"MATERNAL DETERMINANTS OF LOW BIRTH WEIGHT: A CASE CONTROL STUDY IN A TERTIARY CARE HOSPITAL, BELGAUM, KARNATAKA"

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This is to certify that the dissertation entitled **"MATERNAL DETERMINANTS OF LOW BIRTH WEIGHT: A CASE CONTROL STUDY IN A TERTIARY CARE HOSPITAL, BELGAUM, KARNATAKA"** is a bonafide research work done by REGISTRATION NO: BD0108002.

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LIST OF ABBREVIATIONS USED

- LBW – Low Birth Weight
- IUGR – Intra Uterine Growth Retardation
- ANC – Antenatal Care
- SGA – Small for Gestational Age
- AGA – Appropriate for Gestational Age
- LGA- Large for Gestational Age
- PIH – Pregnancy Induced Hypertension
- PROM – Premature Rupture of Membranes
- IMR- Infant Mortality Rate
- BMI- Body Mass Index

ABSTRACT

Background and objectives:

Low Birth Weight (LBW) is an important cause of infant morbidity and mortality and is an important public health problem. There is much controversy regarding the various risk factors implicated in the aetiology of LBW, and the quantitative importance of each. A hospital based case control study was undertaken with the objective of determining the most important risk factors for term LBW after matching for socio-economic variables of the mother and the gestational age of the pregnancy.

Methods:

The present case-control study was conducted at a tertiary care hospital of Belgaum, Karnataka from 1st January 2009 to 31st December 2009. A total of 250 mothers and their singleton term newborns (125 cases and 125 controls) were studied. Mothers were matched for socioeconomic status, occupation, educational status and gestational age of the pregnancy. Odds ratios were calculated, univariate and multiple logistic regression analyses were used to determine the most important maternal determinants of low birth weight.

Results:

The significant risk factors for LBW on univariate regression were maternal age less than 19 years (OR 5.54), residence in a rural area (OR 2.10), primiparity (OR 2.99), female sex of the baby (OR 1.79), pregnancy interval less than 12 months (OR 7.75) ,complications during pregnancy (OR 2.51) ,maternal anaemia (OR 1.72), inadequate ANC (OR 2.85) , late registration of pregnancy (OR 2.29), maternal height less than 145 cm (OR 9.03), maternal weight less than 45 kg (OR 4.01) iron supplementation for less than 100 days (OR 3.72). The significant risk factors on multivariate regression were maternal age less than 19 years (OR 9.74) female sex of the baby (OR 4.17), pregnancy interval less than 12months (OR 5.06), complications during pregnancy (OR 4.96),maternal weight less than 45 kg (OR 14.62), inadequate iron supplementation during pregnancy (OR 8.25) .The risk factors that were not significant on multiple regression were rural area of residence, primiparity, anaemia, less than 3 ANC visits, late registration of pregnancy, maternal height less than 145 cm

Conclusion and interpretation:

Measures should be taken to delay the age of marriage of adolescent girls in order to postpone the age of first pregnancy. Complications during pregnancy should be managed promptly. Mothers should be educated on the importance of good nutrition and adequate iron supplementation, and should also be counselled on the use of proper birth spacing methods.

Keywords:

Term low birth weight, case–control study, hospital

CONTENTS

LIST OF TABLES

INTRODUCTION

Low Birth Weight has been recognized as one of the most important underlying factors of infant mortality in both developing and developed countries. Decades of research have gone into establishing its etiology and finding ways to mitigate its harmful influence but it continues to be a field of research that perplexes and challenges epidemiologists.

The Magnitude Of The Problem

World

The first authoritative global estimates of mean birth weight and the prevalence of LBW were produced by WHO in 1979 and updated to 1982. Of the 127 million infants born in the world in 1982, 20 million (16%) were estimated to weigh less than 2500 g, and over 90% of these infants were born in developing countries, a function not only of the higher birth rate in these countries but also of their much higher prevalence of LBW. The lowest birth weights were reported for Asia, with mean values ranging from about 2700-2800 g in the Indian subcontinent to 3200-3300 g in China and Japan, and corresponding LBW rates of 30-40% and 5-6%, respectively. Unfortunately most of these early studies failed to distinguish between pre-term and IUGR forms of low birth weight[1].

According to a UNICEF report, the worldwide prevalence of LBW is be about 15.5 %, of all births, which puts an estimated 20 million children at risk. 95.6% of LBW babies are born in developing countries and the prevalence of LBW in these countries (16.5%) is more than double the level in developed regions (7%). In developing countries the majority of low birth weight babies are due to prematurity, while in developing countries IUGR has been described as the leading cause. It is estimated that half of all low birth weight babies are born in South-central Asia, where more than a quarter (27 %) of all infants weigh less than 2,500 g at birth. Low birth weight levels in sub-Saharan Africa are around 15 per cent. Central and South America have, on average, much lower rates (10 %), while in the Caribbean the level (14 %) is almost as high as in sub-Saharan Africa. About 10 % of births in Oceania are low birth weight births [2].

India

In India, recently efforts have been made to collect nationally representative estimates of birth weights from institutional and community deliveries. The reliable institution based National Neonatology Forum data for the year 1995 yielded a LBW prevalence of 32.8%. Only 33% of the LBW infants were preterm. The Child Survival Safe Motherhood (CSSM) Programme linked District based data reported wide regional variations with values ranging from a low of 2.7% (Madhya Pradesh) and 5.1% (Assam) to a high of 24.7% (Tamil Nadu) and 40% (Orissa) [3].

Public Health Importance

LBW is an important indicator of the state of maternal and child health in a country and is used to measure progress towards internationally agreed upon health goals. The 34th World Health Assembly of the WHO adopted the goal of reducing the incidence of low birth weight to less than 10% as part of the global strategy of ' Health for All 'by the year 2000[4].

Reduction of low birth weight incidence is one of the major goals of the ' World fit for Children' plan adopted by the United Nations General Assembly in 2002 .It also forms an important contribution to the Millenium Development Goal (MDG) for the reduction of child mortality[2] .

The increased risk of perinatal morbidity and mortality in IUGR babies causes an increased burden on government expense in developed countries and a permanent problem for families in developing countries. The prevention of LBW can reduce IMR, as well as unlock potential economic benefits for both the individual and society.

Clinical Importance

LBW babies are at a higher risk for cerebral palsy. Preterm LBW babies have a much greater risk of developing hyaline membrane disease, apnea, intracranial hemorrhage, sepsis, retrolental fibroplasia and other conditions related to physiological immaturity. IUGR infants are more likely to exhibit growth deficiencies which may be permanent and result in short stature[4].

The causes and effects of low birth weight are complex and have been studied in the conceptual framework of the life cycle. It has been found that low birth weight infants tend to grow up into undernourished and stunted adolescents and consequently undernourished mothers who give birth to LBW infants. Thus, the problem of LBW is intergenerational and is a part of the vicious cycle of poverty and malnutrition. According to the fetal origin of disease hypothesis, also known as Barker's hypothesis, undernutrition at critical stages in fetal growth can cause an increased risk of coronary heart disease and non insulin dependent diabetes mellitus later on in life. There is also growing evidence that those adults born with low birth weight suffer an increased risk of high blood pressure, obstructive lung disease, high cholesterol and renal damage[5].

The WHO defined Low Birth Weight (LBW) as birth weight less than 2500 g , the measurement being taken preferably within the first hour of life , before significant postnatal weight loss has occurred. [4]Thus, an LBW infant is any infant with a birth weight of less than 2. 5 kg regardless of gestational age. This cut off value was determined on the basis of epidemiological studies which suggested that a birth weight less than this value was associated with a significantly higher risk of morbidity and mortality[4].

This definition of LBW in this manner has proven to be a double edged sword. While it confers simplicity and uniformity to the measurement of this condition, it fails to distinguish between the two major processes that govern the birth weight of the child, namely preterm delivery and intrauterine growth retardation (IUGR). Preterm delivery has been defined as a birth that occurs before the completion of 37 weeks of gestation. A preterm baby may have a birth weight that is smaller, larger or appropriate with respect to its gestational age, and thereby accordingly classified as Small for Gestational Age (SGA), Large for Gestational Age (LGA) or Appropriate for Gestational Age (AGA).[6]Thus ,a preterm baby may have normal growth in utero, with a resultant birth weight that is equal to or more than the expected weight for its gestational age and still be classified as' low birth weight'. The term 'Intrauterine Growth Retardation (IUGR)' doesn't have a standard definition but has been variously defined as birth weight of less than 2500 gm when the gestational age is more than or equal to 37 weeks, birth weight less than two standard deviations of the mean value for gestational age or as birth weight below the 5^{th} or 10^{th} percentile of gestational age[4]. The term implies that the normal growth process of the fetus has been hampered at some stage, resulting in a birth weight that is usually SGA but that may also be AGA or rarely LGA.

Thus, 'Low Birth Weight' is an umbrella term encompassing a heterogeneous group of babies who may be born pre-term, IUGR or both. It is often used as a proxy indicator to quantify the magnitude of IUGR in developing countries where valid assessment of gestational age is generally not available.

Studies from India that examine the risk factors associated with LBW have yielded conflicting evidence. While the role of socio-economic factors has been recognized, there is much controversy regarding factors such as maternal age, maternal height, maternal weight, anemia during pregnancy, and quality of antenatal care received. These variables have been have reported as significant risk factors in some studies but not in others. Previous studies have been limited by their lack of control for socioeconomic variables of the mother and the gestational age of the pregnancy. Another weakness of earlier studies is that they do not distinguish between pre-term and term LBW, even though research shown that the processes of preterm delivery and IUGR are both determined by different sets of risk factors[6].

The present case- control study was undertaken in a tertiary care hospital to elicit the significant maternal risk factors associated with low birth weight in term newborns after matching for socio-economic variables of the mother and the gestational age of the pregnancy. In so doing it seeks to help bridge the existing gap in the research literature.

OBJECTIVES

1. To study the maternal determinants of low birth weight

2. To find the leading causes of low birth weight.

REVIEW OF LITERATURE

The accurate weighing of infants at birth can be traced to the mid eighteenth century. The early investigators were inspired by diverse motives, including intellectual curiosity, a desire to understand human biology, and knowledge of the relationship of size to survival of mother and child. During the second half of the century, some investigators regarded birth weight as a useful measure of fetal development, but controversy over this concept persisted well into the twentieth century. By the end of the nineteenth century, however, birth weight and length at birth had become tools of pediatric diagnosis.

As the health implications of low birth weight were gradually brought to light, the topic began to draw the attention of researchers all over the world. Most of the earlier studies were done in developed countries, where hospital deliveries are the norm, rather than in developing countries where most of the deliveries take place at home in settings where birth weight isn't measured [2].

The first reliable global estimates of mean birth weight and the prevalence of LBW were produced by WHO in 1979 and updated in 1982 Unfortunately, most of the studies upon which these data were based did not distinguish between prematurity and IUGR[1].

An extensive meta analysis and critical review of English and French medical literature on low birth weight was performed by Kramer in 1989.A total of 921 relevant publications were identified, of which 895 were successfully located and reviewed. The assessment was restricted to singleton pregnancies of women who lived at sea level and who had no chronic illnesses. Extremely rare factors were also excluded, as were complications of pregnancy. In this way, 43 potential determinants were identified and classified as genetic and constitutional factors, demographic and psycho-social factors, obstetric factors, nutritional factors, maternal morbidity during pregnancy, toxic exposure and antenatal care. Of these factors, those with well-established direct causal impacts on intrauterine growth include infant sex, racial/ethnic origin, maternal height, pre-pregnancy weight, paternal weight and height, maternal birth weight, parity, history of prior low-birth-weight infants, gestational weight gain and caloric intake, general morbidity and episodic illness, malaria, cigarette smoking, alcohol consumption, and tobacco chewing. In developing countries, the major determinants of IUGR were Black or Indian racial origin, poor gestational nutrition, low pre-pregnancy weight, short maternal stature, and malaria. In developed countries, the most important single factor was cigarette smoking, followed by poor gestational nutrition and low pre-pregnancy weight[1].

For most developing countries, estimates of LBW based on data compiled from health facilities are biased because the majority of newborns are not delivered in health facilities and those who are represent a biased sample of all births. As an alternative to health-facility-based data, information on birth weight has been collected systematically since about 1990 from mothers participating in nationally representative household surveys. However, an assessment of the results from 15 countries by Boerma et al. published in 1996 found that mothers were often unable to provide numerical birth weights for their infants, primarily because the infants had not been weighed at delivery[7].

According to Mullany et al in 2005, differences in estimated LBW rates may be entirely due to differences in instrument precision. Conclusions concerning programmatic or research intervention impact, or comparisons of rates across populations should consider the effect of instrument precision on estimates of LBW [11]

In India, recently efforts have been made to collect nationally representative estimates of birth weights from institutional and community deliveries. The reliable institution based National Neonatology Forum data for the year 1995 on 37082 live births yielded a LBW prevalence of 32.8%. Only 33% of the LBW infants were preterm. The Child Survival Safe Motherhood (CSSM) Programme linked District based data on 27069 births estimated the LBW prevalence to be much lower at 18.4%. Wide regional variations were apparent with values ranging from a low of 2.7% (Madhya Pradesh) and 5.1% (Assam) to a high of24.7% (Tamil Nadu) and 40% (Orissa)[3].

Risk factors affecting LBW [12]

An innumerable number of factors influence the duration of gestation and intrauterine growth. The various factors can be broadly considered in the following groups.

1. **Maternal factors**

   The following factors may be considered

   a. Age
   b. Height
   c. Socio-economic status and education
   d. Under-nutrition
   e. Chronic infections and diseases
   f. Previous history of a low birth weight baby
   g. Antepartum hemorrhage
   h. Toxemia of pregnancy
   i. Physical and emotional stress

2. Fetal factors:

a. Multiple fetuses: This is one of the leading causes of low birth weight

b. Congenital malformations: Eg. aencephaly, phocomelia, meningomyelocoele, polycystic or hydronephrotic kidney, cardiovascular malformations

c. Infections transmitted from the mother such as syphilis, rubella, toxoplasmosis, cytomegalic inclusion disease, etc. results in intrauterine growth retardation

d. Chromosomal aberrations: Eg. Down's syndrome, Trisomy 13- 15 and 17-18 are often associated with low birth weight of the newborn

3. Placental factors:

A small placenta is associated with low birth weight. Placental abnormalities such as abnormal attachment of the cord, multiple infants, hemangiomas, premature placental separation, single umbilical artery, avascular terminal villi, etc. may contribute to the occurrence of low birth weight.

Following is a review of literature pertaining to the maternal risk factors included as study variables in the present study.

Parity:

There is general agreement that pregnancy outcomes are more favorable for multiparae than the primiparae, grand multiparity, however is often believed to constitute a risk [1].

Kramer, in1987, used data from four methodologically sound studies and calculated that the sample size weighted risk ratio associated with primiparity was

1.23.[1] Shah and Ohlsson, in an extensive review of literature on LBW in 2002 found that the available evidence pointed to an increased risk of pre-term birth and IUGR with primiparity but the trend was not well confirmed in other studies[6].

Negi et al, studying pregnant women registered at a Rural Health Training Centre at Dehrahun in 2002, reported increased risk of LBW for primiparous women (OR 3.21, p value< 0.01) compared to mutiparous women[13].

Kiran Anand, B.S Garg , in their study performed in Wardha in 2000, reported a similar increase in risk of LBW for primiparous women [OR 3.05. 95%CI 1.58-5.91)[14].

Deshmukh et al' in1998, performed a prospective cohort study in Nagpur and also observed that primiparity was associated with an increased risk of LBW (OR 1.58, 95%CI 1.20-2.10)[15].

Their results conflict with the results of a longitudinal study performed in a slum area of greater mumbai by Joshi et al in 2005 .In this study, the percentage of low birth weight increased significantly with increase in parity. 23% of primiparous women in the study had LBW babies which was significantly lower than the 34 - 67% of multiparous women who delivered LBW babies (r= 0.94, p<0.001)[16].

Birth interval:

A short pregnancy interval may lead to LBW because of nutritional depletion or inadequate physiological recovery. Kramer found that there was insufficient epidemiological evidence to show that birth interval was not a significant risk factor for LBW [1].However,Shah and Ohlsson found that several epidemiological data sources in the US indicated that both short (<18m) and long (>60m) intervals are associated with LBW births[6].

Negi et al , in their study performed in a rural area near Dehradhun in 2006 found that an interpregnancy interval of less than 12 months was associated with a higher risk of LBW (OR 2.58,p < 0.05)[13] .Deshmukh et al, in their longitudinal study in an urban area of Nagpur reported a similar finding (OR 3.84, 95% CI 2.10-6.46) [15].

Bad Obstetric History

Kramer did not find any evidence to show that prior spontaneous abortion or prior still birth/neonatal death was associated with LBW. While there was some evidence to suggest that a history of prior low birth weight delivery was associated with increased risk in the next pregnancy (RR 2.75)[1].

Shah and Ohlsson , in 2002, reviewed 8 studies and found evidence to indicate that prior delivery of LBW baby led to an increased risk of recurrence in a subsequent pregnancy[14].

Studies done in India have reported that prior bad obstetric history is a risk factor for LBW in a subsequent pregnancy. A bad obstetric history, defined as previous history of abortion, still birth, perinatal death, premature delivery or breech delivery, was found to have a highly significant relationship with LBW by Negi et al.[13] Anand and Garg found significant relationships between abortion (OR 4.22 (95% CI 1.78-10.1), p< 0.001) Still birth (OR 3.29 (95% CI 1.09-9.92), p<0.001) Previous LBW (OR 4.55 (95% CI 1.89-11.04), p< 0.001) Perinatal death (OR 9.86 (95% CI 2.27-35.06), p<0.001) and LBW. [14] .Singh et al also reported that history of abortion, still birth, and neonatal death was associated with a higher risk of LBW in the subsequent pregnancy(OR 5.09 (95%CI 1.93-13.49),p< 0.003) [24].

In a cross sectional study of four public hospitals in Peshawar, Pakistan, in 2008 previous history of abortion/miscarriage[OR 1.8 (95% CI 1.1-2.7)] and history of abortion/miscarriage immediately preceding the studied pregnancy [OR1.7 (95% CI 1.1-2.8)] were found to be significant risk factors for LBW [27].

Maternal age:

According to Kramer, adolescents and women over 35yrs of age generally have less favorable pregnancy outcomes, including low birth weight. Whether age is an independent risk factor for IUGR is, however, not clear. Age is closely related to parity and adolescents are likely to have a lower weight for height than older women and may consume less calories and nutrients. Thus, maternal age may be an indirect cause of LBW through its effects on stature, weight, gestational nutrition or drug use. Only one out of the 12 methodologically sound studies reviewed in Kramer's meta analysis found a significant independent effect which could have easily arisen by sampling variation. The largest and the best of these studies found no age effect. For young adolescents (<16yrs of age) there was no evidence to demonstrate age as an independent risk factor for IUGR or prematurity. For mothers above 35yrs of age, also the evidence was inconclusive. He concluded, therefore, that age was not a significant independent risk factor for LBW[1].

