HIGH QUETELET'S BODY MASS INDEX AND ITS EFFECT IN PREGNANCY: MATERNAL AND FETAL OUTCOME

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CERTIFICATE

This is to certify that the dissertation entitled "High Quetelet's body mass index and its effect in pregnancy: Maternal and fetal outcome**"** is a bonafide work done by **Dr. Shanthini M** in Madras Medical College, Chennai in partial fulfillment of the university rules and regulations for award of M.S. degree in Obstetrics and Gynaecology under the guidance and supervision of Prof. Dr. N. Hemalatha MD, DGO during the academic year 2016-2019.

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DECLARATION

I solemnly declare that this dissertation entitled **"High Quetelet's body mass index and its effect in pregnancy: Maternal and fetal outcome"** was done by me at Madras Medical College during 2016 -2019 under the guidance and supervision of, **Prof. Dr. N. Hemalatha MD, DGO.** This dissertation is submitted to the Tamil Nadu Dr. M.G.R. Medical University towards the partial fulfillment of requirements for the award of M.S. Degree in Obstetrics and Gynaecology (Branch-II).

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CONTENTS

INTRODUCTION

With the rapid rate of socio-economic development and socio-cultural changes, changes in dietary pattern and changes in lifestyle, increasing BMI has become a healthcare burden to the nation. This increasing rates of BMI have affected all age groups universally.it causes major medical ailments like hypertension, Diabetes, cardiovascular, neurovascular diseases, arthritis and causes a lot of morbidity and mortality.

Increasing BMI in women poses multiple threat of illness especially in the reproductive age group impacting pregnancy. Pregnant women with overweight and obesity are at a higher risk of developing complications at all stages of the physiological pregnancy, be it antepartum, intrapartum, post partum, causing an economic burden on the healthcare department. The babies born to these mothers also exhibit multiple neonatal complications. Hence it is required a focus on the methods to prevent this trend of increasing weight gain in adolescence, with healthy diet and exercise and to curb all the multifactorial etiology that leads to increased BMI and the further complications.

REVIEW OF LITERATURE

BODY MASS INDEX

Definition

The body mass index (BMI) or Quetelet index is a value derived from the mass (weight) and height of an individual. The BMI is defined as the body mass divided by the square of the body height and is universally expressed in units of kg/m2, resulting from the mass in kilograms and height in meters.

Classification according to BMI[1]

According to the World Health Organization

Underweight BMI= <18.5 Kg/m^2

Normal BMI =18.5 to 24.9 Kg/m^2

Overweight BMI= 25 to 29.9 Kg/m^2

Obesity BMI > 30 Kg/m^2

Obesity is further categorized into,

CLASS I BMI 30 to 34.9 Kg/m^2 (high risk).

CLASS II BMI 35 to 39.9 Kg/m^2 (very high risk).

CLASS III BMI > 40 Kg/m^2 (morbid obese).

Body mass index is now the accepted measure of underweight, overweight and obesity. Overweight is a bodyweight including muscle, bone, fat and body weight in excess of some standard or ideal body weight. Obesity is a state of the excess adipose tissue mass. Adipose tissue mass increases by enlargement of adipose cells as well as by an increase in a number of adipocytes.

Prevalence

According to the World Health Organization (WHO), obesity is one of the neglected, yet most common public health problems in both developed and developing countries[2]. According to the WHO World Health Statistics Report 2012, globally one in six adults are obese and nearly 2.8 million individuals die each year due to high BMI and its complication.[3]

India, the second most populous country in the world with 1.2 billion people is currently experiencing a rapid epidemiological transition. Undernutrition due to poverty which dominated in the past is being rapidly replaced by obesity associated with affluence. Industrialization and urbanization also contribute to the increased prevalence of obesity. Studies from different parts of India have provided evidence of the rising prevalence of increasing BMI (4,5,6,7). This increasing of BMI, which has been termed an epidemic in the past has rather turned out to be an endemic problem in both developing and developed countries, creating much burden on health care.

Risk Factors

Individual

○ Energy intake in excess of energy needs

○ Calorie-dense, nutrient-poor food choices (e.g., sugar-sweetened beverages)

○ Low physical activity

○ Sedentariness

○Little or excess sleep

○ Genetics

○ Pre- and perinatal exposures

○ Certain diseases (e.g. Hypothyroidism, Cushing's disease)

○ Psychological conditions (e.g., depression, stress)

○ Specific drugs (e.g., steroids)

Socioeconomic

○ Low education

○ Poverty

Environmental

○ Lack of access to physical activity resources / low walkability neighbourhoods

○ Viruses

○ “Obesogens” (e.g., endocrine-disrupting chemicals)

○ Obese social ties

Comorbidities and Sequelae

- Metabolic syndrome
- Type 2 diabetes
- Hypertension
- Dyslipidemia
- Heart and vascular diseases
- Ischemic stroke
- Osteoarthritis

- Infertility
- Certain cancers (e.g., esophageal, colon, endometrial carcinoma)
- Respiratory conditions/diseases (e.g., sleep apnea, asthma)
- Liver diseases (e.g., nonalcoholic fatty liver disease, nonalcoholic steatohepatitis)
- Gallstones
- Infection
- Deep vein thrombosis
- Poor wound healing
- Psychological conditions (e.g., depression, psychosocial function)
- Physical disability
- Years of life lost/early mortality
- Absenteeism/loss of productivity
- Higher medical costs.

