acid tablets for the required 90 days. (2) There was positive significant relationship between 46% of urban women and rural 36% of women were took IFA tablets for 90 days.

S Palma (2007), conducted, “A study to assess whether iron and folic acid supplementation reduce the risk of Low Birth Weight”. It was done by University Hospital of Cantabria. In this study involved a sample of 1,256 mother’s.

The major conclusions are (1) 322 cases mother’s without anaemia delivering a singleton baby and 934 controls mother’s without anaemia delivering a term non-small gestational age (SGA) baby. (2) The results suggest that there was a significant trend towards a lower risk of LBW (p< 0.001) with the iron supplementation. (3) Concluded that Iron supplementation is associated with a lower risk of LBW in pregnant women without anaemia.

Chandras Metgud (2008), did, “A study on unregistered mother’s had higher risk delivering Low Birth Weight babies”.

The researcher found that (1) 19.9% unregistered mother’s had 11 times higher risk of having a LBW baby in comparison to those who had 3 or more visits. (2) The results suggest that those women who did not consume IFA tablets during pregnancy, the chances of having LBW baby was 8 times in comparison with those who consumed 100 or more tablets. (3) The increase of antenatal care is the improvement of iron and folic acid supplementation and Low Birth Weight decreases.
Exposure to Second Hand Smoke

Yoonjoung Choi (2010), conducted, "An epidemiologic study on the association between prevalence of tobacco use and Low Birth Weight". It was found that second hand smoke exposure during pregnancy was a risk factor of Low Birth Weight. Finally he concluded that second hand smoke was a risk factor for mortality and morbidity infants.

Shivaprasad S (2010), studied, “A study on exposure to solid fuel and second-hand tobacco smoke during pregnancy women in South Asia”. A sample of total of 7,961 pregnant women.

He concluded that (1) pregnant women from low/middle income countries were commonly exposed to indoor air pollution (IAP) secondary to use of solid fuels. (2) The exposure to second-hand tobacco smoke was also common. (3) The increases of second hand smoke exposure ultimately the risk of poor pregnancy outcomes also increases.

Nora L. Lee (2012), did, “A study on the association between maternal second hand smoke exposure during pregnancy and decreases in neonate birth weight”.

The major findings that (1) Mother’s who were exposed to second hand smoke delivering higher Low Birth Weight neonates compared with the mother’s who were unexposed. (2) Infants had higher mean birth weights among the exposed than the unexposed for all measures of second hand smoke exposure. (3) There was an association between second hand smoke exposure and birth weight.

Stable Relationship

Hendrickson J (2005), did, “A case control study on risk factor of Stable relationship during pregnancy”.

He observed that (1) Mother’s exposure to severe life events during pregnancy have infants with significantly lower birth weight. (2) The probable
mechanism of stress-related effects on birth weight may be changes in lifestyle. (3) Stable relationship was statistically significant associated with Low Birth Weight (p<0.01).

**Financial Worries**

**Tom McGuire (1995),** made a study on “The health and financial problems associated with low preterm birth weight babies (weighing less than 2,500 grams, about 5.5 pounds, at birth)”.

The researcher concluded that (1) Low Birth Weight is still the number one cause of infant mortality. (2) Financial problem also causes many long-term health problems, including an increased risk of cerebral palsy, epilepsy and learning disabilities. (3) Both emotionally and financially of low preterm birth weight babies is tremendous. (4) The risk factor of financial problem is strongly associated with Low Birth Weight.

**D B Binsacca (2008),** conducted, “A case-control study to examine relation of 13 variables to Low Birth Weight was assessed using a multiple logistic regression analysis”.

He found that (1) A six fold increase in the risk of LBW was found an association with financial problems during the pregnancy. (2) the cost of controlling for differences in race, certain poor health habits, complications of pregnancy, and several other factors between cases and controls.

**Physical Violence**

**Umea University Medical Dissertations UUMD (2005),** studied, “The prevalence of emotional, physical and sexual partner abuse during pregnancy”.

The researcher found that (1) Among the subjects 17% of the victims suffered all three types of violence and in two thirds the abuse was severe and repeated. (2) Abuse during pregnancy was also found as an independent risk factor for LBW. (3)
16% of LBW was attributed to physical abuse by a partner during pregnancy. (4) A significant association between abuse during the pregnancy and SGA was found.

The major conclusions were (1) Partner violence during the pregnancy, low social resources and emotional distress were associated with higher levels of salivary cortisol. (2) Pregnant women with high cortisol values were significantly more likely to give birth to SGA babies. (3) Partner violence during pregnancy is a serious social problem that impacts the rights, health and well being of both the woman and her unborn child. (4) The studies call for prioritization of intervention programmes for prevention and detection of violence, treatment and rehabilitation of the victims and the perpetrators, and change of the structural causes producing violence in society.

Kaye DK (2006), made “A prospective cohort study abuse assessment screen during pregnancy” In Mulago of hospital, Kampala, Uganda. A sample of 612 women were recruited in the second pregnancy trimester and followed up to delivery.

They found that (1) 169 women 27.7% who reported domestic violence during pregnancy did not differ significantly from the unexposed regarding socio-demographic characteristics. (2) Differed significantly (P < 0.05) regarding domicile variables (had less household decision-making power, and more had unplanned pregnancy). (3) The delivered babies with a mean birth weight 2647.5 +/- 604 g, on average 186 g 95% CI: 76-296; P: 0.001 lower than those unexposed. (4) In this pregnancy, domestic violence was a risk factor for Low Birth Weight delivery.

Michael A Koenig (2010), conducted, “A study to investigate the relationship between domestic violence and perinatal, neonatal and infant mortality” in rural India. Data was collected from 3,909 birth outcomes that took place during this 4-year period were analysed using bivariate analysis and hazards regression analysis.