Shah and Ohlsson reviewed 3 population cohort studies and analyzed the rates of LBW in Toronto amongst singleton live births in 1997.These studies have shown that the incidence of LBW births follows a "U" shaped curve with high numbers of LBW births at the extremes of age. These studies have also shown moderate evidence to show that adolescent pregnancy may be at a higher risk of LBW but more research need to be done before this can be confirmed.[6]The results of a study performed by Negi et al also showed a 'U shaped curve' with majority of LBW babies being born to teenage mothers and mothers over 30 yrs of age, but the relationship between maternal age and LBW in this study was not statistically significant[13].

Studies performed in India have shown conflicting results on the question of maternal age as a risk factor for LBW.

Kumar et al in a hospital based case control study performed in 2010 were able to demonstrate a maternal age of less than 20 yrs as a significant risk factor for LBW [OR 3.96,(95% CI 1.25-12.62)][17]. This was in contrast to another hospital based case control study performed in Udupi District of Karnataka in 2004 which reported no significant association between maternal age and LBW[18].

A longitudinal study performed in a slum of Greater Mumbai, maternal age less than 20 yrs was found to be a significant risk factor for LBW [19].Similar results are reported by other studies [16,]15.However, a cross sectional study performed in Wardha failed to reveal a statistically significant association between maternal age and LBW[14].

Iron and folic acid supplementation

The epidemiological studies from various parts of the world suggest that supplementation of iron is associated with improvement in maternal iron status but there is no evidence that supplementation reduces the incidence of LBW births.[14]

S Palma et al in a case control study performed in 2008 showed that iron but not folic acid supplementation was associated with a lower risk of LBW in mothers without anemia [OR 0.58 (95% CI 0.34 to 0.98)] adjusted for smoking, maternal education, body mass index, obstetric diseases during pregnancy, weight gain during pregnancy, and previous LBW.[20]

The review by Shah and Ohlsson showed that the quality of the studies assessing the impact of folate on birth weight is poor. The conclusive efficacy of folic acid in improving hematological status was not translated into significant reduction of preterm/IUGR births.[6]

Anemia

Kramer found that studies that have a bearing of the impact on anemia on intrauterine growth were particularly weak from a methodological standpoint. Hemoglobin levels fall during pregnancy because of expanded plasma volume. Moreover, there is the tendency of women who deliver prematurely to have a higher concentration of hemoglobin which may observe an effect until gestational age is controlled for[1].

Anemia was the most significant risk factor associated with LBW birth in a cross sectional study performed in an urban area of Nagpur in 1998, (OR4.81,95%CI 1.68-12.43)[15]. Another cross sectional study done in Wardha in 2000 found a statistically significant association between hemoglobin concentration and LBW[14].

D. Acharya et al in a hospital based case control study from Karnataka in 2004 found maternal anemia (Hb <11gm%) to be a significant maternal determinant of IUGR (OR 2.13, 95%CI 1.15-3.95)[18],a similar finding was noted in another case control study from Karnataka in 2010 (OR 4.37, 95%CI 2.31-8.26,p<0.001)[17].

Maternal weight

Maternal pre-pregnancy weight reflects the nutritional stores potentially available to the growing fetus. Like height, weight is influenced both by genetic and environmental factors. Kramer calculated a sample size weighted effect of 9.5gm birth weight per kg maternal pre-pregnancy weight[1].

Negi et al, in 2006, found that maximum number of LBW babies in their study were delivered by mothers whose gestational weight at third trimester was less than 45kg (OR 8.2) [13].Similar findings were reported by other studies [18,14,17].

A study performed in Rajshahi, Bangladesh in 2003 found that maternal weight of less than 50 kgs in the third trimester of pregnancy was associated with a higher risk of delivering a low birth weight baby [RR 2.29 (95% CI 1.49-3-50)][21].

Maternal height:

Maternal height is determined by genetic growth potential, skeletal maturity and the environmental influences during the period of skeletal immaturity.

According to Kramer, the sample size weighted estimate of the relative risk of IUGR in mothers with a maternal height <157.5-158cm was 1.27[1].

Maternal height has a well established direct causal impact on intra-uterine growth and an intergenerational effect has been noted in the studies pertaining to the influence of maternal height on low birth weight. However, the exact mechanism of how maternal height influence pregnancy outcomes is still not clear and the impact of maternal height on LBW is not clearly established[6].

A Hospital based case control study performed in Udupi district of Karnataka in 2004 found a low maternal height(less than 145 cms) to be a significant risk factor (OR 4.48, 95% CI 1.75-11.5)[18].

A similar hospital based case control study performed in Manipal in 2010 was unable replicate this finding[17].

A cohort study by Deshmukh et al in an urban area of Nagpur in 1998 found maternal height to be a significant risk factor for LBW (OR 2.76,95% CI 1.92-3.92)[15].

However, a longitudinal study performed by Negi at al in a rural area near Dehradhun in 2006 could not demonstrate maternal height to be a significant risk factor[13].

Maternal BMI

Low maternal BMI was found to be a significant risk factor by Deshmukh et al in 1998 [OR 2.02 (95%CI 1.26-3.14)][15]. A similar finding was also reported by other Indian studies [16,9].

A hospital based case-control study on IUGR performed in Udupi, Karnataka, in 2004 showed that BMI<18.5 was a significant risk factor by univariate analysis [OR 2.59 (95% CI 1.08-6.25)] but not on multivariate analysis[18].

Khatun Selina and Rahman Mahamudur, in a study from Bangladesh in 2008 found that BMI was not a significant predictor variable for LBW[22].

Utilization of ANC services

Navneetham and Dhrmalingam analyzed NFHS- 3 data to study the utilization patterns of maternal health care services across South India in 2000. They found that the utilization of ANC services was lower in Karnataka (OR 0.73, $p < 0.01$) than in the states of Andhra Pradesh (OR 1.0), Tamil Nadu (OR 1.5 , $p < 0.01$), and Kerala (OR 2.49 , $p <0.01$) 85% of women in Karnataka received ANC care, and 51% of these women registered their pregnancy in the first trimester. They found that 60% of deliveries in Karnataka take place at home and only half of these are assisted by trained personnel. Birth order was an important predictor of receiving antenatal care in Andhra Pradesh , where a birth order of 4 or more reduced the probability of receiving ANC by upto 50%, but this was not the case in Karnataka. Their study found that there was no difference between working and non-working women in utilizing ANC services, but that women with medium to high exposure to mass media

(Radio and Television) were more likely to receive ANC. In Karnataka, women who had first order births, resided in urban area, or had studied beyond high school were much more likely to deliver their baby in a health care institution (OR 2.65 $p<0.01$, OR 2.21, $p<0.01$, OR 1.7 < 0.05 respectively)[23].

Antenatal care could have a beneficial impact on intrauterine growth by early diagnosis and treatment of pregnancy complications or by reducing or eliminating modifiable risk factors such as low calorie intake, infections during pregnancy, tobacco use and alcohol consumption.

Kramer, in 1987, found no significant evidence to link early antenatal care with intrauterine growth or gestational duration. He cautioned against generalizing this inference, however, as it was drawn from studies that were all from developed countries and were therefore based on generally healthy women who perhaps had less need for antenatal care[1].

Shah and Ohlsson, in 2002, found that case control studies had provided some insight into the role of antenatal care in reducing LBW/pre-term births[6].

Negi et al in a longitudinal study performed at a Rural Health Training Centre in 2006 found that the mothers who had only one antenatal visit had almost a six times higher risk of LBW compared to mothers who had more than 5 visits (OR 5.71)[13]. The study also showed that mothers who registered themselves in the first trimester were at a significantly lower risk (OR 1.24) compared to mothers who registered themselves in the third trimester (OR1.86)[13].

A hospital based cross sectional study carried out in Allahabad found that the proportion of LBW was highest in mothers who did not receive any antenatal care, followed by those who received inadequate care. There was a statistically significant association between birth weight and utilization of ANC services.(χ^2 =26.01, p<0.001)[16].

A study performed at an MCH centre and hospital in Wardha in 2000, demonstrated that mothers who had not registered themselves for ANC services had an 8 times higher risk of having an LBW baby compared to mothers who had 5 or more visits. Out of all the registered mothers, outcome was better in mothers who had registered in the first trimester (OR 1.0) compared to those who had registered in the second [OR 1.16(95%CI 0.29-4.04)] or third trimester [OR 1.37(95% CI 0.375-5.23)][14].

Singh et al in a retrospective study carried out in 2009 also found an increased risk of LBW in unregistered mothers [24].

Studies performed in other developing countries have also provided evidence that point in a similar direction. A case control study in Bandar Abbas in 2007 found that non utilization of antenatal care led to a higher risk of a LBW delivery.[OR3.9(95%CI 1.2-13.7)][25]. A study from Bangladesh in 2008 also showed that mothers who had less than 4 ANC visits had a higher risk for LBW birth.[OR 29.38(95% CI 12.61-68.47)][22].

Complications during pregnancy

Joshi et al, in 2005, in their hospital based cross sectional study found that 27.73% of mothers in their study had some complications during pregnancy and 54.93% of these mothers delivered a LBW baby. 75% of newborns delivered by mothers suffering from pre-eclampsia and eclampsia were LBW, followed by antepartum hemorrhage (53.85%) and malpresentation (46.75%).The association between complications during present pregnancy and LBW was highly significant (z=4.22, p<0.001)[16].

Singh et al, in a retrospective cohort study performed in 2009 also observed a significant association between PIH and low birth weight [24].

A case control study in Bandar Abbas found that maternal hypertension was a significant risk factor for LBW [OR 7.4(95%CI 1.5-36.9)][12].

Most Indian studies have not included complications during pregnancy as a study variable in their analysis of risk factors for low birth weight.

Infant sex

One prospective study performed in Rajshahi district of Bangladesh found that female babies had a significantly higher risk of LBW [OR2.84 (95%CI 1.85-4.36)] compared to male babies [21].

Kramer, in a meta-analysis performed in 1989, found that the male-female difference in birth weight in developed countries was 126.4g, and in developing countries it was 93.1g.He calculated that the relative risk of LBW for females was 1.19 (for an etiologic fraction of 48.5%[1].

Shah and Ohlsson, in a meta-anlaysis performed in 2002, however, found that there was no conclusive evidence of difference in the risk of IUGR/preterm births in relation to sex of the infant. Male newborns are of higher weight compared to female newborns, and they opine that this may have some effect at the lower end of the spectrum of the definition of LBW[6].

Socioeconomic factors and LBW

Rutter and Quine examined four theories concerning the link between social factors and adverse pregnancy outcome. The first is termed the Artifact theory. This theory suggests that reported inequalities in health are artifacts of the ways in which social class are defined and measured. However, Rutter and Quinine point out that the results of longitudinal studies, when definitions are held constant, argue against this theory. The second theory, Natural or social selection , holds that people who are unhealthy or potentially unhealthy are 'selected' for low status occupations or drift downwards into them, while healthy people are selected upwards. The Black Report, in an examination of the relationship between social class and health, rejected this theory because the possible effects were too small to explain the size of the observed inequalities in health. The third theory states that material deprivation affects health directly. While the fourth theory says that material deprivation effects health indirectly, either through the individual's behavior, lack of medical services, or a poor diet[26].

Rutter and Quine suggested that the third and fourth theories should be examined together as material deprivation, culture, and behavior which suggest that social class has an effect on health outcomes because people at the bottom of the social scale suffer material deprivation and are part of a culture in which the predominant forms of health behavior are considered harmful. Still another corollary suggests that material deprivation produces inappropriate behavior, e.g. a 'culture of poverty[26].

In a hospital based cross sectional study from Allahabad maternal education ($\chi2$ =9.42, $p<0.02$), occupation ($\chi2$ =8.14,$p<0.02$) and per capita income of the family per month were found to be significantly associated with LBW of newborn .

45.45% of babies born to illiterate mothers and 43.94% of babies born to mothers who were laborers by occupation were of LBW[16].

Another hospital based study in Wardha in 2000 found that maternal education had a significant association with the birth weight of the newborn, with illiterate mothers at the highest risk [OR 17.04(95%CI 6.6-44.57)]. This study found that mothers who were laborers by occupation had a much higher risk for LBW compared to housewives [OR 7.03(95%CI 3.91-13.83)]. Maximum number of LBW babies (81.5%) in this study were born to mothers whose per capita income was less than Rs.150 [OR 30.8(95%CI 9.44-102.38)][14].

A cohort study in an urban area of Nagpur in 1998 showed that low socio economic status, as assessed by Modified Kuppuswamy scale, was an important determinant of low birth weight.[OR3.96 (95%CI 2.10-6.46)][15].

A longitudinal study in a slum area of Greater Mumbai ` found that education of the mother had a significant effect on birth weight of newborn babies.($\chi 2 = 49.53$, $p<0.001$). The percentage of low birth weight was as much as 52% in illiterate women and the incidence of LBW decreased rapidly in women with a higher educational status. The same study also demonstrated significant co-relation between birth weight and socio economic status[19].

Khatun and Rahman studying the socioeconomic determinants of LBW in an urban clinic Bangladesh found that the mother's education [OR 2.92(95%CI 0.099-0.863,p<0.02)] and per capita income of the family (OR 3.379,95%CI 1.255-9.097) and the mother's occupation-housewife/unemployed ($\chi^2 = 180.678, p<0.001$) were significant determinants of LBW[13].

A cross sectional study from Peshawar, Pakistan showed that family income (OR1.8 (1.1-2.9)), maternal literacy (OR 2.1 95%CI 1.2-3.6) and paternal literacy (OR 1.6 95%CI 1.1-2.4) were significant risk factors[27]. Maternal work (i.e working for cash) was found to be a significant risk factor for LBW in a case control study performed in Bandar Abbas (OR 10.2,95%CI=1.2-87-3)[25].

Calorie intake during pregnancy

Maternal calorie intake during pregnancy is closely related to maternal weight gain. However, it has two main disadvantages; it takes no account of energy expenditure and is difficult to measure with validity and precision[1].

Kramer calculated that for undernourished women, each additional 100 kcal per day ingested throughout pregnancy the birth weight will increase by about 100gm. For well nourished women, the sample size weighted effect magnitude calculated is 34.6gm/100kcal per day.He found that calorie supplementation during pregnancy significantly reduced the risk of IUGR in both undernourished and well nourished women[1].

Protein intake during pregnancy

Protein intake is essential for fetal growth. What is not clear, however, is whether commonly occurring inadequacies in maternal protein status or intake can impair pregnancy outcome.

Kramer found that the available evidence did not support an important role for maternal protein intake or status in either gestational duration or intrauterine growth[1].

Tobacco use

Kramer found tobacco use to be the most significant risk factor for LBW in western societies[1].

Deshmukh et al studying LBW in an urban area of Nagpur found women who had a history of exposure to tobacco(in the form of tobacco chewing or passive smoking) had a significantly higher risk of delivering an LBW baby[OR 3.14(95% CI 2.08-4.88)][15].

In a study performed in Bandar Abbas , the use of hookah during pregnancy was associated with a higher risk for LBW delivery[OR 3.5(95%CI 1.1-12.6)]. Many studies performed in India have not studied tobacco exposure as a risk factor for LBW[25].

MATERIALS AND METHODS

a) **Setting:** Department of Obstetrics and Gynecology in a tertiary care hospital , Belgaum, Karnataka.

b) **Participants:** Mothers who underwent delivery at the hospital and their newborns.

c) **Study Design:** It is a case control study carried out over a period of 1 year from 1st January 2009 to 31st December 2009.

d) **Sample Size:** 250 (Cases: 125, Controls: 125).

$$\text{Formula used}: n = \frac{2 (Z\alpha + Z\beta)^2 \times p \times (1-p)}{(p_2 - p_1)^2}$$

Values used:

$Z\alpha = 1.65$

$Z\beta = 0.84$

P1 = 0.30 (The prevalence of LBW in the general population)

P2 = 0.46 (Calculated for Odds ratio of 2) {P2 = P1 x OR/ 1 + P1(OR – 1)}

Using this formula, the estimated sample size was calculated to be 115.To account for error, 10% more number of participants were selected (125 in each group).

a)Method of collection of data: Data was collected by interviewing the study participants and from hospital records using a pre-designed, pre- tested schedule.

b)Selection of Cases and Controls:

Selection of cases: Mothers delivering singleton term babies with birth weight less than 2.5 kg, by any mode of delivery, in the hospital during the study period

Selection of controls: Mothers delivering singleton term babies, with a birth weight more than or equal to 2.5 kg, by any mode of delivery, in the hospital during the study period.

Matching: Controls were matched for gestational age of the child (in weeks), socio-economic status, educational status and occupation of mother. Individual matching of cases and controls was done.

c) Inclusion Criteria: Subjects had to be of Indian origin residing in Belgaum district of Karnataka, Only singleton live births were included

d) Exclusion criteria: Multiple gestations, Babies with congenital anomalies, Mothers with an incomplete hospital record

e) Study variables : Mother's age, parity, maternal height, maternal weight, body mass index, hemoglobin level during pregnancy, quality of antenatal care, bad obstetric history, inter-pregnancy interval, maternal diet.

f) Outcome variable – Low birth weight of newborn (Birth weight less than 2.5kgs).

g) Statistical test used: Odds ratio was calculated for each study variable, univariate and multivariate regression was done using SPSS 17 software.

Definitions and measurement of variables

Age of mother: Age as per reported by the mothers and recorded to the nearest completed years **.**

Place of Residence: According to the Census, an urban area is defined as a place having a municipality of cantonment, or has a population over 5000 in which more than 75% of male workers are engaged in non-agricultural occupations[8]. For the purposes of this study, a residential address falling within the limits of Belgaum City was classified as 'Urban' .Others were classified as 'Rural'

Educational Status

Illiterate: A person aged more than 7 yrs who cannot read or write in any language.

Primary school: Has studied upto 4th standard

Middle school: Has studied upto 7th standard

High School: Has studied upto 10th standard

College and beyond: Has studied beyond the 10th standard (pre-university/ diploma/ degree courses)

Type of Family[4]

Nuclear family: A married couple along with their dependent children living in the same house.

Joint Family: Many married couples and their children who live in the same household. Males are blood relatives and females of the family are related by either marriage or blood relation.

Broken family: A family in which the parents have separated, or where death has occurred for one or both the parents.

Occupation

House-wife: A woman who is not engaged in any occupation, except household work, and is not contributing to the family income.

Laborer: A woman who is employed in work like farming or masonry.

Service: A woman who is engaged in any occupation, in the private or public sector ,that contributes to the family income.

Socioeconomic status[8]:

Per-capita monthly income of the family was calculated by dividing total monthly income of the family with family size. Per capita income in Rupees per month was classified using the modified BG Prasad classification.