High BMI in pregnancy

The rising trends of increasing BMI in women of reproductive age group is making pre-gravid overweight one of the most common high-risk obstetric conditions. When women with pre-pregnancy high BMI get pregnant, there is an

imbalance in carbohydrate tolerance, hemodynamic adaptation and fetal size, which causes many complications like gestational diabetes mellitus, pre-eclampsia, preterm birth, intrauterine growth retardation(IUGR), macrosomia. Maternal obesity increases perinatal morbidity and mortality. Attributing to the perinatal morbidity and the need for neonatal admissions, the cost of hospital care is more for overweight mothers and their babies when compared to their normal weight counterparts.

Preconception and high BMI

Tight monitoring of weight gain, pre-pregnancy counselling and healthy dietary lifestyle with good physical activity can reduce this economic and social burden due to overweight pregnancies, even in genetically susceptible women. Due to central obesity, there is an increased risk for diabetes and cardiovascular disease. Nearly 50% of patients with the polycystic ovarian syndrome are obese. There is hyperinsulinemia in android obesity and ovulatory dysfunction which is associated with subfertility. In women with BMI>30, there is an association of low fecundity (Neil and Nelson Piercy 2001). High BMI appears to be a risk factor for spontaneous abortion in infertility treated patients. Evidence shows that women who conceive spontaneously are prone to miscarriages not only if they

are obese (Lashen et al., 2004) but also if they are overweight (Hamilton-Fairley et al.). Fedorcsak et al have reported increased miscarriages after IVF in women with raised BMI (Fedorcsak et al., 2000). Insulin resistance due to raised BMI Insulin resistance due to raised BMI is an independent risk factor for spontaneous miscarriage, both after natural conception (Craig et al., 2002) and after ART treatment (Tian et al., 2007).

The mechanism behind miscarriage:

1. Reduced expression of Endometrial glycodelin
2. Reduced insulin growth factor binding protein 1

Endometrial glycodelin and insulin growth factor binding protein 1 regulate implantation. Giudice, 2006).

Role of leptin

1. Leptin receptors which are produced by secretory endometrium play an important role in regulating endometrial angiogenesis in response to the adipose tissue hormone leptin Gonzalez et al., 2000; Mitchell et al., 2005

2. Altered plasma leptin levels and the leptin-resistant state associated with obesity (Enriori et al, 2006) have been shown to be associated with impaired trophoblastic invasion (Castellucci et al., 2000; Kawamura et al., 2003) and early miscarriage (Lage et al., 1999).

3. High BMI mothers have high leptin levels which exacerbate insulin resistance and thereby miscarriage Veleva et al., 2008

Alteration in steroid hormone metabolism and adipose-tissue-dependent secretion of cytokines, such interleukin-6, leukaemia inhibitory factor and tumour necrosis factor-a (ESHRE Capri Workshop Group) plays a role in miscarriages. 2006; Metwally et al., 2008b; Samy et al., 2009).

PRE ECLAMPSIA

Pre eclampsia complicates 3-6% of pregnancies and it is associated with many complications like intrauterine growth restriction, placental abruption, preterm delivery, labour induction and perinatal morbidity.

Pre eclampsia is defined as hypertension occurring after 20 weeks of gestation combined with proteinuria. The two types are early onset and late onset preeclampsia.

Early onset disease is due to abnormal placentation which is the most common cause of maternal and perinatal morbidity and mortality and late-onset pre eclampsia are due to maternal metabolic disease. High BMI mothers are more prone to have preterm pre-eclampsia than their normal counterparts(NH ANDERSON et all).

SARA SOHLBERG et all showed that short stature women are more prone to develop severe pre-eclampsia. Studies show that not all women with abnormal placental perfusion develop pre-eclampsia, implying the assumption that pre eclampsia occurs due to factors other than placental factors like genetics and environmental factors. In such women, a predisposing factor such as high BMI can trigger low-grade inflammation (elevated c-reactive protein, and interleukin -6) endothelial activation, oxidative stress, and initiation of the coagulation cascade and finally cause preeclampsia

Jensen(2003), Sebire (2001), Weiss(2004) found that high BMI is a consistent risk factor for pre eclampsia.

RCOG recommendations for Obesity and pre-eclampsia

1.) NICE clinical guideline on hypertensive disorders during pregnancy

suggested that those women with more than one risk factor for pre eclampsia may benefit from taking 75 mg aspirin starting from 12 weeks till the birth of a baby.

2.) PRECOG 2004 (Pre-eclampsia community guideline)

Women with pre-pregnant BMI of 35 and above with additional one risk factor referred to specialist care.

Additional risk factors mentioned are

1. 1.Primi
2. 1.Previous history of pre eclampsia
3. years and above from last child birth
4. 40 years and above of age
5. The family history of pre-eclampsia
6. Booking diastolic blood pressure of 80 mm Hg and above
7. 1+ or more proteinuria on more than one occasion
8. 0.3 g per day or above of proteinuria

9. Multiple pregnancies
10. Underlying medical condition like APLA, pre-existing diabetes, hypertension, renal disease.

3.) Women with pre-pregnant BMI of 30 and above with no additional risk factors can have routine antenatal care at a minimum of 3 weekly intervals between 24 to 32 weeks and at 2 weekly intervals from 32 weeks onwards.

Exercise is found to have beneficial effects in protecting against pre-eclampsia by reduction of oxidative stress and by increasing placental perfusion, thereby preventing vascular endothelial activation.