The data findings were (1) Overall majority of women who experienced violence had 68% higher risk of infant mortality compared with the ‘no violence group. (2) Births to women who experienced a single episode of violence were not at higher risk of mortality. (3) The study provides additional and more conclusive
evidence on the importance of domestic violence for early childhood mortality in low-resource settings such as rural India. (4) The results argue for a greater focus upon such violence within current child survival programmes.

Vomiting Disorder

JAN NISSEL, RN, BS, (2006), conducted, “A study on morning sickness and birth outcome”.

He found that (1) Morning sickness usually goes away as a pregnancy progress. (2) Some report ongoing nausea or vomiting through the second trimester. (3) If mother have severe, ongoing nausea and vomiting pregnancy can lead to dehydration. (4) The studies indicates that there is significant association between Low Birth Weight and nausea and vomiting.

HB% during Pregnancy

Nancy L. Sloan (2002) reports that prenatal iron supplementation has been the standard recommendation for reducing maternal anaemia in developing countries for the past 30 years.

Major conclusions were the efficacy of iron supplementation on hemoglobin levels in pregnant women in developing countries. The maternal hemoglobin levels can be increased by recommended prenatal supplementation is limited and has uncertain physiological benefits. Food fortification and prevention and treatment of other causes of anaemia, require methodologically rigorous evaluation to find effective answers to this global problem.

Rasmussen (2005) studied “The association between birth outcomes, and anemia”.

He found that (1) Low hemoglobin values reflect inadequate maternal stores. (2) Rates of preterm births were minimal when maternal hemoglobin ranged between 115 and 125 g/l in white women and between 105 and 115 g/l in black women. (3) Low Birth Weight births were seen between 0.76 and 2.96 for moderate anemia and
between 1.0 and 6.33 for severe anemia. (4) The attributable risk for LBW births for moderate anemia was reported to be between 42% and 55%. (5) Severe anemia between 34% and 84%.

Similarly the Relative Risk for preterm births in women with moderate anemia was between 0.6 and 3.2, and for severe anemia it was between 0.55 and 4.01.

Kapil Goel (2010), studied, “Low Birth Weight is influenced by many socio-economic factors”.

The researcher found that (1) Urban or rural religion and caste, nutritional status of mother, body mass index, hemoglobin level were found significant among cases and controls. (2) Prevalence anemia was seen (47.61%) of Low Birth Weight was inversely proportional to the 6.0-8.0gm. hemoglobin level. (3) Primiparous mother’s was found to be (42.86%) and in parity of >5 (23.80%).

Gagan Agarwal (2012), studied, “Low Birth Weight is influenced by maternal socio-economic factors”.

The researcher found that (1) Hemoglobin level depends on the quality of ante-natal care received and spacing of pregnancies. (2) Low Birth Weight babies pose challenge to the families and communities. (3) They contribute major share in perinatal and neonatal mortality and also towards mental, physical and development challenges in paediatric population.

Green leafy vegetables

Hart AD (2005), analyzed that vegetable consumption pattern of households in selected areas. The major conclusions were (1) Factors that influenced vegetable consumption was found to be chiefly season and culture. (2) Leafy vegetables were consumed at least four times per week in Igwuruta and Port Harcourt, while households in Ahoada and Kaiama, where culture had strong influence, consumed them only occasionally. (3) Results report that this situation underscores the need for nutrition education, coupled with a program on dietary diversification to create
awareness, increase production, processing, preservation and consumption of vegetables.

Ashok Kumar (2005), made, “A study food patterns during pregnancy”. The data demonstrates (1) Two-third of pregnant women consumes vegetables every day and 93 percent eat vegetables at least once a week. (2) Pulses and beans, as well as green, leafy vegetables are also important part of their diet. (3) About half of the women (47%) eat pulses or beans everyday and (42%) green, leafy vegetables every day. (4) Milk or curd is a common part of the diet for a majority of the women, but (34.1%) of women consume milk or curd occasionally and (11%) never consume them. (5) Fruits are eaten daily by only eight percent of the women and only one-third of the women eat fruits at least once a week.

G P Savage (2008), conducted, “A study on the soluble and total oxalate contents of 11 leafy vegetables grown in India were determined”.

The researcher found that (1) The data demonstrates Spinach, purple and green amaranth and colocasia contained high levels of total oxalates. (2) Seven other leafy vegetables (curry, drumstick, shepu, fenugreek, coriander, radish and onion stalks) contained only insoluble oxalate. (3) These soluble oxalates are very important ingredients for the increase in the hemoglobin level during pregnancy.

Summary of the studies on the maternal risk factor associated with Low Birth Weight and felt gap.

From the review of the reported studies it was evident that many case control studies were conducted to know the maternal risk factors associated with low birth baby. But the research studies were much limited about the behavioral risk factors. Only few Indian studies examined the maternal risk factors associated with Low Birth Weight babies. Although risk factors for preterm birth have been commonly studied worldwide, no systematic surveys have been conducted in Guntur, Andhra Pradesh, India. In view of the immense cost of preterm birth high total fertility rate in Guntur low socio economic status lack of resources and the stresses of the family in
Andhra Pradesh, it is important to study the maternal risk factors associated Low Birth Weight babies. The present study is an attempt to supplement these studies.

To conduct the present study investigator reviewed approximately 60 journals, 40 books/encyclopedia, 30 surveys/dictionary policies, 20 unpublished and published dissertations/Thesis. This review of literature was a valuable guide to defining the problem, recognize its significance, suggesting promising data gathering devices, appropriate study design and sources of data.

In the next chapter Methodology and Procedure of the study were presented.