Socioeconomic class	Prasad's classification 1961 per capital income in Rs./ Month	Modified Prasad's classification in the study period 2009. Per capital per month income (Rs.)
I	100 & above	3600 & Above
II	50 – 99	1800 & 3599
III	30 –49	1080 & 1799
IV	15 – 29	540 & 1079
V	below 158	<540

Average consumer price index for the year 2009 = 727

Modification was done with the aid of Multiplication Factor (M.F), which was obtained as below:

$$\text{M.F.} = \frac{\text{Average Consumer price index for study period} \times 4.93}{100}$$

$$=727/100\times4.93=35.8$$

Primipara- A woman who had been delivered only once of a fetus or fetuses born alive or dead with an estimated length of gestation of 28 weeks or more[10].

Multipara- A woman who has completed 2 or more pregnancies to 20 weeks or more[10].

Parity- The number of pregnancies reaching 20 weeks and not by the number of fetus delivered. Where required, it will be indicated by the prefix 'Para'[10].

Gestational age-It is calculated from the first day of the last menstrual period approximated to the nearest completed week[10].

Pregnancy interval: The interval between date of the last delivery/abortion and the first day of the index pregnancy, approximated to the nearest completed month.[10]

Birth weight-The weight of a neonate determined immediately after delivery or as soon thereafter as feasible[10]. It was approximated to the nearest gram.

Live birth-A birth where the newborn at or sometime after birth breathes spontaneously or show any other sign of life such as a heart beat or definite spontaneous movement of voluntary muscles[10].

Term neonate: A neonate born after 37 completed weeks of gestation and upto 42 weeks of gestation. (250-294days)[10].

Preterm neonate-A neonate born by 37 completed weeks.(the 259th day)[10].

Post term neonate-A neonate born after completion of 42th week, beginning with day 295[10].

Bad Obstetric History: A prior history of LBW, abortion or still birth.

Minimum number of antenatal care visits: A minimum of 3 ANC visits covering the entire period of pregnancy, with the first visit at 20 weeks or as soon as the pregnancy was known, the second visit at 32 weeks and the third visit at 36 weeks was considered to be the minimum required ANCs[4].

Iron supplementation during pregnancy: Iron supplementation for a minimum period of 100 days was considered as adequate.[4]

Dietic history: The mother was asked to provide a history of what she routinely ate in one day during her pregnancy. The types of food consumed and their quantities were noted. The calorie and protein content of her diet were calculated using a standard chart .[4]

Adequate calorie intake: The calorie intake of the mother was classified as adequate if it was found to be equal to or above the calorie requirement prescribed for her level of physical activity during pregnancy. The cut off values of required calorie intake for each level of physical activity were 2175 kcal/day, 2525 kcal/day and 3225 kcal/day for sedentary, moderate and heavy workers respectively[4].

Adequate protein intake: The protein intake of the mother was considered to be adequate if It was equal to or above the standard protein requirement of a pregnant woman, which is 1 gm protein/kg/ day supplemented by an additional 15 gm per day[4].

Anemia: The Hemoglobin Status (Hb %) of the mother was obtained from the mother's medical records. Anemia was classified, as per the WHO definition, as a hemoglobin value of less than 11 gm%[4].

Maternal height: The subject was made to stand barefoot, with heels, shoulders and back touching the wall. Head was held erect, face forward, in a comfortable position, with the lower border of the orbit in the same horizontal plane as that of the external auditory meatus. It was measured to the nearest centimeter.

Maternal weight: The mother's weight was measured using a calibrated weighing scale. Before each measurement the machine was zeroed and the mother was asked to remove her footwear. She was made to stand erect on the weighing scale, before the observer measured the reading. Regular calibration of the weighing scale was done.

RESULTS

Table 1.Distribution of participants according to maternal age

S. No	Maternal age	Cases No. (%)	Controls No. (%)
1.	19 years or less	15 (12.0%)	3 (2.4%)
2.	20-25	83 (66.4%)	71 (56.8%)
3.	26-30	23 (18.4%)	42 (33.6%)
4.	31 or more	4 (3.2%)	9 (7.2%)
	Total	**125**	**125**

χ^2 = 15.766, DF = 3, p = 0.001

The majority if mothers in both study group and control groups belonged to the age group of 20-25 years. Only 3.2% of cases and 7.2% of mothers in the control group were over 30 years old. The mean age of mothers in the study group was 22.9 + 3.50 years and the mean age of mothers in the control group was 25.4 + 3.91 years. The difference was statistically significant (t = 5.261, p = 0.000).

Table 1 b) Maternal age and risk of LBW

S.no	Maternal age	Cases	Controls
1.	<19 yrs	15 (12.0%)	3 (2.4%)
2	>19 yrs	110 (88.0%)	122 (97.6%)
3	Total	125	125

The number of participants aged less than 19 years was higher in the study group than the in the control group .These younger mothers were at a significantly higher risk for a low birth weight delivery [OR 5.54 (95% CI 1.56- 19.67), p = 0.008].

Table 2.Distribution of Participants According to Place of Residence

S. No	Place of Residence	Cases No. (%)	Controls No. (%)
1.	Rural	86 (68.8%)	64 (51.2%)
2.	Urban	39 (31.2%)	61 (48.8%)
3.	Total	125	125

χ^2 = 8.06, DF = 1, p = 0.005

The number of participants who lived in a rural area was significantly higher amongst the cases (68.8%) than the controls (51.2%). Mothers who resided in a rural area were at a higher risk for LBW [OR 2.10 (1.25- 3.52), p = 0.005].

Table 3.Distribution of participants according to type of family

S. No	Type of Family	Cases No. (%)	Controls No. (%)
1.	Nuclear family	54 (43.2%)	47(37.6%)
2.	Joint family	68(54.4%)	76(60.8%)
3	Broken family	3 (2.4%)	2(1.6%)
6	Total	125	125

χ^2 = 1.130, DF = 2, p = 0.5

The majority of participants amongst both cases and controls belonged to joint families. The difference between the groups was not statistically significant.

Table- 4. Distribution of participants according to socioeconomic status

S. No	Socio-Economic Status	Cases No. (%)	Controls No. (%)
1.	Class1	10 (8.0%)	10(8.0%)
2.	Class 2	22(17.6%)	22(17.6%)
3	Class 3	34(27.2%)	34(27.2%)
4	Class 4	36(28.8%)	36(28.8%)
5	Class 5	23(18.4%)	23(18.4%)
	Total	125	125

χ^2 = 0, DF = 4, p = 1

More than 50% of study participants belonged to classes 3 and 4. Both study and control groups were matched for socio-economic status; hence there is no difference between the groups.

Table - 5.Distribution of participants according to education

S. No	Education	Cases No. (%)	Controls No. (%)
1.	Illiterate	10(8.0%)	10(8.0%)
2.	Primary	35(28.0%)	35(28.0%)
3	Middle school	26(20.8%)	26(20.8%)
4	High School	36(28.8%)	36(28.8%)
5	College and beyond	18(14.4%)	18(14.4%)
	Total	125	125

$\chi^2 = 0$, DF = 4, p = 1

Matching of cases and controls was done on the basis of education hence there is no difference between the groups. The maximum number of study participants had studied up to high school (28.8%), followed by those who had studied up to primary school (28%). Only 8% of the participants in both groups were illiterate.

Table – 6. Distribution of participants according to occupation

S. No	Occupation	Cases No. (%)	Controls No. (%)
1.	Housewife	47 (37.6%)	47(37.6%)
2.	Laborer	47(37.6%)	47(37.6%)
3	Service/Others	31(24.8%)	31(24.8%)
4	Total	125	125

$\chi^2 = 0$, DF = 2, p = 1

Matching of cases and controls was done on the basis of the mother's occupation so there is no difference between the two groups. Most of the participants were either housewives (37.6%) or laborers (37.6%).

Table -7a) Distribution of participants according to parity

S. No	Parity	Cases No. (%)	Controls No. (%)
1.	Para 1	86 (68.8%)	53 (42.4%)
2.	Para 2	24 (19.2%)	39 (31.2%)
3.	Para 3	9(7.2%)	26(20.8%)
4	Para 4 or more	6(4.8%)	7(5.6%)
5	Total	125	125

$\chi 2$ = 24.663, DF= 4, p = 0.000

The largest number of participants in both study and control groups were primipara. This was followed by women who were para 2. Only 4.8 % of women in the study group and 2.4% of women in the control group were para 4 or more.

Table 7b) Parity and risk of LBW

S. No	Parity	Cases No. (%)	Controls No. (%)
1.	Primiparity	86 (68.8%)	53 (42.4%)
2.	Multiparity	39 (31.2%)	72 (57.6%)
5	Total	125	125

The number of primipara was significantly higher amongst the cases (68.8%) than the controls (42.4%). Primiparity was associated with a higher risk for LBW [OR 2.99 (95% CI 1.79- 5.02),p =0.000].

Table – 8 a.Distribution of participants according to pregnancy interval

S. No	Pregnancy Interval	Cases No. (%)	Controls No. (%)
1.	<12m	7 (5.6%)	4 (3.2%)
2.	13-24m	11 (8.8%)	21 (16.8%)
3	25-36m	10 (8.0%)	18 (14.4%)
4	>36	13 (10.4%)	23 (18.4%)
5	Primipara	84 (67.2%)	59 (47.2%)
5	Total	125	125

$\chi^2 = 17.928$, DF = 4, p = 0.001

Amongst the study participants, 13.6% of cases versus 3.2% of controls had a birth interval of less than 12 months, 8.8% of cases versus 16.8% of controls had a birth interval varying between 13-24m. 8% of cases versus 14.4% of controls had a birth interval between 25-36 m., and 10.4% of cases versus 18.4% of controls had a birth interval of more than 36m.The difference was statistically significant.

Table 8 b) Pregnancy interval and risk of LBW

S. No	Pregnancy interval	Cases No. (%)	Controls No. (%)
1.	Less than 12m	17 (13.6%)	4 (3.2%)
2.	More than 12 m	34 (27.2%)	62 (49.6%)
	Total	51	66

The number of women with an inter-pregnancy interval of less than 12 months was significantly higher among the cases (13.6%) than the controls (3.2%).Pregnancy interval less than 12 months was associated with a higher risk of LBW [OR 7.75 (95% CI 2.45- 24.89),p = 0.001].

Table-9. Distribution of participants according to gestational age

S. No	Gestational age	Cases No. (%)	Controls No. (%)
1.	37wks	38(30.4%)	38(30.4%)
2.	38 wks	31(24.8%)	31(24.8%)
3	39 wks	25(20%)	25(20%)
4	40 wks	28(22.4%)	28(22.4%)
5	41 wks	2(1.6%)	2(1.6%)
6	42 wks	1(0.8%)	1(0.8%)
	Total	125	125

$\chi^2 = 0$, DF= 5, p = 1

Matching of cases and controls was done on the basis of gestational age so there is no difference between the two groups. The highest proportion of study participants (30.4%) had completed a gestational age of 37 weeks, and there was a decrease in the number of participants with increasing gestational age. More than 50 % of the participants had a gestational age less than or equal to 38 weeks. There was only one participant in each group who had a gestational age that extended until the 42^{nd} week of gestation.

Table-10 a) Distribution of participants according to bad obstetric history

S.No	Bad Obstetric History	Cases No. (%)	Controls No. (%)
1	Present	22 (17.6%)	20 (16.0%)
2	Absent	103 (82.4%)	105 (84.0%)
	Total	125	125

χ^2 = 0.11, DF= 1, p = 0.73

More than 80% of the participants in both groups had no prior history of abortion, still birth or LBW. The difference between the two groups was not statistically significant.

Table-10b). Distribution of participants according to type of bad obstetric history

S.No	Bad Obstetric History	Cases No. (%)	Controls No. (%)
1	Abortion	8 (6.4%)	9 (7.2%)
2	Still birth	1(0.8%)	5(4.0%)
3	Prior Low Birth Weight	13(10.4%)	6(4.8%)
4	None	103(82.4%)	105(84.0%)
	Total	125	125

χ^2 = 5.324, DF= 3, p = 0.150

More than 80.0% of study participants gave no history of abortion, still birth or LBW in the past. 10.4 % of mothers in the study group gave a past history of LBW delivery, compared to only 4.8% of mothers in the control group. The difference was not statistically significant however.

Table 11. Distribution of participants according to number of antenatal care visits

S.no	Number of ANC visits	Cases No. (%)	Controls No. (%)
1	< 3 visits	35 (28.0%)	15 (12.0%)
2	>3 visits	90 (72.0%)	110 (88.0%)
	Total	125	125

χ^2 = 10, DF = 1, p = 0.002

More than 70.0% of women in both groups received 3 ANC visits or more. However, the number of women was higher amongst the controls (88%) than the cases (72.0 %,) .The difference was statistically significant. Women who received less than 3 ANC visits were at a higher risk for LBW [OR 2.85 (95% CI 1.46- 5.55), p= 0.002].

Table-12 a) Distribution of participants according to time of registration of pregnancy

S.No	Time of Registration	Cases No. (%)	Controls No. (%)
1	Not registered	2(1.6%)	0
2	First Trimester	65(52.0%)	91(72.8%)
3	Second Trimester	33(26.4%)	23(18.4%)
4	Third Trimester	25(20.0%)	11(8.8%)
	Total	125	125

χ^2 = 12.386, DF = 3, p = 0. 0062

The majority of women in both groups registered their pregnancy in the first trimester. The number of women who did so was higher in the control group (72.8%) than the study group (52.0%) and this was statistically significant. There were only two women, both belonging to the study group, who did not register their pregnancy.

Table 12b) Time of registration and risk of LBW

S.no	Time of registration	Cases No. (%)	Controls No. (%)
1	Not registered in first trimester	60 (48.0%)	34 (27.2%)
2	Registration in first trimester	65(52.0%)	91(72.8%)
	Total	125	125

χ^2 = 11.52, DF = 1, p = 0. 000

The number of women who did not register in the first trimester of pregnancy was significantly higher in the study group (48.0%) than in the control group (27.2%).Women who did not register in the first trimester were at a higher risk for LBW [OR 2.29 (95% CI 1.35- 3.89), p = 0.002].

Table 13. Distribution of participants according to history of iron supplementation during pregnancy

S.No	Iron supplementation	Cases No. (%)	Controls No. (%)
1	< 100 days	50 (40.0%)	19 (15.2%)
2	100 days or more	75 (60.0%)	106 (84.8%)
	Total	125 (100%)	125 (100%)

χ^2 = 19.233, DF = 1, p = 0.000

The number of women who received iron supplementation for less than 100 days of pregnancy was significantly higher amongst the cases (40.0%) than the controls (15.2%). Iron supplementation for less than 100 days was associated with a higher risk of LBW. [OR 3.72 (95% CI 2.03- 6.81), p = 0.000].

Table 14. Distribution of participants according to history of calcium supplementation during pregnancy

S.no	Calcium supplementation	Cases No. (%)	Controls No. (%)
1	Not received	65 (52.0%)	73 (58.4%)
2	Recieved	60 (48.0%)	52 (41.6%)
	Total	125	125

χ^2 = 1.04. DF = 1, p = 0.30,

The majority of participants in both study and control groups received adequate calcium supplementation. The number of women who did not receive adequate calcium supplementation was marginally higher among the cases (48.0%) than the controls (41.6%) but this was not statistically significant.

Table-15.Distribution of participants according to history of morbidity during pregnancy

S. No	History of maternal morbidity	Cases No. (%)	Controls No. (%)
1.	Present	6(4.8%)	10 (8.0%)
2.	Absent	119(95.2%)	115(92.0%)
3.	Total	125	125

χ^2 = 1.578, DF = 1, p = 0. 209

A history of a major medical or surgical illness during pregnancy was present in only 4.8% of cases and 8.0% of controls. The difference was not statistically significant.

Table -16. Distribution of participants according to history of complication during pregnancy

S.no	Presence of Complication	Cases No. (%)	Controls No. (%)
1	**No Complications**	83(64.0%)	102 (80.8%)
2	**Presence of complications**		
a	PIH	12(9.6%)*	11(8.8%)*
b	Gestational Diabetes	-	4(3.2%)
c	Abruptio placentae	5 (4.0%)	-
d	PROM	11(8.8%)	6 (4.8%)
e	Placenta previa	1(0.8%)	1(0.8%)
f	Malpresentation	6(4.8%)	0(0%)
g	Oligohydramnios , anamnios	8(6.4%)	2(1.6%)
	Total	125	125

$\chi^2 = 9.358$, DF = 1, p = 0.002

*One mother in the study group was diagnosed with both PIH and oligohydramnios. One mother in the control group was diagnosed with both PIH and PROM

The number of women who gave a history of complication during pregnancy was significantly higher in the study group (36%) than in the control group. Women who had a history of complication during pregnancy were at a higher risk for LBW [2.51 (95% CI 1.38- 4.56), p = 0.003]

Pregnancy Induced Hypertension (PIH) was the most common complication observed both among the cases (9.6%) and controls (8.0%).Premature rupture of membranes (PROM) was the next most common complication, observed in 8.8% of cases and 4.8% of controls.

Table 17. Distribution of participants according to the presence of anemia

S.no	Anemia	Cases No. (%)	Controls No. (%)
1	Present	84 (67.2%)	68(54.4%)
2	Absent	41(32.8%)	57(45.6%)
	Total	125	125

χ^2 = 4. 296, DF= 1, p= 0.038

The majority of participants in both groups had anemia. The condition was more common amongst the cases (67.2%) than the controls (54.4%) Anemia in the mother was associated with a higher risk of LBW [OR 1.72 (95% CI 1.03 – 2.87), p = 0.039].

Table 18.Distribution of participants according to type of diet during pregnancy

S.no	Type of Diet	Cases No. (%)	Controls No. (%)
1	Vegetarian	66(52.8%)	58(46.4%)
2	Non-vegetarian (mixed)	59(47.2%)	67(53.6%)
	Total	125	125

χ^2 = 1.024, DF = 1, p = 0.312

There were a higher number of vegetarians in the study group (52.8%) than in the control group (46.4%) but the difference was not statistically significant.

Table 19.Distribution of participants according to calorie intake during pregnancy

S.no	Calorie intake	Cases No. (%)	Controls No. (%)
1	Adequate	30(24.0%)	34(27.2%)
2	Inadequate	95(76.0%)	91(72.8%)
3	Total	125	125

χ^2 = 0.336, DF = 1, p = 0.562.

More than 70.0% of women in both the study group and control group had a history of consuming less than adequate calories during pregnancy.There was no significant difference in the calorie intake between the two groups.

Table 20.Distribution of participants according to protein intake during pregnancy

S.no	Protein intake	Cases No. (%)	Controls No. (%)
1	Adequate	22 (17.6%)	24(19.2%)
2	Inadequate	103(82.4%)	101(80.8%)
3	Total	125	125

χ^2 = 0.107, DF = 1, p = 0.744

More than 80.0 % of participants in both the study group and control groups gave a history of consuming less than adequate proteins. The difference in protein intakes between the two groups was not statistically significant.

Table 21. Distribution of participants according to maternal height

S.no	Maternal height	Cases No. (%)	Controls No. (%)
1	Maternal Height < 145 cm	18(14.4%)	4(3.2%)
2	Maternal Height > 145 cm	107(85.6%)	121(96.8%)
3	Total	125	125

χ^2 = 11.734, DF = 1, p = 0.002

The number of women with a short stature was more in the study group (14.4%) than in the control group (3.2%).The difference was statistically significant. Mothers with a height less than 145 cm were at a higher risk for LBW [OR 9.03 (95% CI 2.03- 40.15),p = 0.004].