GESTATIONAL DIABETES MELLITUS

Any degree of glucose intolerance that appears for the first time or is first recognized during pregnancy.

Etiopathogenesis

1. Adipocyte-derived pro-inflammatory peptides like tumour necrosis factor alpha, leptin, free fatty acids have an adverse effect on glucose metabolism. TNF alpha downregulates GLUT 4, which causes insulin resistance in peripheral

tissue. The increased amount of Leptin inhibits insulin secretion. There is increased insulin resistance, a decrease in insulin receptor kinase and a decrease in post-receptor signalling which causes diabetes

2. Some patients have HLA DR3, DR4 and antibodies against islet cells.

WHO guideline:

The diagnosis of GDM at any time during pregnancy should be based on one of the following values:

– Fasting plasma glucose = 5 .1– 6 .9 mmol/L (92– 1 25 mg/dL)

– One-hour post-75 g oral glucose load ≥ 10.0 mmol/L (180 mg/dL)

– Two-hour post-75 g oral glucose load 8.5 – 11.0 mmol/L (153 – 199 mg/dL).

RCOG Recommendations regarding Obesity and Gestational diabetes:

Level 2+ evidence indicates three-fold increased the risk of developing gestational diabetes in obese.

Screening for gestational diabetes is in accordance with NICE clinical guideline 63 which suggest 2 hours oral glucose tolerance test between 24 to 28 weeks.

All obese women with gestational diabetes offered an oral glucose tolerance test 6 weeks after child birth.

Regular follow up for development of type 2 diabetes for a period of 5 years.

Annual screening for cardiac risk factors and healthy life style to be advised.

Studies show that

1.) Exercise decreases risk for gestational diabetes (Zhang et all 2006)

2.) Women with high BMI are more prone to develop GDM. Odds ratio-2.6(Weiss et all 2004)

3.) Brisk walking for at least 25 minutes thrice a week showed decreased fasting and postprandial blood glucose level (Davenport et al 2008)

ABRUPTIO PLACENTA

Abruptio placenta is defined as the condition in which placenta is separated from the uterus either partially or completely. The known risk factors are increased maternal age, pre-eclampsia, twin pregnancy, intrauterine infections predisposing separation of the placenta, oligohydramnios, polyhydramnios, premature rupture of membranes.

Joel G. Ray et all studied that women with metabolic syndrome are at a high risk of abruption placenta. the diagnostic criteria are

1. Intraamniotic or subchorionic marginal haematoma

2. Jelly-like a preplacental or retroplacental collection

3. Placental thickness more than 5 mm

4. Movement of the chorionic surface when fetus moves.

5. Antepartum haemorrhage/blood stained liquor

Underweight mothers and extremely obese mothers are at high risk of placental abruption. When weight gain during pregnancy is moderate it is protective against abruption.

Overweight mothers are prone to intra uterine infections, pre-eclampsia, polyhydramnios due to gestational diabetes which makes them at risk for abruption.

ANEMIA COMPLICATING PREGNANCY

Gestational anemia is a public health problem causing burden in health care. National Health and examination survey (NHANES) confirmed using multivariate regression analysis that overweight population were twice as anemic as normal weight population. The hypothesis states that increased weight causes defective iron absorption through the inflammatory mediated mechanism.

The pathophysiology of high BMI is the excess of adipose tissue . Obese adipose tissue is characterized by macrophage infiltration and local production of pro-inflammatory cytokines such as interleukin 1, interleukin 6 and tumour necrosis

factor alpha creating a low-grade inflammatory milieu. Hormonal peptides called as adipokines are also secreted whose expression gets markedly changed as the adipose tissue progresses from lean type to obese phenotype.

1. Leptin, which produces satiety in normal individuals, is resistant in obese individuals who exhibit hyperleptinemia and hypothalamic leptin resistance.

2. Resistin is the adipokine closely related to low-grade inflammation and cardiovascular disease.

3. Adiponectin which is an anti-inflammatory agent and its concentration is found to be decreased in mothers with high BMI.

4. Adipocyte fatty acid binding protein (A-FABP) is expressed in mature adipocytes which are positively associated with insulin resistance and causes increased lipolysis and free fatty acid efflux to the liver.

In response to this low-grade inflammation caused by the cytokines, adipokines and free fatty acids, the body responds by expressing elevated hepcidin levels, which is produced both from liver and adipose tissue. Increased hepcidin levels cause decreased duodenal ferroportin absorbtion and cause decreased iron absorption.

Furthermore, the pro-inflammatory cytokines interfere with erythropoietin production and interfere with the response of the erythroid precursors to erythropoietin.

High plasma volume and consumption of high-calorie food with poor nutrient value are some of the hypothesis proposed for anemia occurring in mothers with high body mass index.

Amato et all studied that there was an improvement in iron absorbtion and decrease in serum hepcidin after a six-month weight loss program. After restrictive bariatric surgery, patients were found to be with increased transferrin and decreased hepcidin as supported by many studies.

OLIGOHYDRAMNIOS

Oligohydramnios refers to an amniotic fluid volume less than that is expected for gestational age. It is mainly due to intrauterine growth restriction, fetal anomalies, Premature rupture of membranes, which are common in mothers with high BMI , making it a risk factor for oligohydramnios.

The diagnostic criteria are that the deepest vertical pool is less than or equal to 1 cm or an amniotic fluid index of less than 5 cm.