Table 22. Distribution of participants according to maternal weight

S.no	Weight	Cases No. (%)	Controls No. (%)
1	<45 kg	34(27.8%)	7(5.6%)
2	45 kg or more	91(72.8%)	118(94.4%)
3	Total	125	125

χ^2 = 10.642, DF = 1, p = 0.001

The number of women who weighed less than 45 kg was more in the study group (27.8%) than in the control group (5.6%). The difference was statistically significant. Mothers weighing less than 45 kg were at a higher risk for LBW [OR 4.01 (95% CI 1.66 – 9.68), p = 0.002].

Table-23.Distribution of participants according to BMI

S.no	BMI	Cases No. (%)	Controls No. (%)
1	<18.5	16 (12.8%)	9(7.2%)
2	18.5-24.99	102(81.6%)	107(85.6%)
3	25 and above	7(5.6%)	9(7.2%)
4	Total	125	125

χ^2 = 330, DF = 2, p=0.312

More than 80.0% of study participants in both groups had a ‘normal’ BMI between 18.5- 24 99.The difference observed between the BMI of the two groups was not statistically significant.

Table 24. Distribution of participants according to mode of delivery

S.no	Mode of delivery	Cases No. (%)	Controls No. (%)
1	Vaginal	81 (64.8%)	82(65.6%)
2	C-section	44(35.2%)	43 (34.4%)
3	Total	125	125

χ^2 = 0. 018, DF = 1, p = 0.594

More than 60.0% of women in both the study group and control group had a vaginal delivery. The two groups did not differ significantly in terms of mode of delivery.

Table 25.Distribution of participants according to sex of the child

S.no	Sex of child	Cases No. (%)	Controls No. (%)
1	Female	70(56.0%)	52(41.6%)
2	Male	55(44.0%)	73(58.4%)
3	Total	125	125

χ^2 = 5.187, DF = 1, p = 0.023

There were a higher number of female newborns in the control group than in the study group and this difference was statistically significant. Female newborns had a higher risk of LBW [OR 1.79 (95% CI 1.08 – 2. 95), p = 0.023].

None of the study participants reported using tobacco or alcohol during the course of their pregnancy.

Results of Logistic Regression analysis

Table 26. Univariate Logistic Regression

S.no	Variable	Unadjusted Odds Ratio	95% CI	P
1	Age (<19)	5.54	1.56-19.67	0.008
2	Rural/Urban	2.10	1.25-3.52	0.005
3	Primiparity	2.99	1.79-5.02	0.000
4	Sex (F/M)	1.79	1.08-2.95	0.023
5	Pregnancy interval (<12m)	7.75	2.45-24.89	0.001
6	Complications during pregnancy	2.51	1.38-4.56	0.003
7	Anemia	1.72	1.03-2.87	0.039
8	No. of ANC visits (<3)	2.85	1.46-5.55	0.002
9	Late registration of pregnancy (after first trimester)	2.29	1.35-3.89	0.002
10	Height (<145 cm)	9.03	2.03-40.15	0.004
11	Weight(<45 kg)	4.01	1.66-9.68	0.002
12	Iron supplementation for less than 100 days	3.72	2.03-6.81	0.000

Table 26. Univariate regression analysis showed that the risk factors associated with LBW in the present study were mother's age less than 19 yrs [OR 5.54 (95% CI 1.56-19.67),p = 0.008),rural area of residence [OR 2.10(95% CI 1.25-3.52) p = 0.005] parity of the mother [OR 2.99(95% CI 1.79-5.02) p=0.000], sex of the child [OR 1.79 (95% CI 1.08-2.95), p = 0.023], pregnancy interval less than 12 months [OR 7.75 (95% CI 1.08-2.95, ,p =0.001], complications during pregnancy

[OR 2.51 (95% CI 1.38-4.56)p = 0.003], anemia OR 1.72 (95% CI 1.03-2.81) p= 0.039],less than 3 ANC visits [OR 2.85(95 % CI 1.46-5.55,) p =0.002],late registration of pregnancy [OR 2.29 (95% CI 1.35-3.89) p = 0.002],height less than 145 cm [OR 9.03(95% CI 2.03-40.15) p = 0.004],pre-delivery weight less than 45 kg [OR 4.01(95% CI 1.66-9.68) p =0.002],and inadequate iron supplementation [OR 3.72 (95% CI 2.03-6.81) p =0.000].

Table 27. Multivariate Logistic Regression

S.no	Variable	Adjusted Odds Ratio	95% CI	P
1	Age (<19)	9.74	2.66-22.32	0.001*
2	Rural/Urban	2.66	0.90-7.87	0.076
3	Primiparity	3.95	0.62-25.25	0.147
4	Sex (F/M)	4.17	1.47-11.77	0.007
5	Pregnancy interval(<12m)	5.06	1.22-21.02	0.025
6	Complications during pregnancy	4.96	1.53-16.11	0.008
7	Anemia	1.45	0.51-4.15	0.486
8	No. of ANC visits (<3)	0.43	0.05-3..85	0.454
9	Late registration of pregnancy (after first trimester)	0.49	0.14-1.75	0.274
10	Height (<145 cm)	0.002	0.00	>0.05
11	Weight(<45 kg)	14.62	1.14-186.8	0.039
12	Iron supplementation for less than 100 days	8.25	1.10- 61.75	0.040

Multivariate logistic regression

Table 27.The significant risk factors on multivariate logistic regression (with adjusted odds ratios) were maternal age less than 19 yrs [OR 9.74 (95% CI 2.66 – 22.32), p = 0.001], female gender of newborn [OR 4.17 (95% CI 1.47- 11.77), p = 0.007], pregnancy interval less than 12 months [OR 5.06 (95% CI 1.22 -21.02), p = 0.025], complications during pregnancy [OR 4.96 (95% CI 1.53 – 16.11), p = 0.008],maternal weight less than 45 kg [OR 14.62 (1.14 -186.8),p = 0.039],and iron

supplementation less than 100 days [OR 8.25 (95% CI 1.10 – 61.75), p = 0.040].The factors which were not statistically significant were area of residence [OR 2.66 (0.90 – 7.87), p = 0.076], Primiparity [OR 3.95 (95% CI 0.62 -25.25), p = 0.147], Anemia [OR 1.45 (95% CI 0.51 – 4.15), p = 0.486], Less than 3 ANC visits [OR 0.43 (95% CI 0.05 – 3.85), p = 0.454], Time of registration of pregnancy [OR 0.49 (0.14 – 1.75), p = 0.274], Height less than 145 cm [OR 0.02, p > 0.05].

DISCUSSION

The Study was carried out in the Department of Obstetrics and Gynecology in a large tertiary care hospital of Belgaum, Karnataka. In this case control study, efforts were made to know the maternal determinants of low birth weight among the term deliveries after matching for socio-economic variables of the mother, namely socioeconomic status, educational status and occupation, as well as for gestational age of the pregnancy.

Age of mothers (Table 1)

Our study showed that the majority of mothers amongst both cases and controls belonged to the age group of 20-25 yrs, followed by those in the age group of 26-30. Amongst the cases ,the mean age of mothers was 22.9+3.50 years and amongst the controls it was 25.4+3.91years.The difference in age was statistically significant (t= 5.261,p = 0.000), proving an inverse relationship between the age of the mother and the risk of low birth weight.

The majority of mothers (86.4% in the cases group and 90.4% of in the control group) were between 20-30 years age. This is in accordance with the sample registration system report of Govt. of India 2003 which states that age specific fertility rate is maximum for the age group if 20-35 years.

We found that adolescent mothers (Age < 19 years) had a higher risk of delivery of a low birth weight baby compared to older mothers on univariate regression analysis [OR 5.54 (95% CI 1.56- 19.67), p = 0.008] and on multivariate regression analysis [OR 9.74 (95% CI 2.66- 22.32), p = 0.001)].

The inverse relationship between maternal age and low birth weight has also been reported by other authors. Kumar et al showed that maternal age less than 20 years was a significant risk factor for LBW (OR 3.96, 95%CI (1.25-12.62)[17].

Bisai et al in a cross sectional retrospective study performed in a hospital in Kolkata found that mothers aged less than 19 years had 2.9 times higher risk of an LBW delivery (95%CI, 1.53-5.65,p <0.001)compared to mothers aged 19-28 yr [28].Khushawa et al in a study of adolescent pregnancies in urban slums found that 67.3% of these pregnancies resulted in LBW deliveries. The incidence of LBW in the age groups of 15-17 years and 17-19 years were 81.3% and 55.9% respectively[19].

Kramer proposed that the effect of age may be indirect rather than direct. Age is closely related to parity and adolescents are also likely to have a lower weight for height than older women[1]. In Indian societies early marriage of the girl child is more common in families belonging to lower socio economic status. It is possible that many of the young mothers, who delivered LBW babies, were from poorer families and as a result had a poorer nutritional status at the time of conception than those women who had grown up in more affluent families. The mother's current socio-economic status may or may not have been the same as the socio-economic conditions of the family in which she was raised; a factor which may have an important bearing on her nutritional status at the time of conception and consequently, on her risk of delivering a LBW baby. This is especially true in the case of primiparous women, who happened to form the majority of cases (68.8%) in the present study[1].

In the neighboring country of Pakistan Badshaah et al found that teenage mothers were independently associated with low maternal weight and had a lower family income as compared to older mothers.(OR 2.3,p<0.01).Teenage pregnancy was also independently associated with SGA compared to middle aged and older mothers [OR 8.35,(95 % CI 4.36-15.98)][27].

Sharma A.K et al studying adolescent pregnancies in Eastern Nepal, highlighted the differences in behavior between teenage and older mothers. He found that teenage mothers were less likely to get their pregnancy registered in the first trimester also had a fewer number of antenatal checkups compared to older women[30].

Area of residence (Table 2)

In our study, 68.8% of cases belonged to rural areas compared to 51.2% of controls. The remaining participants came from urban areas. The difference observed was statistically significant (χ^2 =8.06, $p<0.005$). Women living in rural areas had a higher risk for LBW than women living in urban areas on univariate regression analysis (OR 2.10 (95% CI 1.25-3.52. $p<0.005$) but not on multivariate regression analysis (OR 2.71 (95% CI 0.96-7.93), $p=0.068$).

Padam Singh et al, studying the utilization of antenatal care by pregnant women in India, found that 63.7% of women with low birth weight in their study resided in rural areas, and the remaining 36.3% resided in an urban areas[31].

Bhargava et al also found that mothers who lived in rural areas and urban slums had a higher prevalence of LBW. In their study, there was a higher prevalence of LBW in the urban slum cohort (41.4%) compared to the rural cohort (38.1%)[33].

Type of family (Table 3)

The type of family that a mother belonged to was not a significant risk factor for LBW in the present study (χ^2=1.130,p=0.568).

Table 3 shows that a higher number of women, in both study and control groups, belonged to joint families. The number of women belonging to nuclear families was slightly higher amongst the cases than the controls.(43.2% vs 37.6% respectively). There were few women who belonged to broken families (3 amongst cases, 2 amongst the controls).

Nair et al, studying the socio-demographic and maternal determinants of low birth weight, also found that the majority (75%) of women who delivered LBW babies in their study belonged to joint families, 12 % were from nuclear families and 13% were from three generation families[34].

Socioeconomic status, Occupation and Education (Tables 4, 5, 6)

Cases and Controls were matched on the basis of socio-economic status, education and type of occupation.

Most of the study participants (74.4%) belonged to Classes 2, 3, and 4 of modified B.G. Prasad's classification. Only 8% belonged to Class 1, and 18.4% belonged to Class 5.

Only 8% of the participants were illiterate .Navneetham and Dharmalingam found that, in Karnataka, illiterates were less likely to utilize ANC services. They also found that mothers who had studied beyond high school were much more likely to have a hospital delivery (OR 1.71, $p < 0.05$) than less educated mothers[23].

Amongst the study participants in both groups, 37.6% were housewives, 37.6% were laborers, and 24.8% were employed in the service sector.

A woman's work status may have an influence on her utilization of antenatal care services, and in her degree of autonomy. Navneetham and Dharmalingam reported that non-working women in Andhra Pradesh were about 82 per cent more likely to go for antenatal check-up compared to earning women[23].

Shah and Ohlsson found that the evidence from epidemiological studies on work, type of work, shift work and control at workplace indicates that physically demanding work increases the risk of SGA/LBW/preterm birth[6].

Parity (Tables 7a, 7 b)

Primiparity was a significant risk factor associated with LBW on univariate regression analysis [OR 2.99 (95% CI 1.79-5.02), p= 0.000] but not on multivariate regression analysis [OR 3.95 (CI 0.62-25.25),p = 0.147] .Table 7 shows that the majority of women in the study group (68.8%) were primipara compared to 42.4% of women in the control group.

This finding was in accordance with the results of a longitudinal study performed in a slum area of greater mumbai by Joshi et al in 2005 . In this study, the percentage of low birth weight increased significantly with increase in parity. 23% of primiparous women in their study had LBW babies which was significantly lower than the number of multiparous women (67%) who delivered LBW babies (r= 0.94, p<0.001)[16].

Kramer, in1987, used data from four methodologically sound studies and calculated that the sample size weighted risk ratio associated with primiparity was 1.23[1]. Shah and Ohlsson, in an extensive review of literature on LBW in 2002 found that the available evidence pointed to an increased risk of pre-term birth and IUGR with primiparity but the trend was not well confirmed in other studies[6].

Other authors have also reported primiparity to be a significant risk factor for LBW.

K.S Negi et al studying pregnant women registered at a Rural Health Training Centre at Dehrahun in 2002 reported increased risk of LBW for primiparous women (OR 3.21, p value< 0.01) compared to mutiparous women[13].

Kiran Anand, B.S Garg in their study performed in Wardha in 2000, reported a similar increase in risk of LBW for primiparous women (OR 3.05, 95%CI 1.58-5.91)[14].

Deshmukh et al, in1998, performed a prospective cohort study in Nagpur and also observed that primiparity was associated with an increased risk of LBW (OR 1.58, 95%CI 1.20-2.10)[15].

Parity is closely associated with the age of the mother. Those studies, in which parity was found to be a significant risk factor, were limited by their lack of control for the age of the mother. This may explain the difference in findings.

Pregnancy interval (Tables 8a, 8b)

Pregnancy interval was found to be a significant risk factor for LBW in the present study. We found that women with a pregnancy interval of less than 12 months were at a significantly higher risk for LBW, both on univariate regression analysis [OR 7.75 (95% CI 2.45- 24.89), p<0.001] and on multivariate regression analysis [OR 5.06 (95% CI 1.22 -21.02), p= 0.025].

This finding was in accordance with other studies. Negi et al , in their study performed in a rural area near Dehradhun found that an interpregnancy interval of less than 12 months was associated with a higher risk of LBW (OR 2.58,p < 0.05)[13]. Deshmukh et al in their longitudinal study in an urban area of Nagpur reported a similar finding (OR 3.84 (95% CI 2.10-6.46)] [15].

A short pregnancy interval may lead to LBW because of nutritional depletion or inadequate physiological recovery. Kramer found that there was insufficient epidemiological evidence to show that birth interval was a significant risk factor for LBW [1].However,Shah and Ohlsson found that several epidemiological data sources in the US indicated that both short (<18m) and long (>60m) intervals are associated with LBW births[6].

Gestational Age (Table 9)

Cases and controls were matched on the basis of gestational age of the pregnancy.

In our study, a higher proportion of LBW babies (30.4%) were born at a gestational age of 37 wks i.e. at the lower spectrum of the definition of Term LBW. As expected, fewer deliveries took place at the gestational ages of 41 and 42 weeks.

Bad Obstetric History (Table 10 a, 10 b)

There was no statistically significant difference between the cases and control with respect to prior bad obstetric history (χ^2 =5.324,p=0.150). Many mothers were unable to accurately recall the birth weight of a previous child and documentary evidence was relied on whenever available. This may explain why so few of them (13 cases and 6 controls) gave a previous history of LBW.

Kramer did not find any evidence to show that prior spontaneous abortion or prior still birth/neonatal death was associated with LBW. While there was some evidence to suggest that a history of prior low birth weight delivery was associated with increased risk in the next pregnancy (RR 2.75)[1].

A number of studies from the sub continent have reported bad obstetric history to be a significant risk factor for LBW [13,27,14,24]. In the present study there was no statistically significant difference between the two groups with respect to previous history of low birth weight, and thus it was not found to be a significant risk factor for LBW.

Antenatal care received by the mothers (Tables 11, 12a, 12b, 13,14)

The present study found that those mothers who received less than 3 ANC visits were a significant risk factor for LBW on univariate regression analysis [OR 2.85 (95% CI 1.46- 5.55), p = 0.002] but not on multivariate regression analysis [OR 0.43 (95% CI 0.05 – 3.85), p = 0.454].

In our study, 52 % of women in the study group and 72% of women in the control group were registered in the first trimester of pregnancy. This finding is in accordance with that of NFHS -3 Data which showed that 51% of women in Karnataka registered their pregnancy in the first trimester.[23] The difference between the two groups was statistically significant (χ^2 =12.386, p<0.006) . Women who registered their pregnancy after the first trimester were at a higher risk for LBW on univariate regression analysis [OR 2.29 (95% CI 0.43-0.86), p<0.005], but not on multivariate regression analysis (OR 1.17 (95% CI 0.60-2.26), p = 0.637). Kramer also found that the number of ANC visits a woman received was not a significant risk factor for delivery of a low birth weight baby[1]. A number of studies from India[13,14,24] have reported the beneficial effect that adequate and regular ANCs have on lowering the risk of LBW.

It is probable that women who have regular ANC visits are also more likely to be diagnosed with complications during pregnancy and are thus referred to the hospital for an institutional delivery. This may have had an effect on the findings.

The number of women who consumed more than 100 tablets of iron during the course of their pregnancy was higher among the controls (84.8%) than the cases. The difference was statistically significant (χ^2 = 19.23, p <0.000). Univariate regression analysis showed that mothers who consumed less than 100 tablets of iron had a higher risk of LBW OR 3.72 (95% CI 2.03-6.81), p=0.00). There was a slight reduction in this risk level on multivariate regression. (OR 3.49 (0.89-13.61),p= 0.072].

This finding is in accordance with that of S Palma at al who, in a case control study, showed that iron supplementation was associated with a lower risk of LBW in mothers without anemia [OR 0.58 (95% CI 0.34 to 0.98)] adjusted for smoking, maternal education, body mass index, obstetric diseases during pregnancy, weight gain during pregnancy, and previous LBW[20]. The number of women who received adequate calcium supplementation was marginally higher in the control group rather than the study group, but the difference was not statistically significant.