PRETERM BIRTH AND PREMATURE RUPTURE OF MEMBRANES

Preterm birth may be defined as the birth between the period of viability and 37 completed weeks of gestation. Preterm birth is classified into spontaneous with premature rupture of membrane, spontaneous without premature rupture of membrane and indicated preterm birth. Rudra et al studied that indicated preterm birth is more in high BMI. Zhong et al reported that high BMI is associated with increased preterm birth with PROM, and decreased spontaneous preterm birth without PROM. The pathophysiology being increased levels of cytokines like interleukin 1 , IL 6 and tumour necrosis factor alpha cause cervical ripening, myometrial contractions and weakening of membranes through stimulation of prostaglandin production and matrix-degrading enzymes. Moreover, women with high BMI are more prone to intra uterine bacterial infection and chorioamnionitis. This inflammatory upregulation, enhanced cytokines and adipokines coupled with low-grade systemic infection predispose to preterm labour and premature rupture of membranes. Naeye et al reported that women with high BMI were associated with chorioamnionitis and preterm deliveries.

INTRAPARTUM COMPLICATIONS

INDUCTION OF LABOUR

Women with high BMI have an increased incidence of labour induction. Labour is more likely to be prolonged and dysfunctional needing higher requirements of oxytocin and the need for operative delivery and increased morbidity. Fat deposition in the maternal pelvis and fetal macrosomia may contribute to labour dystocia and increased rates of caeserian delivery. wolfe et all demonstrated that the need for caeserian delivery increased with elective labour induction in women with high BMI with an unfavourable cervix.

Biarco et al found an increased slow progression of labour in women with high BMI. Namiko et al studied that the prolongation of labour was limited to the first stage of labour only. Increased BMI was not associated with a difference in second stage duration, regardless of whether labour was induced or spontaneous.Moyinihan et al found that there were impairments in uterine contractility in women with high BMI

Chuhan et al observed that the rates of instrumental delivery in women with high BMI were 13%.

CAESERIAN SECTION

The HAPO study found an association between maternal hyperglycemia and the rate of caeserian delivery. however sebire et al suggest that irrespective of gestational diabetes, high BMI is a high-risk factor for increased caeserian delivery.

Neonatal macrosomia alone cannot explain the increased rates of caeserian delivery. the slow progress of labour in high BMI women along with labour dystocia leads to caeserian delivery as well.

Dietz et al found that caeserian section for normal BMI was found to be 14.3% and 42.6% for women with high BMI.

Sebire et al studied that there was an increased risk of shoulder dystocia and emergency caeserian section in women with high BMI.

Cnattingius et al demonstrated increasing caeserian delivery with high BMI and short stature.

Young et al studied that indications for caesarian delivery among women with high BMI were mainly cephalopelvic disproportion and failure to progress

INTRAOPERATIVE AND POST OPERATIVE COMPLICATION

Comorbidities associated with caeserian delivery are anesthetic complications, increased operative time, Blood loss >1000ml, difficulty in delivering the baby, wound infection, endometritis , postoperative fever , prolonged hospital stay, thromboembolic manifestations.

Anaesthetic complications:

Ranta et al studied that in women with high BMI there were more technical problems in establishing epidural anaesthesia such as inadvertent dural puncture, multiple attempts and senior anaesthetist consultation. There was no difference in response to pain treatment.

Skin incision

Pfannenstiel incision is preferred in less centrally obese which allows early post operative ambulation and better respiratory function. the disadvantage is that more of fat tissue is cut through and the moist skin crease is exposed to infection leading to wound breakdown. In very obese patients, for the sake of improved exposure and for the sake of cutting through less fat, vertical skin incision is preferred. Though the wound care is better in vertical incision the disadvantage is that the lateral forces act upon the wound causing breakdown of the wound.

NICE guidelines 13 suggest that women with high BMI should be given antibiotic prophylaxis in order to prevent wound infection. Also in those with more than 2 cm subcutaneous fat, suturing of subcutaneous tissue will reduce the risk of wound infection and wound separation.

Thromboembolism:

EDWARDS et al 461996 found the incidence of thrombo embolism to be 2.5% in an obese woman.

Green Top Guideline 37 Suggest

1. Those obese women with two or more additional risk factors for thrombo embolism should be started on thrombo prophylaxis in antenatal period itself.
2. All woman with thromboprophylaxis in the antenatal period should be continued on prophylaxis for six weeks postnatally along with postnatal risk assessment for thrombo embolism.

Weight Specific Dosage For Thrombo Prophylaxis:

Weight (kg)	**DOSE**
91-130	60 mg Enoxaparin or 7500 units Dalteparin or 7000 units Tinzaparin daily
131-170	80 mg Enoxaparin or 10000 units Dalteparin or 9000 units Tinzaparin daily
>170	0.6 mg/kg/day Enoxaparin or 75 units/kg/day Dalteparin or 75 units/kg/day Tinzaparin daily

3. All obese woman advised early ambulation after delivery.

4. All morbidly obese women should be given postnatal thromboprophylaxis irrespective of the mode of delivery.

5. Also, women with BMI > 30kg/m2 with 1or more additional risk factors for thromboprophylaxis should be given Low Molecular Weight Heparin for 7 days in the postpartum period.

6. BMI > 30kg/m2 with 2 or more additional risk factors for thromboprophylaxis should be managed with graduated compression stocking in addition to Low Molecular Weight Heparin.

RCOG Recommendations2 for Thrombo Prophylaxis in an obese woman

Thrombo prophylaxis with low molecular weight heparin is recommended for obese woman for 3 to 5 days following vaginal delivery.

Thrombo prophylaxis recommended before and also after cesarean section for 3 to 5 days.

LACTATION:

Li et al demonstrated lactational dysfunction in women with high BMI. The excess weight gain during pregnancy gained by women with high BMI as studied by catalano et al is difficult to shed in post partum period, which causes parous obesity.

POSTPARTUM DEPRESSION

Varner et al found increased incidences of post partum depression in women with high BMI. the severity increased in relation to the degree of obesity.

Class I(22.6%) ,ClassII(32.4%),Class III(40%)

PERINATAL COMPLICATIONS

STILL BIRTH

Huang et al found an increased incidence of unexplained fetal death in women with high BMI. Cedergren et al found that odds ratio for still birth with BMI more than 35 is 2.79. The reasons for increased still birth is suggested due to uteroplacental insufficiency due to atherosclerosis, chronic hypertension, birth defects and macrosomia due to diabetes, decreased ability to perceive fetal movements and increased incidence of sleep apnea which results in oxygen desaturation and hypoxia.

IUGR

Studies show that Babies born to mothers with high BMI have higher incidences of IUGR due to chronic hypertension, uteroplacental insufficiency, pre eclampsia, anaemia.

MACROSOMIA

Prepregnancy weight and maternal weight gain during pregnancy play an important role in determining infant birth weight. The prevalence of macrosomic infants is increased in women with high BMI.

OBESITY-RELATED PREGNANCY COMPLICATIONS

Author, Year	*Medical Complication*	*Antepartum Complication*	*Intrapartum Complication*	*Postpartum Complication*	*Perinatal Complication*
Edwards et al 1978[24]		Hypertensive disorders of pregnancy, Mild Preeclampsia, Gestational diabetes, inadequate pregnancy weight gain		Wound episiotomy infection	Birth weight >4kg
Gross et al 1980[42]	Hypertension Diabetes mellitus	Gestational diabetes, Multiple gestation, inadequate weight gain	Labor induction Fourth degree laceration		Birth weight >4kg LGA
Calandra et al.1981[13]			Labor Induction	Fever	Birth Weight >4kg
Garbaciak et al 1985[35]	Hypertension Diabetes mellitus Thyroid disease	Pre-eclampsia, Urinary tract infection	Primary cesarean Meconium Late decelerations		
Abrams et al, 19883	Hypertension diabetes mellitus	Pregnancy induced hypertension, Gestational diabetes	Primary cesarean		
Naeye, 199070	Hypertension Diabetes mellitus	Preterm birth < 30wks, Twins			Congenital anomaly Perinatal mortality
Perlow et al, 199279	Hypertension Diabetes mellitus	Gestational diabetes	Cesarean, primary cesarean		Birth weight<2.5kg Birth weight >4kg SGA

					NICU admission
Johnson et al,199252		Postdates	Labor induction cesarean, Meconium		Birth Weight >4kg
Cnattingius et al 1998[19]	Diabetes mellitus	Gestational diabetes, Pre-eclampsia, Preterm birth <32wks			Late fetal death Early neonatal death.
Bianco et al,199811	Hypertension Diabetes Mellitus	Pre-eclampsia, Gestational diabetes, Abruption	Meconium, Labor arrest, Cesarean	Endometritis	LGA
Baeten et al 20019		Gestational diabetes, Pre-eclampsia, Preterm birth <32wks	Cesarean		Birth weight >4kg Infant death.
Sebire et al, 200187		Gestational diabetes, Pre-eclampsia, Urinary tract infection	Labor induction, Emergency Cesarean	Hemorrhage Genital tract infection Wound infection	LGA Fetal Death Delayed lactation
Lu et al, 2001[64] Ehrenberg et al, 2002[26]	Diabetes Mellitus	Gestational diabetes, Pre-eclampsia, Post term gestation	Cesarean		LGA Birth weight >4kg Birth weight>4.5kg
Jensen et al, 200351		Postterm gestation, Pre-eclampsia	Labour Induction, Cesarean		LGA, Birth Weight >4kg.

Clinical Obstetrics and Gynecology (Brown Journal, Vol. 47; No-4:900-901, 2004

AIM AND OBJECTIVE

1. To compare the antepartum, intrapartum, postpartum and neonatal outcome in pregnant mothers with high body mass index in the first trimester with those of normal body mass index.

2. To find the incidence of complications in mothers with high body mass index.

MATERIALS AND METHODS

This prospective study was conducted in the Department of Obstetrics and Gynecology, Madras Medical College, Chennai. Written informed consent was obtained from all antenatal women who participated in the study.

Subject Selection:

Subjects are selected from the Antenatal OPD of Madras Medical College.

Inclusion Criteria:

1) Primi gravida pregnant mothers below 12 weeks of gestation

Exclusion Criteria

1)Patients not willing for the study

2)Multiple pregnancies

3) Women with medical disorders, Diabetes, hypertension.

METHODOLOGY:

Pregnant women visiting the antenatal op, in the early trimester after getting written consent were registered. Detailed history taking and examination were

carried out with the measurement of body mass index as weight in kg/height in meter square.