Maternal morbidity during pregnancy (Table 15)

Table 15 shows that the number of women who gave a history of major medical illness during pregnancy was unexpectedly higher amongst the controls (8.8%) rather than cases (4.8%), but this finding was statistically insignificant (χ^2 = 1.578, p = 0.209) . The types of illnesses included Hypertension (excluding pregnancy induced hypertension), Diabetes (excluding gestational diabetes), urinary tract Infection, HIV, mitral regurgitation, hypothyroidism, epilepsy, acute renal failure, portal hypertension, and thrombocytopenic purpura.

Shah and Ohlsson found that certain types of medical illness during pregnancy may influence the pregnancy outcome. Gestational diabetes usually results in large for date infants. If the mother has previous glucose intolerance, superimposed gestational diabetes can lead to growth restriction Maternal thrombophilic conditions can also affect the development of the placenta and lead to IUGR.

In addition, maternal infection with rubella, cytomegalovirus, malaria, syphilis, varicella, herpes, and Listeria, Epstein - Barr virus and Chagas disease can cause fetal growth restriction.

Urinary tract infection is common during pregnancy and It can lead to preterm labor andpreterm rupture of the membranes[6].

Brocklehurst et al, studying pregnancy outcomes in HIV + pregnant women found that they were at an increased risk of preterm births (OR 1.83, 95% CI 1.63, 2.06), LBW [OR 2.09(95% CI 1.86, 2.35)] and IUGR (OR 1.7(95% CI 1.43, 2.02)] [6]

According to Kramer common episodic illnesses and symptoms, such as upper respiratory infections, fever, nausea, vomiting, diarrhea, headache, and anorexia, could also affect intrauterine growth or gestational duration. In rural developing countries, such illness may be associated with an impaired fetal growth, on average, of 45 g per birth. However, whether such an association represents a causal effect of maternal illness on fetal growth, or merely a marker for problem pregnancies, is not clear at present. Maternal malaria could be a major determinant of intrauterine growth or gestational duration in countries where it is endemic.[1]

Complications during pregnancy (Table 16)

In our study we found that 33.6% cases versus 16.8% controls gave a history of complications during the immediate pregnancy. The difference was statistically significant (χ^2 =9.358,p<0.0002). Mothers who suffered from a complication during pregnancy were at a higher risk for LBW on univariate regression analysis (OR2.51

(95%CI 1.38-4.56), p<0.003) as well as on multivariate regression analysis (OR2.73 (1.34-5.54), p<0.006).

Pregnancy Induced Hypertension (PIH) and Premature Rupture of Membranes (PROM) were the leading complications observed amongst both cases and controls.

There was a positive history of gestational diabetes in 3 (2.4%) controls but in none of the cases.

These findings were in accordance with other studies. Joshi et al in his hospital based cross sectional study, found a highly significant association between a history of complications during pregnancy and LBW (z=4.22,p<0.001).Pre- eclampsia and eclampsia were the leading complications reported in his study and were diagnosed in 53.85% of mothers. 75% of mothers with pregnancy induced hypertension delivered LBW babies in their study[16]. Singh et al also reported a significant association between PIH and LBW in his retrospective cohort study[24].A case control study performed in Bandar Abbas also found that and increased risk of LBW babies amongst mothers with maternal hypertension [OR7.4 (95%CI 1.5-36.9)][25].

Maternal Anemia (Table 17)

We found that that anemia was more common among the cases (67.2%) than the controls (54.4%) and this difference was statistically significant (χ^2 = 4.296, p < 0.05). Univariate logistic regression showed that anemic mothers were at a higher risk of LBW compared to the controls [OR (1.03-2.87), p < 0.039] however this relationship could not be demonstrated on multivariate logistic regression [OR 1.12 (0.59- 2.09), p= 0.725].

This finding was is in contrast to the findings of two hospital based retrospective case control studies performed in Karnataka D.Acharya et al , in a study done in Udipi district, found maternal anemia (Hb<11gm%) to be a significant maternal determinant of IUGR [OR 2.13(95%CI 1.15-3.95)][18.].A similar finding was noted by Kumar et al in their study done in Manipal [OR4.37(95%CI 2.31-8.26) p<0.001)[17].

Other studies done in India have also reported a higher risk of LBW in anemic mothers. Deshmukh et al found that anemia was the most significant risk factor associated with LBW birth (OR 4.81,95%CI 1.68-12.43) in their cohort study[15] . Kiran Anand and B.S.Garg in their cross sectional study also found a highly significant association between hemoglobin concentration and LBW (p < 0.001) [14].

The difference in findings could be because the other studies did not control for socio-economic variables. Anemia and LBW are both more common in the lower compared to the higher socioeconomic classes and the aim of the present study was to determine whether the relationship between these two variables was independent of the effect of socio-economic class, and other important variables The findings from the present study appear to suggest that this is not the case.

Diet of the mother (Tables 18, 19, 20)

The study group and control group were similar with respect to the type of diet consumed. 76% of cases and 72.8% of controls consumed a diet that was deficient in calories. The difference between the two groups was statistically insignificant (χ^2 = 0.336, p= 0.562).

Amongst the study participants only 17.6% of cases and 19.2% of controls consumed enough protein in their diet. The difference between the two groups was statistically insignificant (χ^2 = 0.107, p = 0.744).

Alcohol and tobacco use:

None of the study participants gave a history of using tobacco or alcohol during the course of their pregnancy.

Deshmukh et al studying LBW in an urban area of Nagpur found women who had a history of exposure to tobacco (in the form of tobacco chewing or passive smoking) had a significantly higher risk of delivering an LBW baby (OR 3.14,95% CI 2.08-4.88)[15]. In a study performed in Bandar Abbas , the use of hookah during pregnancy was associated with a higher risk for LBW delivery. (OR 3.5(95%CI 1.1-12.6) [12].

Kramer found tobacco use to be the most significant risk factor for LBW in western societies[1].

Maternal height (Table 21)

The mean height of mothers in the study group was 151.9 + 5.42 cm which was significantly lower than the mean height of mothers belonging to the control group (154.9 + 4.59 cm, t = 4.651 , p=0.000).

There was a significantly higher number of women with a height less than 145 cm in the study group than the control group (χ^2 = 11.734, P = 0.002). Short stature was found to be a significant risk factor on univariate regression analysis (OR 9.028 (95% CI 2.03- 40.15), p<0.004) but not on multivariate regression analysis [p > 0.05]

This finding was in accordance with Kumar et al who, in a hospital based study from Manipal, did not find a maternal height of less than 145 cm to be a significant risk factor for LBW [17]. Negi et al reported that the association between a maternal height of less than 150 cm and LBW in their study was insignificant[13].

These findings are in contrast, however, to other studies done in India and abroad. A hospital based case control study which was done by Acharya et al, reported that that Maternal height less than 145 cm was associated with a higher risk of LBW .(OR 4.48, 95% CI 1.75-11.5)[18]. A cohort study by Deshmukh et al in an urban area of Nagpur also found maternal height less than 140 cm to be a significant risk factor for LBW [OR 2.76(95% CI 1.92-3.92] [15]. Kramer reviewed the literature on LBW from western countries and found that short stature in the mother was a significant risk factor for IUGR He calculated the sample size weighted estimate of the relative risk of IUGR in mothers with a maternal height <157.5-158 cm was 1.27[1.]. In most of the Indian studies, the cut off point for the definition of short stature varies between 140 -145 cm . This could explain the difference in findings between the studies.

Maternal weight (Table 22)

The mean pre-delivery weight of mothers in the study group was 48.6 + 4.92 kg which was significantly lower than the mean weight of mothers belonging to the control group (51.7 + 5.80 kg)(t= 4.543, p<0.000).

Maternal pre-delivery weight less than 45 kg was a significant risk factor for LBW on univariate regression analysis [R 4.01 (95% CI 1.65-9.68), p<0.000] as well as on multivariate regression analysis [OR 14.62 (95% CI 1.14- 186.8) p= 0.039].

This finding was in accordance with a number of other studies. Acharya et al , in a hospital based case-control study performed in Udipi, found that a maternal weight of less than 45 kg was a significant risk factor for IUGR [OR 7.0 (95% CI 3.3-14.73)[18] . Kumar et al also found that a maternal eight of less than 45 kg was associated with a higher risk of LBW (OR 7.0 (95% CI 2.59-19.01), p.<0.001) [17]Negi et al also found that maximum number of LBW babies in their study were delivered by mothers whose gestational weight at third trimester was less than 45kg (OR 8.2)[13].Anand and Garg, in their cross sectional study performed in Wardha found that a pre-delivery weight of less than 45 kg was associated with a higher risk of LBW [OR 7.1 (955 CI 1.83-24.38),p.<0.05][14] .A study performed in Rajshahi, Bangladesh found that maternal weight of less than 50 kg in the third trimester of pregnancy was associated with a higher risk of LBW [RR 2.29(95% CI 1.49-3-50)] [11]

Maternal pre-pregnancy weight reflects the nutritional stores potentially available to the growing fetus. Like height, weight is influenced both by genetic and environmental factors. Kramer calculated a sample size weighted effect of 9.5gm birth weight per kg maternal pre-pregnancy weight.[1]

BMI (Table 23)

The BMI values of mothers belonging to the study and control groups were not significantly different. ($\chi^2 = 2.330$, $p = 0.312$).

Khatun Selina and Rahman Mahamudur also reported that BMI was not a significant predictor variable for LBW in their study done in Bangladesh [22].

A number of studies have reported a significant association between maternal BMI and LBW. A hospital based case-control study on IUGR performed in Udupi, Karnataka, showed that BMI<18.5 was a significant risk factor by univariate analysis (OR 2.59, 1.08-6.25) but not on multivariate analysis.[18] Singh et also reported a decreasing risk of LBW with increase in pre-pregnancy BMI[24]. Deshmukh et al reported the maternal BMI was a significant risk factor for LBW (OR 2.02 (95%CI 1.26-3.14)[15]as did Joshi et al ($\chi^2 = 17.57$, $p < 0.001$)[16].

A woman's pre-delivery BMI depends on the amount of weight gain during pregnancy in addition to her pre-pregnancy nutritional status .It is likely that women belonging to the same socioeconomic strata are similar in these respects.

Mode of Delivery (Table 24)

One concern that has been expressed about hospital based studies on IUGR is that they do not take into account the effect of mode of delivery on the resultant birth weight.[18].A Caesarean section, especially one that has been done as an emergency, may reduce the period of gestation and consequently prevent the fetus from achieving its full growth potential, thereby resulting in a lower birth weight.

We found that there was no significant difference between cases and controls with respect to mode of delivery.

Infant sex (Table 25)

There were a larger number of female babies who were born LBW 70(56%) compared to male babies (55(44%)).This difference was statistically significant (χ^2 =5.187,p=0.023).

On univariate logistic regression analysis, females had a significantly higher risk of LBW compared to males (OR 1.79(95%CI 1.08-1.51), p=0.023).The relationship persisted on multivariate regression (OR 4.17(95% CI 1.47-11.77), p=0.007).

This finding was in accordance with that of a study done in Rajshahi, Bangladesh which also reported a significantly higher risk of LBW among female babies [OR 2.84 (95%CI 1.85-4.36)][21].

Kramer also found that males had a higher birth weight and lower risk of IUGR compared to females. He calculated that the relative risk of IUGR (for females) was 1.19.[1]

Shah and Ohlsson found that there was no conclusive evidence of difference in the risk of IUGR/preterm births in relation to sex of the infant. Male newborns are of higher weight compared to female newborns, and they opine that this may have some effect at the lower end of the spectrum of the definition of LBW.[6] However Kramer pointed out that the influence of infant sex on birth weight depends upon the population being studied, and the effect may be greater in developing countries than in developed countries[1].

Regression Analysis (Tables 26, 27)

The significant risk factors for LBW in the newborn on multivariate logistic regression analysis were maternal pre-delivery weight less than 45 kg (OR 14.62), maternal age less than 19 years (OR 9.74), iron supplementation for less than 100 days (OR 8.25), pregnancy interval less than 12 months (OR 5.06), complication during pregnancy (OR 4.96), and female sex of the newborn (OR 4.17). The risk factors that were significant on univariate regression but not on multivariate regression analysis were residence in a rural area, primiparity, maternal anemia, less than 3 ANC visits, late registration of pregnancy (after first trimester), and maternal height (<145 cm)

CONCLUSION

A retrospective case control study was conducted in a tertiary care hospital to know the maternal determinants of low birth weight (LBW).In this study, 125 mothers with their LBW babies were cases, and 125 mothers with their normal birth weight babies were controls. The cases were matched on a one to one basis for socioeconomic variables, like socioeconomic status, educational status and the occupation of the mother, as well as for gestational age of the pregnancy. The study variables included age of the mother, area of residence, parity, inter-pregnancy interval, bad obstetric history, number of ANC visits, time of registration of pregnancy, iron supplementation during pregnancy, calcium supplementation during pregnancy, maternal anemia, maternal morbidity during pregnancy, complications during pregnancy, alcohol and tobacco use during pregnancy, maternal height, maternal weight, BMI, and infant sex. Odds ratios were calculated for each study variable and then univariate and multivariate logistic regression analyses were performed. The significant risk factors associated with low birth weight on multivariate regression analysis were maternal weight less than 45 kg (OR 14.62), maternal age less than 19 yrs (OR 9.74), inadequate iron supplementation (OR 8.25) pregnancy interval less than 12 months (OR 5.06), complications during pregnancy (OR 4.96) and female gender of the new born (OR 4.17).

LIMITATIONS

1. The Hemoglobin values of the mother during pregnancy were obtained from the mother's medical records. Ideally, they should have all reflected the hemoglobin status of the participant at one particular point in the duration of her pregnancy, to ensure better comparability between the values, but this was not possible due to the retrospective nature of the study.
2. The family's socio-economic status, which was ascertained using the modified B.G. Prasad classification, only considers the total amount of money earned by the working members of the family, to determine the economic class to which the family belongs. It doesn't take into account other economic assets such as land or cattle which also have a bearing on the family's and therefore the mother's, economic well being.
3. It is a hospital based study and therefore subject to certain biases. The proportion of mothers suffering from complicated pregnancies is likely to be higher in the study sample than in the general population. It is possible that mothers who undergo institutional deliveries may differ from mothers undergoing home deliveries in terms of their attitude towards the pregnancy, and the amount of social and economic support they receive during the course of the pregnancy.
4. A number of fetal and placental causes of low birth weight were not included as risk factors in the study.
5. Information on pre-pregnancy weight could not be collected.
6. The intake of proteins and calories were measured but energy expenditure by the study participants was not calculated.

7. Recall bias is a limitation of the retrospective study design. Participants had to rely on their memory for giving a history of time of registration of pregnancy, amount of iron supplementation received, and previous history of low birth weight delivery. Hospital records were consulted where available.

RECOMMENDATIONS

1. Measures should be taken to prevent the early marriage of the girl child and delay the age of the first pregnancy.
2. Encourage couples to use temporary methods of family planning, so as to increase the pregnancy interval.
3. Improvement of nutritional status of women through proper implementation of the ICDS program.
4. Measures to ensure regular intake of iron tablets during pregnancy. ASHA workers can act as direct observers, just like DOTS, we can try DO - IT (Directly Observed Iron Therapy).
5. Prompt identification of complications during pregnancy and their treatment or timely referral.
6. The female baby, on average, weighs less than the male baby but the current definition of LBW is the same for both genders. Perhaps a new cut off point for the definition of LBW in the female baby is required. More studies need to be done to confirm this.

SUMMARY

Low Birth Weight, defined as a birth weight of less than 2,500 gm, is an important risk factor for childhood morbidity and mortality and is important public health problem, especially in developing countries. There are two main processes governing LBW, namely IUGR and pre-term delivery, and both processes are determined by different sets of risk factors. While it is well known that LBW is multifactorial in origin and is caused by the interplay of numerous genetic, social, and environmental factors there is much controversy regarding the various factors involved and their quantitative importance. Many of the earlier studies on LBW did not distinguish between pre-term and term LBW, and were also limited by their lack of control for socio-economic factors and gestational age. The present case control study was designed to determine the risk factors for LBW after controlling for socio-economic variables of the mother and gestational age of the pregnancy.

The study was conducted in the department of Obstetrics and Gynecology in a tertiary care hospital of Belgaum, Karnataka from 1st January 2009 to 31st December 2009. The study participants included mothers who delivered in the hospital during the study period and their singleton term newborns. The sample size was calculated to be 250, with 125 cases and 125 controls. Cases were mothers who had given birth to term LBW babies, i.e. babies with birth weight less than 2,500 gm, while Controls were mothers who had given birth to term babies with a birth weight of 2,500 gm or more. The mother’s were interviewed using a pre-designed, pre-tested schedule and were matched on a one on one basis for their socioeconomic status, educational status and occupation. They were also matched for the gestational age of the pregnancy (in weeks).

The study variables were age of the mother, area of residence, type of family, inter-pregnancy interval, bad obstetric history, number of antenatal care visits, time of

registration of pregnancy, iron supplementation during pregnancy, calcium supplementation during pregnancy, maternal morbidity during pregnancy, complications during present pregnancy ,alcohol and tobacco intake during pregnancy, anemia during pregnancy, maternal diet, maternal height, maternal weight, maternal BMI, mode of delivery and gender of the baby.

Univariate and multivariate logistic regression analyses were done using SPSS 17 software.

The significant risk factors on univariate regression analysis were mother's age less than 19 yrs [OR 5.54 (95% CI 1.56-19.67), p = 0.008),rural area of residence [OR 2.10(95% CI 1.25-3.52),p = 0.005] parity of the mother [OR 2.99(95% CI 1.79-5.02) p=0.000], female gender of newborn [OR 1.79 (95% CI 1.08-2.95), p = 0.023], pregnancy interval less than 12 months [OR 7.75 (95% CI 1.08-2.95, ,p =0.001], complications during pregnancy [OR 2.51 (95% CI 1.38-4.56)p = 0.003], anemia OR 1.72 (95% CI 1.03-2.81) p= 0.039], less than3 ANC visits [OR 2.85(95 % CI 1.46-5.55,) p =0.002], late registration of pregnancy [OR 2.29 (95% CI 1.35-3.89) p = 0.002], height less than 145 cm [OR 9.03(95% CI 2.03-40.15) p = 0.004],pre-delivery weight less than 45 kg[OR 4.01(95% CI 1.66-9.68) p =0.002], and inadequate iron supplementation [OR 3.72 (95% CI 2.03-6.81) p =0.000].

The significant risk factors on multivariate logistic regression were maternal age less than 19 years [OR 9.74 (95% CI 2.66 – 22.32), p = 0.001], female gender of newborn [OR 4.17 (95% CI 1.47- 11.77), p = 0.007], pregnancy interval less than 12 months [OR 5.06 (95% CI 1.22 -21.02), p = 0.025], complications during pregnancy [OR 4.96 (95% CI 1.53 – 16.11), p = 0.008], maternal weight less than 45 kg [OR 14.62 ((95% CI 1.14 -186.8),p = 0.039],and inadequate iron supplementation [OR 8.25 (95% CI 1.10 – 61.75), p = 0.040].