The subjects were classified into 2 groups

GROUP 1- NORMAL –BMI (20-24.9)

GROUP 2 - OVERWEIGHT and OBESE (BMI 25 and above)

Follow up procedure:

The women were followed up for the antepartum, intrapartum, post partum variables and neonatal outcome.

The data were analysed for the 2 groups of patients in the study.

Assessment of parameters:

1) ANTENATAL VARIABLES:

Abortion

Preeclampsia

Gestational diabetes mellitus

Oligohydramnios

Abruptio placenta

Anaemia

PROM

2) INTRAPARTUM VARIABLES

Vaginal delivery

Caeserian section

Instrumental delivery

3) POSTPARTUM VARIABLES:

PPH

Duration of hospital stay

Wound infection/gaping

Pyrexia

Lactational dysfunction

4) NEONATAL VARIABLES:

IUGR

Preterm

Macrosomia (>4 kg)

Post-term

Still birth

NICU Admission

Need for intubation.

Statistical analysis plan

Statistical comparison between data of cases (BMI>25) and controls (BMI<25) was performed with Chi-square test and a P value of less than 0.05 denotes statistical significance.

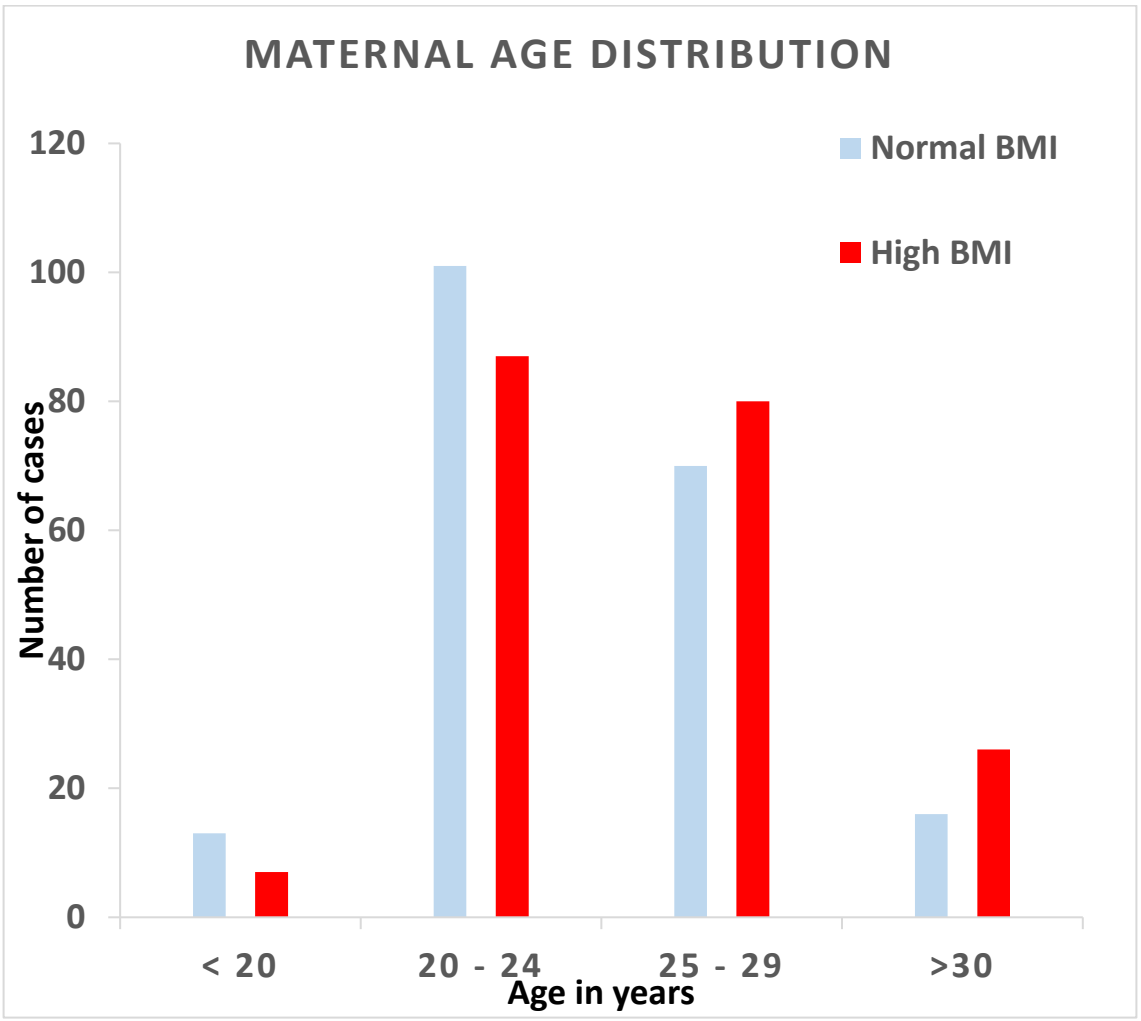
RESULTS AND ANALYSIS

Two hundred pregnant women with high BMI >25 kg/m2 and two hundred pregnant women with normal BMI were selected and were followed prospectively.

1. MATERNAL AGE DISTRIBUTION:

AGE (YEARS)	Normal BMI		High BMI	
	No	Percentage	No	Percentage
<20	13	6.5	7	3.5
20-24	101	50.5	87	43.5
25-29	70	35	80	40
> 30	16	8	26	13

About 50% of women with normal BMI are in the age group between 20 to 24 years and in the high BMI group about 43.5% fall in the age group between 20 to 24 years.


MATERNAL AGE DISTRIBUTION
Normal BMI
High BMI
Number of cases
120
100
80
60
40
20
0
< 20
20 - 24
25 - 29
>30
Age in years

2. MISCARRIAGE RATE

	Normal BMI (n = 200)		High BMI (n = 200)	
	No	Percentage	No	Percentage
Abortion	3	1.5	7	3.5
Live	197	98.5	193	96.5

Chi square = 1.641, p = 0.200

The rate of miscarriage in our study was 1.5% among women with normal BMI and 3.5% among women with high BMI.

In our study, as the p value is greater than 0.05, BMI and abortion was found to be independent of each other.

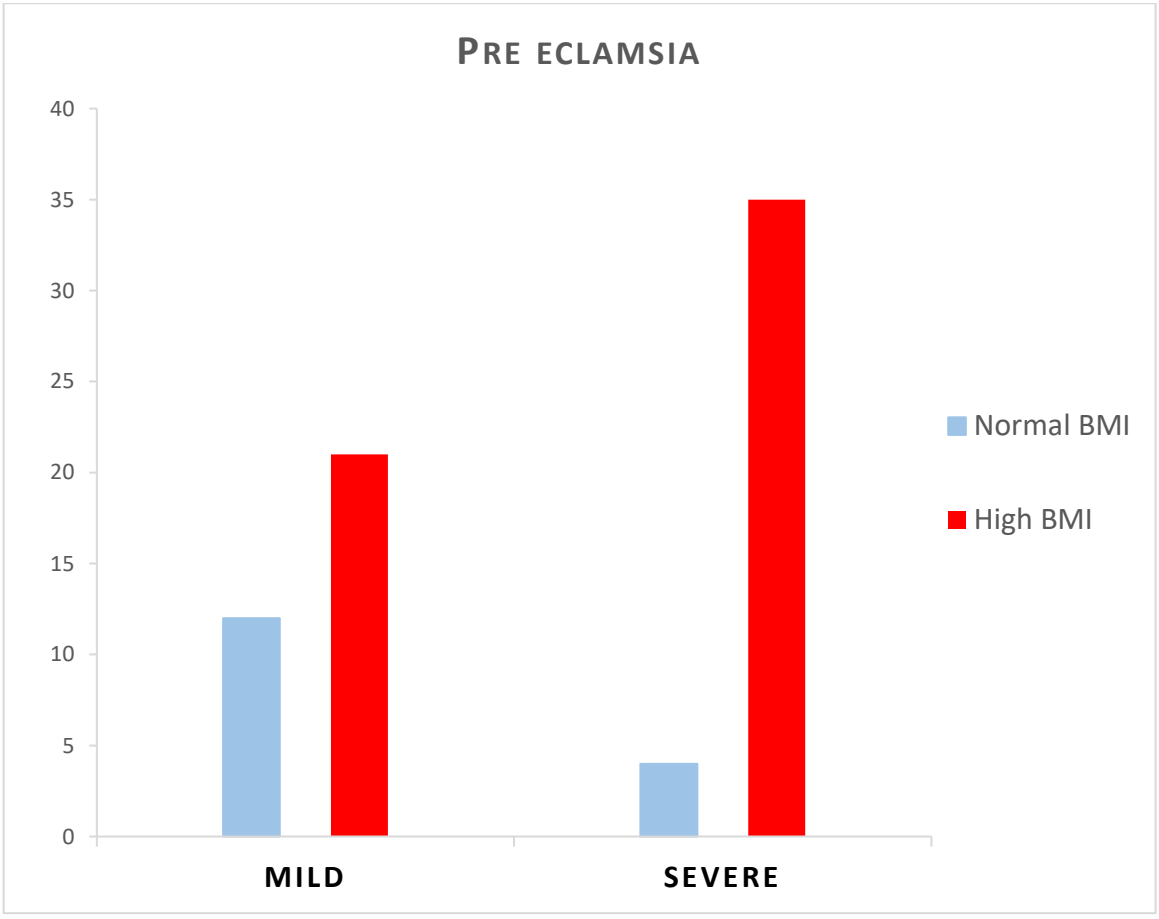
3. PRE ECLAMPSIA:

Pre eclampsia	Normal BMI (n= 200)		High BMI (n=200)	
	No	Percentage	No	Percentage
Mild	12	6	21	10.5
Severe	4	2	35	17.5
Total	16	8	56	28

Chi square = 27.100, p = 0.001($p<0.05$)

In our study, women with high BMI had 28% incidence of pre eclampsia and those with normal BMI had 8% incidence.

As the p value is less than 0.05, BMI and pre eclampsia was found to be dependent of each other.