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ANNEXURE-I

INFORMED CONSENT FORM

“MATERNAL DETERMINANTS OF LOW BIRTH WEIGHT: A CASE CONTROL STUDY IN A TERTIARY CARE HOSPITAL, BELGAUM, KARNATAKA”

INVESTIGATORS: Dr. _______________________, Dr._________________

Introduction

You are being invited to participate in this study to find out the maternal determinants of low birth weight in mothers delivering in a tertiary care hospital in Belgaum. Participation in this study is completely voluntary.

Explanation of procedures

In this study you will have to answer a few prepared questions about your general health information and socio-demographic details. Questions will mainly be concerning your health during pregnancy and details about the kind of antenatal care you received If you agree to participate, then only will the information be collected, and if at any moment you don’t want to continue then you can leave.

Possible Benefits

The investigator does not promise or guarantee that you will receive direct benefit being in the study. It will benefit for the whole community because this study will enable a better understanding of the maternal health factors that cause low birth weight of babies in Belgaum district, thus helping doctors to improve mother and child health services

Possible risks

The tools employed for conducting the study are safe and as such are not likely to cause any harm to the persons.

Confidentiality

Your identity will not be revealed. All information collected will be collected and coded so that no one will know your identity.

Withdrawal

Participation in this study is voluntary. If you don't not to wish to participate in this study, you will not lose benefits to which you are entitled.

Costs of Participation

The cost of the study will be borne by the researcher. There will be no additional cost to you for participating in this study.

Payment of Participation

There will be no incentives to you for participating in this study.

Questions

If you have any questions about this study, you should contact Dr. (Mrs.) ________________________ (Ph:_______________) and Dr.___________ at ________________ If you have any questions about your rights as a study participant, you may contact Dr ________________, Chairman, JNMC Institutional Ethics Committee on human subjects research at ________________.

Authorization to publish results

The Researchers may use the information gathered from this study for presentation in scientific journals. However your identity will not be disclosed in such presentation or publication.

Legal Rights

By signing this consent form, you are not waiving any of your legal rights.

CONSENT STATEMENT

I volunteer and consent to participate to participate in this study. I have read the consent or it has been read to me. The study has been fully explained to me and I had given the opportunity to ask questions and they have answered to my satisfaction and that I have received a copy of this signed consent form.

___________________________________ __________________________

Name of the participant Sign. /Left Hand Thumb Impression

___________________________________ __________________________

Name of Person Obtaining Consent Sign.

___________________________________ __________________________

Name of Witness Sign.

Date__________________________

ANNEXURE –II

PROFORMA

MATERNAL DETERMINANTS OF LOW BIRTH WEIGHT: A CASE CONTROL STUDY IN A TERTIARY CARE HOSPITAL, BELGAUM, KARNATAKA

Serial no:

Case/Control:

1) Name:

2) Age

3) Address

4) Occupation

a) Housewife

b) Laborer

c) Service/Others

5) Religion

a) Hindu

b) Muslim

c) Christian

d) Others (specify)

6) Per Capita Income _____________________

Socio- economic status: Class I / II / III / IV / V

7) Education

a) Illiterate

b) Primary (1-4 years)

c) Middle school (5 – 7 years)

d) High School (8 – 10 years)

e) College (>10 years)

8) Type of Family (Joint/Nuclear/Broken)

9) Obstetric history

a) Parity (1/2/3 or more)

b) Pregnancy interval (in months) (<12/ 12-24 / 24- 36 />36)

c) History of major illness/complication during last pregnancy

i) Pregnancy Induced Hypertension (PIH)

ii) Antepartum haemorrhage

iii) Gestational Diabetes

iv) PROM

v) Malpresentation

vi) Abruptio placenta

vii) Oligohydramnios, Anamnios

viii) Placenta previa

d) Duration of last pregnancy (in weeks)

e) Mode of delivery:

Vaginal delivery / Caesarean –section

10) Bad OBH

Previous history of low birth weight baby (Y/N/)

Previous history of abortion (Y/N)

Previous history of still birth: (Y / N)

11) Quality of Antenatal Care

a) Was antenatal care received or not? (Y / N)

b) If yes

i) Time of registration (T1 / T2 / T3/ Not registered)

ii) Number of ANC visits (< 3 / 3 or more)

iii) Iron supplementation received or not (Y/N)

Number of tablets taken (<100 days/ >100 days)

iv)Calcium supplementation received or not (Y / N)

12) Medical History: History of any other major medical or surgical illness during pregnancy (Eg. Hepatitis, fever with rash etc.) (Y/N) (Specify)

13) Personal History: History of drug/alcohol/tobacco use during pregnancy (Y/N)

If Yes then Duration_:____________________

Quantity________________________

14) Maternal nutrition

Type of diet: Vegetarian/ Mixed

Total calories consumed: Adequate / Inadequate

Total proteins consumed: Adequate/ Inadequate

15) Anthropometry

a)Maternal height (in cm) _____________ b) Maternal weight (in kg) _______

c) BMI ____________________

d) Birth weight of newborn (in kg)______________________

e) Sex of the child

ANNEXURE III – MASTER CHART

Key to Master Chart

Maternal Determinants of Low Birth Weight: A case control study in a tertiary care hospital, Belgaum, Karnataka

1.Maternal age
- <19 - 1
- 20-30 - 2
- >30 - 3

2.Occupation
- Housewife - 1
- Heavy labour-2
- Others -3

3.Socio-economic status
- Class 1- 1
- Class 2- 2
- Class 3- 3
- Class 4- 4
- Class 5- 5

4.Educational status
- Illiterate- 1
- Primary- 2
- Middle - 3
- High School-4

5. Parity
- P1- 1
- P2-2
- P3-3
- P4-4
- P5 or more- 5

6. Pregnancy interval
- 0- not applicable (primigravida)
- <12 - 1
- 12-24- 2
- 24-36- 3
- >36 - 4

7. Gestational age
- <37 wks- 0
- 37 wks- 1
- 38 wks- 2
- 39 wks- 3
- 40 wks- 4
- 41 weeks-5
- 42 weeks-6

8. Bad obstetric history
- still birth - 1
- spontaneous abortion- 2
- low birth weight 3

9.Quality of ANC

No. of ANCs revieved
<3- 0
3 or more -1

10.IFA supplementation

<90- 0
90 or more -1

11.Calcium supplementation

<90- 0
90 or more -1

12History of major illness during pregnancy

No -0
Yes-1

13.Anemia

<11 gm%- 1
>11 gm%- 2

13.Height

<145 cms- 1
>145 cms- 2

14.Weight

<45 kgs - 1
>45 kgs - 2

15Sex of child

Male- 1
Female-0

16.Type of diet

vegetarian- 0
mixed - 1

17.type of family

0-separated
1- nuclear
2- joint
3- extended

18.Type of Complication during pregnancy (U)

0- none
1- abruptio placentae
2- prom
3- placenta previa
4- malpresentation
5- oligohydramnios, anamnios

7- PIH
8-Gestational diabetes

19.Religion
Hindu -1
Muslim -2
Christian-3
Other- 4

20.Address
Rural- 1
Urban- 2

21. Type of delivery
Vaginal deliveries (including induced)- 1
C-section emergency- 2
C-section elective- 3

MASTER CHART

S.no	Case/Control	CaseControl	Age	Age	Religion	Address	type of family	Education	Occupation	SES	Parity	Pregnancy interval	duration of pregnancy	illness during pregnancy	complication during pregnancy	type of complication	bad obh	regular anc	time of registration	iron supplementation	calcium supplementation	calorie intake	protein intake	type of diet	Hb%	anemia	height	short stature	weight	low weight(<45 kgs)	BMI	BMI<18.5	mode of delivery	birthwt	gender
1	Case	1	26	3	1	1	2	3	2	3	2	3	5	0	0	0	0	1	1	1	0	0	0	1	10.5	0	155	0	51.5	0	21.4360042	0	1	2.5	0
2	Case	1	25	2	1	1	2	4	2	5	1	0	1	0	1	1	1	1	1	1	1	0	0	1	10	0	150	0	48	0	21.3333333	0	3	1.7	0
3	Case	1	20	2	1	1	2	3	1	3	1	0	4	0	0	0	0	1	1	1	1	1	0	1	11	0	148	0	46	0	21.0007305	0	1	2.3	0
4	Case	1	26	3	1	1	2	4	3	2	2	4	1	0	1	7	0	1	1	1	0	0	0	1	10.5	0	154	0	60	0	25.2993759	0	2	2.2	1
5	Case	1	19	1	1	1	2	4	1	3	1	0	1	0	1	7	0	0	3	0	0	1	1	0	14.7	1	163	0	48.7	0	18.3296323	1	3	2.2	1
6	Case	1	22	2	1	1	1	5	3	1	2	3	4	0	0	0	3	1	2	0	1	0	0	1	9	0	150	0	48	0	21.3333333	0	1	2.3	0
7	Case	1	20	2	1	2	2	4	1	3	1	0	3	0	0	0	0	0	0	0	0	0	0	0	10	0	156	0	45	1	18.4911243	1	1	2.3	0
8	Case	1	25	2	1	2	1	5	3	1	2	4	2	0	0	0	0	1	1	1	1	0	0	0	10	0	154	0	54	0	22.7694384	0	2	2.1	0
9	Case	1	23	2	1	1	2	4	2	4	1	0	1	0	1	7	0	1	1	1	0	1	1	1	12	1	151	0	49	0	21.4902855	0	3	2.2	1
10	Case	1	22	2	2	1	2	2	2	5	1	0	5	0	0	0	0	1	2	0	1	0	0	1	8.9	0	155	0	43.9	1	18.2726327	1	3	2.2	0
11	Case	1	23	2	1	2	2	4	1	4	1	0	3	0	0	0	0	1	2	1	1	0	0	0	9.5	0	150	0	46.5	0	20.6666667	0	1	2.25	0
12	Case	1	24	2	1	1	2	3	2	4	2	4	1	0	1	7	0	1	1	1	1	1	1	1	12	1	152	0	50	0	21.6412742	0	1	2.4	0
13	Case	1	24	2	1	2	1	5	1	2	1	0	1	0	1	7	0	0	2	0	0	0	0	0	11	0	167	0	51	0	18.2867797	1	1	2.4	0
14	Case	1	19	1	1	1	2	4	1	3	1	0	2	0	0	0	0	1	1	1	1	0	0	1	11.5	1	157	0	45.5	1	18.4591667	1	1	1.8	0
15	Case	1	21	2	1	1	2	4	1	1	1	0	4	0	1	4	0	1	1	1	1	1	1	1	11	0	151	0	49	0	21.4902855	0	1	2.25	0
16	Case	1	18	1	1	1	2	4	1	1	1	0	2	0	0	0	0	1	2	0	1	0	0	0	9.8	0	156	0	44.8	1	18.4089415	1	1	2.2	1
17	Case	1	24	2	1	2	1	5	3	4	1	0	4	0	0	0	0	1	1	1	1	0	0	1	11.4	1	151	0	49.4	0	21.6657164	0	1	2.1	1
18	Case	1	28	3	1	2	2	5	1	1	1	0	1	0	0	0	2	1	1	1	1	0	0	1	11.4	1	159	0	64	0	25.3154543	0	2	2.4	0
19	Case	1	20	2	1	1	2	3	1	2	1	0	4	0	0	0	0	1	1	1	1	1	1	1	12	1	150	0	48	0	21.3333333	0	3	2.3	0
20	Case	1	30	3	1	1	1	4	2	4	1	0	4	0	0	0	0	1	1	1	1	0	0	1	12	1	158	0	56	0	22.4323025	0	3	2.3	0
21	Case	1	27	3	1	1	2	3	1	3	3	2	1	1	0	0	0	1	1	1	1	1	0	1	11	0	155	0	53	0	22.0603538	0	1	2.1	1
22	Case	1	20	2	1	1	1	3	2	3	1	0	1	0	0	0	0	1	2	1	1	0	0	0	10	0	147	0	45	1	20.8246564	0	1	2.25	1
23	Case	1	22	2	1	1	2	3	1	3	2	4	2	0	0	0	3	1	1	1	1	0	0	1	10.5	0	149	0	47.5	0	21.3954326	0	1	2.3	0
24	Case	1	23	2	1	1	2	4	3	3	1	0	4	0	1	2	0	0	3	0	0	0	0	0	10.5	0	163	0	48.5	0	18.2543566	1	1	2.3	0
25	Case	1	24	2	1	1	1	2	2	5	2	3	1	0	1	1	3	1	2	1	1	0	0	0	10	0	149	0	47	0	21.1702176	0	3	2.2	0
26	Case	1	28	3	1	2	3	4	3	1	3	2	1	0	1	5,7	3	1	2	0	1	0	0	0	5.9	0	152	0	50.9	0	22.0308172	0	3	2.2	0
27	Case	1	20	2	1	1	2	4	2	4	1	0	1	0	0	0	0	0	3	0	0	0	0	1	11	0	157	0	45	1	18.2563187	1	1	2	1
28	Case	1	19	1	1	1	2	3	1	3	1	0	2	0	1	2	0	0	1	0	0	1	1	0	12.7	1	149	0	46.7	0	21.0350885	0	1	2.4	1
29	Case	1	21	2	1	1	1	2	2	5	1	0	2	0	0	0	0	1	3	1	1	0	0	0	10	0	144	1	44	1	21.2191358	0	1	2.3	0
30	Case	1	27	3	1	1	2	3	3	4	1	0	2	0	1	5	0	1	2	1	1	0	0	0	10	0	153	0	51	0	21.7864924	0	1	2.25	1
31	Case	1	22	2	1	1	1	3	2	5	1	1	1	1	0	0	0	0	3	0	0	0	0	0	10	0	147	0	45	1	20.8246564	0	1	2.2	0
32	Case	1	19	1	1	2	1	4	1	4	1	2	1	0	0	0	0	1	1	1	1	1	1	1	13	1	148	0	46	0	21.0007305	0	1	2.3	1
33	Case	1	21	2	1	1	2	3	2	3	2	3	2	0	0	0	3	0	2	0	0	1	0	1	11.7	1	148	0	47.7	0	21.7768444	0	1	2.25	1
34	Case	1	20	2	1	1	2	1	2	4	1	0	1	0	0	0	0	1	2	1	1	0	0	0	10	0	143	1	44	1	21.5169446	0	1	2.2	0
35	Case	1	27	3	1	1	2	2	1	3	3	4	1	0	0	0	0	1	1	1	1	1	0	1	11.5	1	156	0	53.5	0	21.9838922	0	1	2.2	0
36	Case	1	19	1	1	1	1	2	2	4	1	0	3	0	0	0	0	1	1	1	0	0	0	0	10.5	0	145	1	43.5	1	20.6896552	0	1	2.25	0
37	Case	1	26	3	2	2	3	3	1	2	1	0	2	0	0	0	0	1	1	1	1	0	0	1	11.1	1	154	0	53.1	0	22.3899477	0	3	2.4	0
38	Case	1	23	2	1	2	2	4	3	3	3	3	1	0	1	4	0	1	1	1	0	1	0	0	11	0	164	0	49	0	18.2183224	1	1	2.4	0
39	Case	1	26	3	1	1	1	2	2	4	1	1	2	0	1	1	0	1	2	1	1	0	0	0	10.8	0	153	0	50.8	0	21.7010551	0	3	2.2	0
40	Case	1	25	2	1	2	2	4	3	2	1	0	4	0	1	5	0	0	3	0	0	0	0	0	8.4	0	164	0	49.4	1	18.3670434	1	1	2.4	0
41	Case	1	23	2	1	1	1	2	2	5	2	3	1	0	0	0	0	0	3	0	0	0	0	1	9	0	156	0	45	1	18.4911243	1	1	2.3	1
42	Case	1	23	2	1	1	1	4	3	3	1	0	2	0	1	2	0	0	3	0	0	0	0	1	11.2	1	152	0	49.2	0	21.2950139	0	3	2.2	1
43	Case	1	24	2	1	1	2	4	2	4	1	0	2	0	1	7	0	0	3	0	0	0	0	1	11	0	151	0	49	0	21.4902855	0	1	2.4	1
44	Case	1	24	2	1	1	2	3	3	2	1	0	3	0	0	0	0	1	1	1	1	0	0	1	12	1	154	0	52	0	21.9261258	0	1	2.2	0
45	Case	1	20	2	1	1	1	1	2	5	1	0	1	0	0	0	0	1	2	1	0	0	0	0	9.9	0	145	1	42.9	1	20.4042806	0	1	2.4	1
46	Case	1	20	2	1	1	2	2	2	3	1	1	2	0	1	2	0	0	3	0	0	0	0	0	6.2	0	143	1	41.2	1	20.1476845	0	1	2.3	1
47	Case	1	21	2	1	2	2	3	2	5	1	0	3	0	0	0	0	1	1	1	1	0	0	0	11	1	157	0	45	0	18.2563187	1	1	2.4	0
48	Case	1	18	1	1	1	1	4	3	4	1	0	3	0	0	0	0	1	1	1	0	1	1	1	12	1	146	1	44	1	20.6417714	0	1	2.2	1
49	Case	1	27	3	1	1	2	4	3	2	4	2	3	0	0	0	2	1	1	1	1	1	1	1	12	1	157	0	62	0	25.1531502	0	1	2.45	1
50	Case	1	23	2	1	2	2	1	2	5	1	1	4	0	1	1	0	0	3	0	0	0	0	0	5.5	0	144	1	41.5	1	20.0135031	0	1	2.25	0
51	Case	1	19	1	1	1	2	3	1	2	1	0	1	0	0	0	0	1	1	1	0	1	0	1	11.2	1	147	0	46.2	0	21.3799806	0	2	2.3	0
52	Case	1	21	2	1	1	1	2	2	4	1	0	2	0	0	0	0	1	1	1	1	1	1	0	12.5	1	150	0	47.5	0	21.1111111	0	1	2.4	0
53	Case	1	25	2	1	1	2	3	2	5	2	4	4	0	0	0	3	1	2	0	0	0	0	0	8.6	0	149	0	46.6	0	20.9900455	0	3	2.25	1
54	Case	1	24	2	1	1	2	3	2	5	2	4	4	0	0	0	0	0	3	0	0	0	0	0	9.4	0	159	0	46.4	0	18.3537044	1	3	2.4	1
55	Case	1	20	2	1	1	2	3	2	4	1	0	3	0	0	0	0	1	1	1	1	0	0	1	10.5	0	147	0	44.5	1	20.5932713	0	1	2.3	1
56	Case	1	22	2	1	1	2	4	3	2	1	0	1	0	1	4	0	0	3	0	0	0	0	1	9.5	0	150	0	47.5	0	21.1111111	0	2	2.1	0

57	Case	1	28	3	1	2	1	4	1	3	3	3	4	0	0	0	0	1	2	1	1	0	0	0	9	0	154	0	52	1	21.9261258	0	1	2.1	0
58	Case	1	29	3	1	2	1	4	3	4	4	3	3	0	1	4	2	1	1	1	0	0	0	1	11	0	156	0	54	0	22.1893491	0	3	2.25	0
59	Case	1	19	1	1	1	2	1	2	5	1	0	4	0	0	0	0	0	0	0	0	0	0	0	9	0	143	1	41	1	20.0498802	0	1	2.25	1
60	Case	1	23	2	1	1	2	2	2	5	1	0	4	0	1	2	0	1	3	0	0	0	0	0	8.3	0	146	0	44.3	1	20.7825108	0	3	2.3	0
61	Case	1	26	3	1	2	2	4	3	4	1	0	1	0	0	0	0	1	1	1	1	0	0	0	10.2	0	152	0	50.2	0	21.7278393	0	1	2.3	0
62	Case	1	20	2	1	2	1	3	2	5	1	0	3	0	0	0	0	1	2	0	0	0	0	1	9	0	144	1	42	1	20.2546296	0	1	2.45	0
63	Case	1	28	3	1	2	1	5	1	1	1	0	3	0	1	3	0	1	1	1	0	0	0	1	11.5	1	159	0	65	0	25.7110083	0	2	2.4	0
64	Case	1	32	4	1	2	1	5	3	4	2	4	1	0	1	4	3	1	1	1	1	0	0	0	11.4	0	159	0	57.4	0	22.7047981	0	3	2.4	0
65	Case	1	22	2	1	1	1	4	1	3	2	2	1	0	0	0	0	1	1	1	1	1	0	0	11	0	150	0	48	0	21.3333333	0	1	2.4	1
66	Case	1	22	2	1	2	2	5	3	2	1	1	4	0	0	0	0	1	1	1	0	0	1	1	10.5	0	151	0	48.5	0	21.2709969	0	1	2.2	0
67	Case	1	19	1	1	2	1	3	3	3	1	0	2	0	0	0	0	1	2	0	0	0	0	0	9.5	0	145	1	43.5	1	20.6896552	0	1	2.4	1
68	Case	1	20	2	1	1	2	2	2	5	1	0	2	0	1	2	0	1	2	0	0	0	0	0	7.5	0	142	1	40.5	1	20.0853005	0	3	2.25	1
69	Case	1	20	2	1	2	2	4	1	4	1	1	2	0	0	0	0	0	3	0	0	1	1	1	13.4	1	160	0	47.4	0	18.515625	0	1	2.2	0
70	Case	1	23	2	1	1	1	5	3	3	3	3	1	0	0	0	0	1	2	1	1	0	0	1	10	0	150	0	48	0	21.3333333	0	3	2.4	0
71	Case	1	22	2	1	1	2	2	2	4	1	0	6	0	0	0	0	0	2	0	0	0	0	0	8.3	0	146	0	44.3	1	20.7825108	0	1	2.4	0
72	Case	1	20	2	1	2	2	5	3	1	1	0	4	0	1	5	0	1	1	1	0	0	0	0	10.5	0	150	0	47.5	0	21.1111111	0	2	2.3	1
73	Case	1	20	2	1	2	1	5	3	2	1	0	2	0	1	7	0	0	2	0	0	0	1	1	11.2	1	149	0	47.2	0	21.2603036	0	1	2.2	1
74	Case	1	20	2	1	2	2	4	1	3	1	0	3	0	0	0	0	1	1	1	1	0	0	0	10	0	147	0	45	0	20.8246564	0	1	2.25	0
75	Case	1	25	2	1	1	1	3	2	3	2	2	2	1	0	0	0	0	2	0	0	0	0	1	11	0	163	0	51	0	19.1953028	0	1	2.25	1
76	Case	1	26	3	1	1	1	4	2	3	2	0	2	0	1	2	0	0	3	0	0	0	0	0	9.4	0	152	0	50.4	1	21.8144044	0	1	2.3	0
77	Case	1	20	2	1	1	2	3	2	4	1	2	4	0	0	0	0	1	1	1	1	1	1	0	12	1	155	0	46	0	19.1467222	0	1	2.4	1
78	Case	1	21	2	1	1	1	3	1	3	1	0	2	0	1	2	0	1	1	1	0	0	0	0	10	0	148	0	46	0	21.0007305	0	1	2.3	1
79	Case	1	32	4	1	1	2	1	3	5	2	3	4	0	1	2	0	0	3	0	0	0	0	0	10.4	0	164	0	55.4	0	20.5978584	0	3	2.25	1
80	Case	1	25	2	1	1	1	2	3	2	1	0	4	0	0	0	0	1	1	1	1	0	0	0	10.4	0	153	0	51.4	0	21.9573668	0	1	2.4	1
81	Case	1	19	1	1	1	1	3	2	5	1	0	1	0	1	7	0	0	3	0	0	1	1	1	13.4	1	147	0	45.4	0	21.0097644	0	3	2	0
82	Case	1	29	3	1	2	2	2	3	5	3	1	1	1	0	0	2	1	1	1	0	0	0	0	11	0	155	0	53	0	22.0603538	0	1	2.2	0
83	Case	1	19	1	1	1	1	1	1	4	1	0	3	0	1	4	0	1	1	0	1	0	0	1	10.5	0	145	1	43.5	1	20.6896552	0	3	2.4	1
84	Case	1	19	1	1	1	2	4	1	2	1	0	1	0	0	0	0	1	1	1	0	1	1	1	13.7	1	151	0	48.7	0	21.3587123	0	3	2.18	1
85	Case	1	21	2	1	2	2	2	2	4	1	0	2	0	0	0	0	1	1	1	1	0	0	0	12	1	149	0	47	0	21.1702176	0	1	2.3	0
86	Case	1	20	2	1	1	1	4	1	2	1	1	4	0	1	5	0	1	1	1	1	0	0	1	12	1	150	0	48	0	21.3333333	0	1	1.7	0
87	Case	1	21	2	1	2	1	4	1	3	1	0	4	0	0	0	0	1	1	1	0	0	0	1	11	0	149	0	47	0	21.1702176	0	1	2.35	0
88	Case	1	24	2	1	2	2	2	3	4	2	2	3	0	0	0	3	1	1	1	1	0	1	1	12	1	152	0	50	0	21.6412742	0	1	2.4	0
89	Case	1	25	2	1	1	2	2	3	2	1	1	3	0	0	0	0	0	2	0	0	1	1	1	12.2	1	155	0	61	0	25.3902185	0	1	2.3	1
90	Case	1	21	2	1	1	2	2	1	3	1	0	3	0	0	0	0	1	1	1	1	0	0	1	11.3	1	149	0	47.3	0	21.3053466	0	3	2.2	1
91	Case	1	22	2	1	1	1	2	2	5	1	0	2	0	0	0	0	0	3	0	0	0	0	0	11	0	148	0	46	0	21.0007305	0	1	2.4	0
92	Case	1	20	2	1	2	1	5	1	3	1	0	3	0	0	0	0	1	2	0	0	0	0	0	9	0	144	1	44	1	21.2191358	0	1	2.25	1
93	Case	1	20	2	1	1	1	2	1	4	1	0	1	0	0	0	0	1	1	1	1	0	0	0	11	0	156	0	45	0	18.4911243	1	1	2.4	1
94	Case	1	25	2	1	1	3	2	1	3	2	0	2	0	0	0	0	1	1	1	1	0	0	0	11.5	1	153.5	0	51.5	0	21.8569958	0	1	2.4	1
95	Case	1	20	2	1	1	1	2	3	2	1	0	2	0	0	0	0	0	2	0	0	0	0	0	11	0	149	0	47	0	21.1702176	0	1	2.4	0
96	Case	1	28	3	1	1	1	1	2	5	4	4	4	0	0	0	3	1	1	1	1	0	0	0	10	0	153	0	51	0	21.7864924	0	1	2.35	0
97	Case	1	20	2	1	1	2	2	1	3	4	1	1	0	0	0	0	0	3	0	0	0	0	1	10	0	156	0	45	0	18.4911243	1	1	2.25	0
98	Case	1	32	4	1	1	1	4	1	2	1	1	1	1	1	5	0	1	1	1	1	1	0	0	12	1	162	0	60	0	22.8623685	0	2	2.05	1
99	Case	1	28	3	1	1	1	2	2	3	3	2	1	0	0	0	3	1	2	0	1	0	0	1	9.5	0	155	0	52.5	0	21.8522373	0	3	2.3	1
100	Case	1	21	2	1	1	2	2	2	4	1	0	1	0	1	7	0	1	1	1	1	0	0	0	11	0	148	0	46	0	21.0007305	0	1	2.25	1
101	Case	1	21	2	1	1	1	3	2	2	1	0	3	0	1	5	0	1	1	1	1	1	1	0	12.5	1	161	0	49.5	0	19.0964855	0	1	2.3	1
102	Case	1	28	3	1	2	2	5	1	2	2	1	3	0	1	5	0	1	1	1	1	1	1	1	12.5	1	159	0	64	0	25.3154543	0	3	2.27	0
103	Case	1	23	2	1	1	1	2	1	4	2	4	1	0	0	0	0	1	2	0	1	0	0	0	11	0	150	0	48	0	21.3333333	0	1	1.2	0
104	Case	1	20	2	1	1	1	2	1	4	2	1	3	0	0	0	2	1	2	1	1	1	0	0	12	1	148	0	46	0	21.0007305	0	1	2.1	0
105	Case	1	19	1	1	1	2	1	2	4	1	0	3	0	0	0	0	1	2	1	0	0	0	0	11	0	145	1	44	1	20.9274673	0	1	2.2	0
106	Case	1	23	2	1	1	1	2	1	3	1	0	4	0	0	0	0	0	3	0	0	0	0	0	10	0	150	0	48	0	21.3333333	0	1	2.25	0
107	Case	1	34	4	3	2	2	5	3	1	1	1	2	1	1	2	0	1	1	1	1	0	0	1	10.5	0	154	0	61.5	0	25.9318603	0	2	2.3	0
108	Case	1	23	2	1	1	1	2	2	5	1	1	1	0	1	7	0	0	3	0	0	0	0	1	9.8	0	148	0	45.8	0	20.9094229	0	3	1.75	1
109	Case	1	20	2	1	2	1	4	1	3	1	0	4	0	0	0	0	1	1	1	1	1	0	0	11.5	1	157	0	46.5	0	18.8648627	0	1	2.2	1
110	Case	1	28	3	1	1	1	2	1	4	3	2	4	0	1	2	2	1	1	1	1	0	0	1	12	1	156	0	54	0	22.1893491	0	1	2.1	1
111	Case	1	25	2	1	2	2	5	1	2	1	2	2	0	0	0	2	0	3	0	0	0	0	0	11	0	154	0	52	0	21.9261258	0	1	2.45	0
112	Case	1	18	1	1	1	1	2	1	3	1	0	3	0	1	1	0	0	3	0	0	0	0	0	11	0	143	1	44	1	21.5169446	0	3	1.9	1
113	Case	1	30	3	1	2	2	3	2	4	4	4	1	0	0	0	3	1	1	1	1	0	0	1	11	0	157	0	55	0	22.3132784	0	3	2.3	0
114	Case	1	24	2	1	1	2	2	2	5	1	0	2	0	0	0	0	0	3	0	0	0	0	1	10	0	161	0	47	0	18.1320165	1	1	2.45	0
115	Case	1	23	2	1	1	2	2	3	4	1	0	4	0	0	0	0	1	1	1	1	1	0	0	12	1	151	0	49	0	21.4902855	0	1	2.2	0
116	Case	1	24	2	1	1	1	2	1	3	1	0	3	0	0	0	0	1	2	0	1	0	0	1	8.9	0	150	0	47.9	1	21.2888889	0	3	2.2	1
117	Case	1	24	2	1	2	1	5	1	2	2	1	3	0	1	7	0	1	1	1	1	1	1	1	12	1	154	0	52	0	21.9261258	0	1	2	1
118	Case	1	21	2	1	1	1	4	2	4	1	0	4	0	0	0	0	0	2	0	0	0	0	0	9.5	0	145	1	44.5	1	21.1652794	0	3	2.3	0

119	Case	1	20	2	2	2	2	5	1	1	1	0	1	0	0	0	0	1	1	1	1	1	1	1	12	1	151	0	49	0	21.4902855	0	2	2.2	1
120	Case	1	22	2	1	1	2	4	1	2	2	4	3	0	0	0	3	1	1	1	1	0	0	1	11	0	151	0	49	0	21.4902855	0	2	2.25	0
121	Case	1	21	2	1	2	1	4	1	4	1	0	2	0	0	0	0	0	2	0	0	0	0	0	9.5	0	155	1	44.5	1	18.5223725	0	1	2.2	1
122	Case	1	30	3	1	1	2	2	3	3	4	1	2	0	0	0	2	1	1	1	1	0	0	1	10	0	157	0	55	0	22.3132784	0	2	2	0
123	Case	1	20	2	1	2	2	2	1	4	2	4	1	0	0	0	3	1	1	1	1	0	0	0	10.4	0	146	0	44.4	1	20.8294239	0	3	2.4	1
124	Case	1	20	2	1	1	2	1	2	5	1	0	2	0	0	0	0	1	2	0	1	0	0	1	9.9	0	145	1	42.9	1	20.4042806	0	3	1.7	1
125	Case	1	20	2	1	1	1	1	2	4	1	0	4	0	0	0	0	1	1	1	0	0	0	0	11	0	147	0	45	0	20.8246564	0	1	2.1	1
																											151.948		48.6624		21.0767453			2.2408	
1	Control	0	25	2	1	1	2	3	2	3	1	0	5	0	0	0	0	0	3	0	0	0	0	1	10.2	0	153	0	50.2	0	21.4447435	0	1	3.25	1
2	Control	0	22	2	1	1	2	4	2	5	1	0	1	0	0	0	0	1	1	0	1	0	0	0	9.1	0	147	0	44.1	1	20.4081633	0	1	3.5	0
3	Control	0	25	2	1	2	1	3	1	3	2	3	4	0	0	0	0	0	3	0	0	0	0	0	10	0	166	0	50	0	18.1448686	1	3	3.7	1
4	Control	0	25	2	1	1	2	4	3	2	2	3	1	0	0	0	0	0	3	0	0	1	0	0	10	0	154	0	51	0	21.5044696	0	1	3.7	1
5	Control	0	20	2	1	1	1	4	1	3	3	4	1	0	0	0	0	0	2	0	0	1	0	0	11.4	1	149	0	46.4	0	20.8999595	0	1	3.2	1
6	Control	0	25	2	1	1	2	5	3	1	2	3	4	0	0	0	0	1	1	0	1	0	0	0	10.5	0	157	0	52.5	0	21.2990385	0	3	3.5	1
7	Control	0	34	4	1	1	2	4	1	3	1	0	3	0	0	0	0	1	1	1	1	0	0	1	10.5	0	162	0	68	0	25.9106843	0	2	3.75	0
8	Control	0	23	2	1	2	1	5	3	1	1	0	2	0	0	0	0	1	1	1	1	1	1	1	12	1	155	0	52	0	21.6441207	0	1	3.2	0
9	Control	0	28	3	1	1	2	4	2	4	3	4	1	0	0	0	0	1	2	1	1	0	0	0	12.5	1	158	0	54.5	0	21.8314373	0	2	2.9	1
10	Control	0	27	3	1	2	2	2	2	5	3	2	5	0	0	0	3	1	2	1	1	0	0	0	11.5	1	155	0	51.5	0	21.4360042	0	2	3.4	1
11	Control	0	26	3	2	2	1	4	1	4	1	0	3	0	0	0	0	1	1	1	1	0	0	1	10.8	0	154	0	50.8	0	21.4201383	0	1	2.75	0
12	Control	0	29	3	1	2	2	3	2	4	2	0	1	0	0	0	0	1	2	1	1	1	1	1	12.5	1	159	0	55.5	0	21.9532455	0	1	3	1
13	Control	0	29	3	1	2	1	5	1	2	1	0	1	0	0	0	0	1	1	1	1	1	1	1	13.3	1	161	0	66	0	25.4619806	0	1	3	1
14	Control	0	26	3	1	1	1	4	1	3	3	0	2	0	0	0	0	1	1	1	1	0	0	1	11.5	1	156	0	52.5	0	21.5729783	0	2	2.9	1
15	Control	0	21	2	2	2	2	4	1	1	2	0	4	0	0	0	0	1	1	1	1	1	1	1	12	1	153	0	50	0	21.3593062	0	3	2.7	0
16	Control	0	24	2	1	1	1	4	1	1	2	0	2	0	0	0	0	1	1	1	1	0	0	0	10	0	154	0	51	0	21.5044696	0	2	3.3	0
17	Control	0	20	2	1	1	2	5	3	4	1	0	4	0	0	0	0	1	1	1	1	0	0	0	9.8	0	155	1	43.8	1	18.2310094	1	1	2.7	1
18	Control	0	18	1	1	1	2	5	1	1	1	0	1	0	0	0	0	1	1	1	1	0	0	0	11	0	149	0	46	0	20.7197874	0	3	2.7	0
19	Control	0	29	3	1	2	2	3	1	2	1	0	4	0	0	0	0	1	1	1	1	1	0	0	11.6	1	160	0	56.6	0	22.109375	0	2	3.7	0
20	Control	0	25	2	1	2	2	4	2	4	3	2	4	0	1	7	2	1	2	1	0	0	0	0	10.2	0	152	0	49.2	0	21.2950139	0	3	3.4	1
21	Control	0	37	4	1	2	1	3	1	3	2	4	1	0	0	0	3	1	1	1	1	1	0	1	11.9	1	167	0	70	0	25.0995016	0	2	2.9	1
22	Control	0	22	2	1	1	1	3	2	3	1	0	1	0	0	0	0	1	1	1	1	0	0	0	10.3	0	150	0	47.3	0	21.0222222	0	1	3.1	0
23	Control	0	30	3	2	2	2	3	1	3	4	0	2	0	1	8	0	1	2	1	1	1	0	1	10.5	0	159	0	55.5	0	21.9532455	0	1	3.2	0
24	Control	0	20	2	1	1	1	4	3	3	3	1	4	0	0	0	2	1	2	1	1	0	0	0	11	0	149	0	46	0	20.7197874	0	3	2.9	0
25	Control	0	24	2	1	2	1	2	2	5	3	2	1	0	1	2	0	1	2	1	1	0	0	0	9.5	0	149	0	46.5	0	20.9450025	0	1	2.7	1
26	Control	0	34	4	1	2	2	4	3	1	3	1	1	0	0	0	0	1	1	1	1	1	1	1	12.5	1	167	0	63.5	0	22.7688336	0	1	2.8	1
27	Control	0	23	2	1	1	2	4	2	4	1	0	1	0	0	0	0	0	2	0	0	0	0	0	9	0	149	0	46	0	20.7197874	0	3	3.25	1
28	Control	0	30	3	2	2	2	3	1	3	5	4	2	0	0	0	0	0	3	0	0	0	0	1	12	1	160	0	57	0	22.265625	0	1	3.1	1
29	Control	0	30	3	1	2	2	2	2	5	3	3	2	0	0	0	0	1	2	1	1	0	0	0	11.5	1	158	0	54.5	0	21.8314373	0	3	3.2	1
30	Control	0	26	3	2	2	1	3	3	4	2	3	2	0	1	3	0	1	1	1	1	0	0	1	11.3	1	154	0	51.3	0	21.6309664	0	2	2.75	0
31	Control	0	20	2	1	1	2	3	2	5	1	0	1	0	0	0	0	1	1	0	1	0	0	0	10	0	143	1	43	1	21.0279231	0	1	2.5	0
32	Control	0	23	2	1	1	1	4	1	4	1	0	1	0	0	0	0	1	1	1	1	0	0	0	9.8	0	150	0	46.8	0	20.8	0	1	2.5	0
33	Control	0	20	2	1	2	3	3	2	3	3	0	2	0	1	7	0	0	3	0	0	0	0	0	7.3	0	145.3	0	42.3	0	20.0359131	0	1	3	0
34	Control	0	20	2	1	2	2	1	2	4	2	2	1	0	1	7	0	1	1	1	0	0	0	0	14.8	1	152	0	48.8	0	21.1218837	0	1	2.7	1
35	Control	0	24	2	2	2	2	2	1	3	3	3	1	0	0	0	0	1	1	1	1	0	0	1	11	0	153	0	50	0	21.3593062	0	2	2.6	1
36	Control	0	20	2	1	2	2	2	2	4	1	0	3	0	0	0	0	1	1	1	1	0	0	0	10.4	0	155	1	44.4	1	18.4807492	1	1	3.2	1
37	Control	0	25	2	1	1	1	3	1	2	1	0	2	0	0	0	0	1	1	1	1	1	1	1	11.1	1	155	0	52.1	0	21.685744	0	3	2.6	1
38	Control	0	24	2	1	1	2	4	3	3	3	4	1	1	0	0	3	1	1	1	1	0	0	1	11	0	153	0	50	0	21.3593062	0	2	3.1	1
39	Control	0	28	3	1	2	2	2	2	4	1	0	2	0	1	2	0	1	1	1	1	0	0	1	11	0	156	0	53	0	21.7784352	0	1	3.25	0
40	Control	0	26	3	1	1	2	4	3	2	1	0	4	0	0	0	0	1	1	1	1	1	1	1	12	1	157	0	54	0	21.9075825	0	1	3.2	1
41	Control	0	20	2	1	2	1	2	2	5	1	0	1	0	1	7	0	1	2	1	0	0	0	1	11.9	1	157	0	44.9	1	18.2157491	1	3	2.9	1
42	Control	0	28	3	1	2	1	4	3	3	1	0	2	0	0	0	0	1	1	1	1	1	1	1	12.5	1	159	0	55.5	0	21.9532455	0	1	3.1	1
43	Control	0	24	2	1	2	2	4	2	4	1	0	2	0	0	0	0	1	1	1	1	0	0	1	12	1	153	0	50	0	21.3593062	0	1	2.6	1
44	Control	0	25	2	1	1	2	3	3	2	2	2	3	0	0	0	0	0	3	0	0	1	0	0	10	0	154	0	51	0	21.5044696	0	1	2.7	0
45	Control	0	25	2	1	1	1	1	2	5	3	2	1	0	0	0	3	1	2	1	1	0	0	0	10	0	151	0	48	0	21.0517083	0	1	2.5	1
46	Control	0	25	2	1	1	2	2	2	3	2	3	2	1	0	0	0	1	1	1	1	0	0	0	9.8	0	153	0	49.8	0	21.273869	0	1	3.1	1
47	Control	0	34	4	1	1	1	3	2	5	3	2	3	0	0	0	0	1	2	1	1	0	0	1	10.4	0	160	0	57.4	0	22.421875	0	3	2.9	0
48	Control	0	22	2	1	2	2	4	3	4	1	0	3	0	0	0	0	1	1	1	1	0	0	0	10	0	149	0	46	0	20.7197874	0	1	3	1
49	Control	0	27	3	1	2	2	4	3	2	1	0	3	0	1	7	0	1	1	1	1	1	1	1	12	1	158	0	64	0	25.6369172	0	2	2.6	1
50	Control	0	27	3	1	2	2	1	2	5	2	2	4	0	1	8	0	1	2	1	1	1	1	1	12.2	1	155	0	52.2	0	21.7273673	0	1	3.25	1
51	Control	0	30	3	1	2	1	3	1	2	2	3	1	0	0	0	0	1	1	1	0	0	0	0	11	0	160	0	57	0	22.265625	0	2	3.5	0
52	Control	0	23	2	1	1	2	2	2	4	2	2	2	1	0	0	3	1	2	1	1	0	0	1	9.5	0	159	0	46.5	0	18.3932598	1	1	2.8	1
53	Control	0	32	4	1	2	2	3	2	5	1	0	4	1	0	0	0	1	1	1	1	0	0	0	12.8	1	161	0	57.8	0	22.2985224	0	3	3.6	0
54	Control	0	24	2	1	2	1	3	2	5	1	0	4	0	1	7	0	0	2	0	0	0	0	0	12.9	1	153	0	49.9	0	21.3165876	0	1	3.25	0
55	Control	0	25	2	1	1	1	3	2	4	1	0	3	0	1	7	0	1	1	1	1	0	0	0	10	0	152	0	49	0	21.2084488	0	3	2.8	1

56	Control	0	19	1	1	1	2	4	3	2	1	0	1	0	0	0	0	1	1	1	0	1	0	1	11	0	149	0	46	0	20.7197874	0	1	2.75	0
57	Control	0	24	2	1	1	1	4	1	3	3	3	4	0	1	7	0	1	1	1	1	0	0	1	11	0	153	0	50	0	21.3593062	0	1	2.8	0
58	Control	0	29	3	1	1	2	4	3	4	2	2	3	0	0	0	0	1	1	1	1	0	0	0	11.8	1	158	0	54.8	0	21.9516103	0	1	2.6	1
59	Control	0	23	2	1	1	2	1	2	5	2	2	4	0	0	0	0	1	1	1	0	0	0	0	12.5	1	152	0	48.5	0	20.992036	0	1	3	1
60	Control	0	30	3	3	2	1	2	2	5	1	0	4	0	0	0	0	1	1	1	1	0	0	1	13.1	1	159	0	56.1	0	22.1905779	0	2	3.45	1
61	Control	0	22	2	1	1	2	4	3	4	2	3	1	0	0	0	0	0	3	0	0	0	0	0	9	0	157	0	45	1	18.2563187	1	1	2.5	1
62	Control	0	25	2	1	2	1	3	2	5	2	2	3	0	0	0	0	1	1	1	1	0	0	0	10	0	151	0	48	0	21.0517083	0	1	3.3	1
63	Control	0	25	2	1	1	2	5	1	1	3	4	3	0	0	0	0	1	1	1	0	0	0	1	12	1	157	0	54	0	21.9075825	0	3	2.6	1
64	Control	0	26	3	1	1	2	5	3	4	4	4	1	0	0	0	1	1	1	1	1	0	0	0	11.8	1	155	0	51.8	0	21.5608741	0	1	3.25	1
65	Control	0	28	3	1	1	1	4	1	3	2	0	1	0	0	0	0	1	1	1	0	0	0	0	9.5	0	156	0	52.5	0	21.5729783	0	1	2.5	1
66	Control	0	39	4	1	2	2	5	3	2	5	0	4	1	0	0	2	1	1	1	1	1	0	1	10.8	0	169	0	73	0	25.5593292	0	3	2.7	0
67	Control	0	24	2	1	2	2	3	3	3	2	2	2	0	1	2	0	1	1	1	1	1	1	1	12.5	1	155	0	51.5	0	21.4360042	0	3	3.45	1
68	Control	0	21	2	1	1	1	2	2	5	2	3	2	0	0	0	0	1	2	1	1	0	0	0	12	1	149	0	46	0	20.7197874	0	1	2.6	1
69	Control	0	27	3	1	2	2	4	1	4	3	2	2	0	0	0	0	1	1	1	0	0	0	0	10.2	0	154	0	51.2	0	21.5888008	0	2	2.5	0
70	Control	0	28	3	1	2	1	5	3	3	1	0	1	1	0	0	0	1	1	1	1	1	1	1	11.2	1	157	0	54.2	0	21.9887217	0	1	2.5	1
71	Control	0	30	3	1	1	2	2	2	4	3	4	6	0	0	0	0	1	2	1	1	0	0	1	11	0	158	0	55	0	22.0317257	0	1	3	0
72	Control	0	24	2	1	1	2	5	3	1	3	3	4	0	0	0	0	1	1	1	1	0	0	1	9.2	0	153	0	50.2	0	21.4447435	0	1	3.5	1
73	Control	0	25	2	1	1	1	5	3	2	1	0	2	0	0	0	0	1	1	1	0	1	1	1	12	1	156	0	53	0	21.7784352	0	1	2.75	0
74	Control	0	32	4	1	1	2	4	1	3	2	4	3	0	0	0	1	1	1	0	1	0	0	1	9.5	0	160	0	65	0	25.390625	0	1	3.3	0
75	Control	0	26	3	1	1	2	3	2	3	2	3	2	0	0	0	0	0	3	0	0	0	0	0	9.4	0	153	0	50.4	0	21.5301807	0	1	2.9	1
76	Control	0	21	2	1	1	2	4	2	3	1	2	2	0	1	2	0	1	1	1	0	0	0	0	11	0	150	0	47	0	20.8888889	0	1	2.6	1
77	Control	0	22	2	1	1	1	3	2	4	1	0	4	0	0	0	0	1	1	1	1	0	0	1	11.8	1	151	0	47.8	0	20.9639928	0	1	2.65	1
78	Control	0	22	2	1	1	2	3	1	3	3	4	2	0	0	0	0	1	1	1	1	1	1	1	12.5	1	152	0	49.5	0	21.4248615	0	1	3.35	1
79	Control	0	23	2	1	2	1	1	3	5	1	0	4	0	1	7	0	1	1	1	0	0	0	1	12.5	1	152	0	48.5	0	20.992036	0	2	2.7	0
80	Control	0	25	2	1	1	1	2	3	2	2	4	4	0	0	0	0	1	1	1	0	0	0	0	9.5	0	154	0	50.5	0	21.2936414	0	1	2.6	1
81	Control	0	24	2	1	2	2	3	2	5	2	4	1	0	0	0	0	1	2	1	1	0	0	1	10.5	0	151	0	47.5	0	20.8324196	0	1	3.2	1
82	Control	0	29	3	1	2	2	2	3	5	2	2	1	0	0	0	0	1	1	1	1	0	0	0	11	0	156	0	53	0	21.7784352	0	3	2.75	0
83	Control	0	24	2	1	1	2	1	1	4	2	1	3	0	0	0	2	1	1	1	1	0	0	1	10.4	0	152	0	48.4	0	20.9487535	0	1	2.5	1
84	Control	0	27	3	1	1	1	4	1	2	3	4	1	0	0	0	0	0	3	0	0	1	1	1	12	1	158	0	55	0	22.0317257	0	2	2.8	1
85	Control	0	20	2	1	1	2	2	2	4	2	2	2	0	0	0	0	1	2	1	1	0	0	0	12.5	1	160	0	46.5	0	18.1640625	1	2	2.6	0
86	Control	0	29	3	1	2	1	4	1	2	1	0	4	0	0	0	0	1	1	1	1	1	1	1	12.1	1	160	0	57.1	0	22.3046875	0	1	2.5	1
87	Control	0	23	2	2	2	2	4	1	3	1	0	4	0	1	5	0	1	1	1	1	1	1	1	12.2	1	153	0	50.2	0	21.4447435	0	1	2.7	0
88	Control	0	22	2	1	1	2	2	3	4	1	0	3	0	1	2	0	0	3	0	0	0	0	1	11.4	1	150	0	47.4	0	21.0666667	0	1	11.4	1
89	Control	0	33	4	1	2	1	2	3	2	2	4	3	0	0	0	0	1	1	1	1	0	0	1	11.8	1	164	0	68	0	25.2825699	0	2	2.93	0
90	Control	0	27	3	1	1	2	2	1	3	1	0	3	0	0	0	0	1	1	1	1	1	1	1	12.8	1	158	0	54.8	0	21.9516103	0	1	3.3	1
91	Control	0	25	2	1	1	1	2	2	5	2	4	2	0	0	0	0	1	2	1	0	0	0	1	10.5	0	152	0	48.5	0	20.992036	0	1	2.75	0
92	Control	0	24	2	1	2	2	5	1	3	3	3	3	0	0	0	1	1	1	1	1	0	0	1	11.5	1	153	0	50.5	0	21.5728993	0	1	2.7	0
93	Control	0	26	3	1	1	1	2	1	4	3	4	1	0	0	0	0	1	1	1	1	0	0	1	12	1	155	0	52	0	21.6441207	0	1	3.3	1
94	Control	0	23	2	1	1	1	4	1	3	1	0		0	1	8	0	1	1	1	0	1	0	0	10	0	151	0	48	0	21.0517083	0	1	3.3	1
95	Control	0	29	3	1	2	1	2	3	2	2	2	2	1	0	0	1	1	1	1	1	0	0	0	10.3	0	158	0	64	0	25.6369172	0	2	2.9	1
96	Control	0	23	2	1	2	2	1	2	5	1	0	4	0	0	0	0	1	1	1	1	0	0	0	10	0	149	0	46	0	20.7197874	0	3	2.9	0
97	Control	0	25	2	1	2	1	2	1	3	2	4	1	0	0	0	0	1	1	1	1	1	1	1	11.5	1	155	0	51.5	0	21.4360042	0	1	3.2	1
98	Control	0	25	2	1	1	2	4	1	2	2	4	1	0	0	0	0	1	1	1	1	0	0	1	10	0	154	0	51	0	21.5044696	0	1	2.6	0
99	Control	0	22	2	2	2	2	2	2	3	2	1	1	0	0	0	0	1	1	1	1	1	1	1	12	1	152	0	49	0	21.2084488	0	1	2.6	0
100	Control	0	30	3	1	1	2	2	2	4	4	3	1	0	1	7	3	0	3	0	0	0	0	1	11.3	1	163	0	55.3	0	20.8137303	0	1	3.25	1
101	Control	0	30	3	1	1	2	3	2	2	3	2	3	0	0	0	1	1	1	1	1	0	0	1	10	0	159	0	56	0	22.1510225	0	1	2.55	1
102	Control	0	29	3	1	1	1	5	1	2	2	3	3	0	0	0	2	1	1	1	1	0	0	1	11	0	159	0	56	0	22.1510225	0	2	2.8	0
103	Control	0	25	2	1	2	2	2	1	4	1	0	1	0	0	0	0	1	1	1	0	0	0	1	12.5	1	155	0	51.5	0	21.4360042	0	1	2.85	0
104	Control	0	22	2	1	2	1	2	1	4	1	0	3	0	0	0	0	1	1	1	1	1	1	0	12.5	1	151	0	48.5	0	21.2709969	0	1	2.6	0
105	Control	0	25	2	1	1	2	1	2	4	1	0	3	1	0	0	0	1	2	1	1	0	0	0	9	0	151	0	48	0	21.0517083	0	1	2.6	0
106	Control	0	23	2	1	2	2	2	1	3	1	0	4	1	0	0	0	1	1	1	1	0	0	1	11	0	152	0	49	0	21.2084488	0	3	2.7	1
107	Control	0	25	2	1	1	2	5	3	1	1	0	2	1	1	,2,7	2	1	1	1	0	0	0	0	10	0	155	0	52	0	21.6441207	0	1	2.7	1
108	Control	0	27	3	1	1	1	2	2	5	2	4	1	0	0	0	0	1	2	1	1	0	0	0	8.6	0	152	0	48.6	0	21.0353186	0	1	2.9	0
109	Control	0	28	3	1	2	2	4	1	3	1	4	4	0	0	0	2	1	1	1	1	0	0	1	11	0	157	0	54	0	21.9075825	0	1	3.5	0
110	Control	0	22	2	1	2	1	2	1	4	1	0	4	0	0	0	0	1	1	1	0	1	1	1	12.5	1	151	0	48.5	0	21.2709969	0	2	2.8	1
111	Control	0	21	2	1	1	2	5	1	2	2	4	2	1	0	0	0	1	1	1	1	1	1	1	12	1	152	0	49	0	21.2084488	0	1	3.2	0
112	Control	0	34	4	1	2	1	2	1	3	2	4	3	0	0	0	0	1	1	1	1	0	0	1	12	1	164	0	61	0	22.6799524	0	1	3.8	1
113	Control	0	27	3	2	2	1	3	2	4	3	4	1	0	0	0	0	1	1	1	1	0	0	0	10.1	0	154	0	51.1	0	21.5466352	0	1	2.75	0
114	Control	0	22	2	1	2	2	2	2	5	1	0	2	0	0	0	0	0	3	0	0	0	0	0	10.3	0	148	0	45.3	0	20.6811541	0	1	2.9	0
115	Control	0	20	2	1	2	2	2	3	4	1	0	4	0	1	5	0	1	1	1	1	0	0	0	10	0	145	1	44	1	20.9274673	0	1	2.7	1
116	Control	0	28	3	1	2	2	2	1	3	1	0	3	0	0	0	0	1	1	1	1	1	1	1	12.4	1	158	0	55.4	0	22.1919564	0	2	2.75	1
117	Control	0	27	3	1	2	2	5	1	2	1	0	3	0			0	1	1	1	0	0	0	0	11	0	157	0	54	0	21.9075825	0	1	3.35	0
118	Control	0	25	2	1	2	0	4	2	4	5	2	4	0	0	0	2	1	1	1	1	0	0	0	10	0	152	0	49	0	21.2084488	0	2	2.8	0

119	Control	0	30	3	2	1	2	5	1	1	3	3	1	0	0	0	0	1	1	1	0	0	0	1	10	0	160	0	66	0	25.78125	0	1	2.9	1
120	Control	0	25	2	1	2	2	4	1	2	5	3	3	0	0	0	2	1	1	1	1	1	0	1	12	1	156	0	53	0	21.7784352	0	1	2.8	0
121	Control	0	30	3	1	2	2	4	1	4	1	0	2	0	0	0	0	1	1	1	1	0	0	1	13	1	160	0	57	0	22.265625	0	1	2.7	1
122	Control	0	19	1	1	1	1	2	3	3	1	0	2	0	0	0	0	1	1	1	1	0	0	0	11	0	156	0	45	0	18.4911243	1	3	2.75	0
123	Control	0	22	2	1	1	2	2	1	4	2	2	1	0	0	0	0	1	1	1	1	0	0	0	12.8	1	152	0	48.8	0	21.1218837	0	1	2.9	1
124	Control	0	23	2	2	1	2	1	2	5	1	0	2	0	0	0	0	1	1	1	1	0	0	1	11.6	1	151	0	47.6	0	20.8762774	0	1	2.7	0
125	Control	0	21	2	1	1	1	1	2	4	1	0	4	0	0	0	0	1	1	1	0	0	0	0	10.3	0	158	0	45.3	0	18.1461304	1	1	3.5	1
																									11.076		154.906		51.7552					3.02344	

LIMITATIONS

RECOMMENDATIONS

ANNEXURE-I

CONSENT FORM

ANNEXURE-II

PROFORMA

ANNEXURE-III

MASTER CHART