PRE ECLAMSIA
40
35
30
25
20
15
10
5
0
MILD
SEVERE
Normal BMI
High BMI

4. GESTATIONAL DIABETES MELLITUS

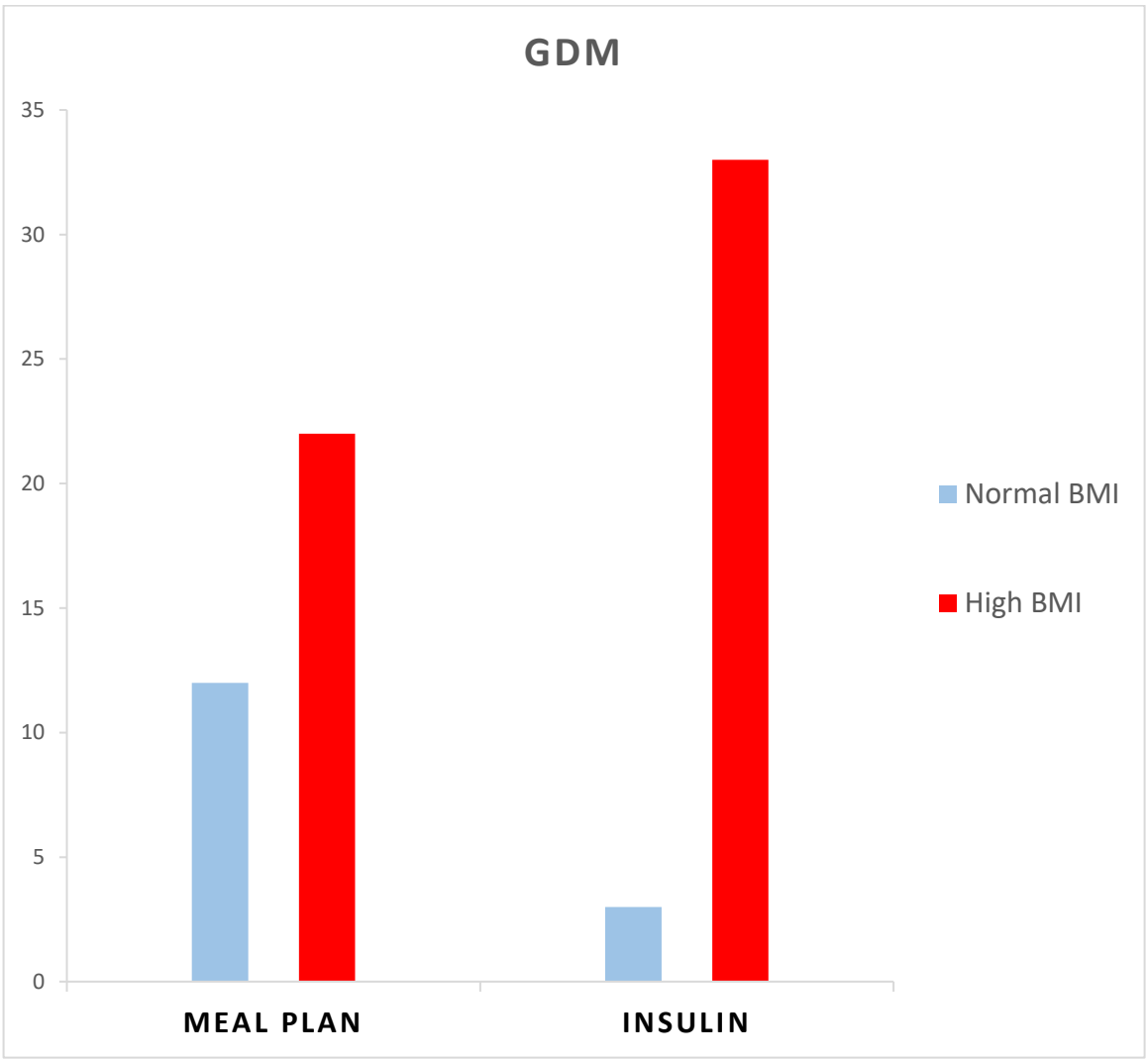
GDM	Normal BMI (n= 200)		High BMI (n=200)	
	No	Percentage	No	Percentage
Meal plan	12	6	22	11
Insulin	3	1.5	33	16.5
Total	15	7.5	55	27.5

Chi square = 27.706, $p = 0.001 (p<0.05)$

In our study, women with high BMI had 27.5% incidence of gestational diabetes mellitus and those with normal BMI had 7.5% incidence.

As the p-value is less than 0.05, BMI and gestational diabetes mellitus were found to be dependent on each other.

It was found that BMI influences gestational diabetes mellitus.


GDM
35
30
25
20
15
10
5
0
MEAL PLAN
INSULIN
Normal BMI
High BMI

5. OLIGOHYDRAMNIOS

Oligohydramnios	Normal BMI (n= 200)	High BMI (n=200)
No of cases	26	29
Percentage	13	14.5

Chi square = 0.190, p = 0.663(p>0.05)

In our study, women with high BMI had 14.5% incidence of oligohydramnios and those with normal BMI had 13% incidence.

As the p-value is more than 0.05, BMI and oligohydramnios were found to be independent of each other.

6. ABRUPTIO PLACENTA

Abruption	Normal BMI (n= 200)	High BMI (n=200)
No of cases	8	10
Percentage	4	5

Chi square = 0.233, p = 0.630(p>0.05)

In our study, women with high BMI had 5% incidence of abruption and those with normal BMI had 4% incidence.

As the p-value is greater than 0.05, BMI and abruption were found to be independent of each other.

7. ANEMIA

Anemia	Normal BMI (n= 200)	High BMI (n=200)
No of cases	20	14
Percentage	10	7

Chi square = 1.157, p = 0.283 (p>0.05)

In our study, women with high BMI had 7% incidence of anaemia and those with normal BMI had 10% incidence.

As the p-value is greater than 0.05, BMI and gestational diabetes mellitus were found to be independent of each other.

8. PROM

PROM	Normal BMI (n= 200)	High BMI (n=200)
No of cases	26	28
Percentage	13	14

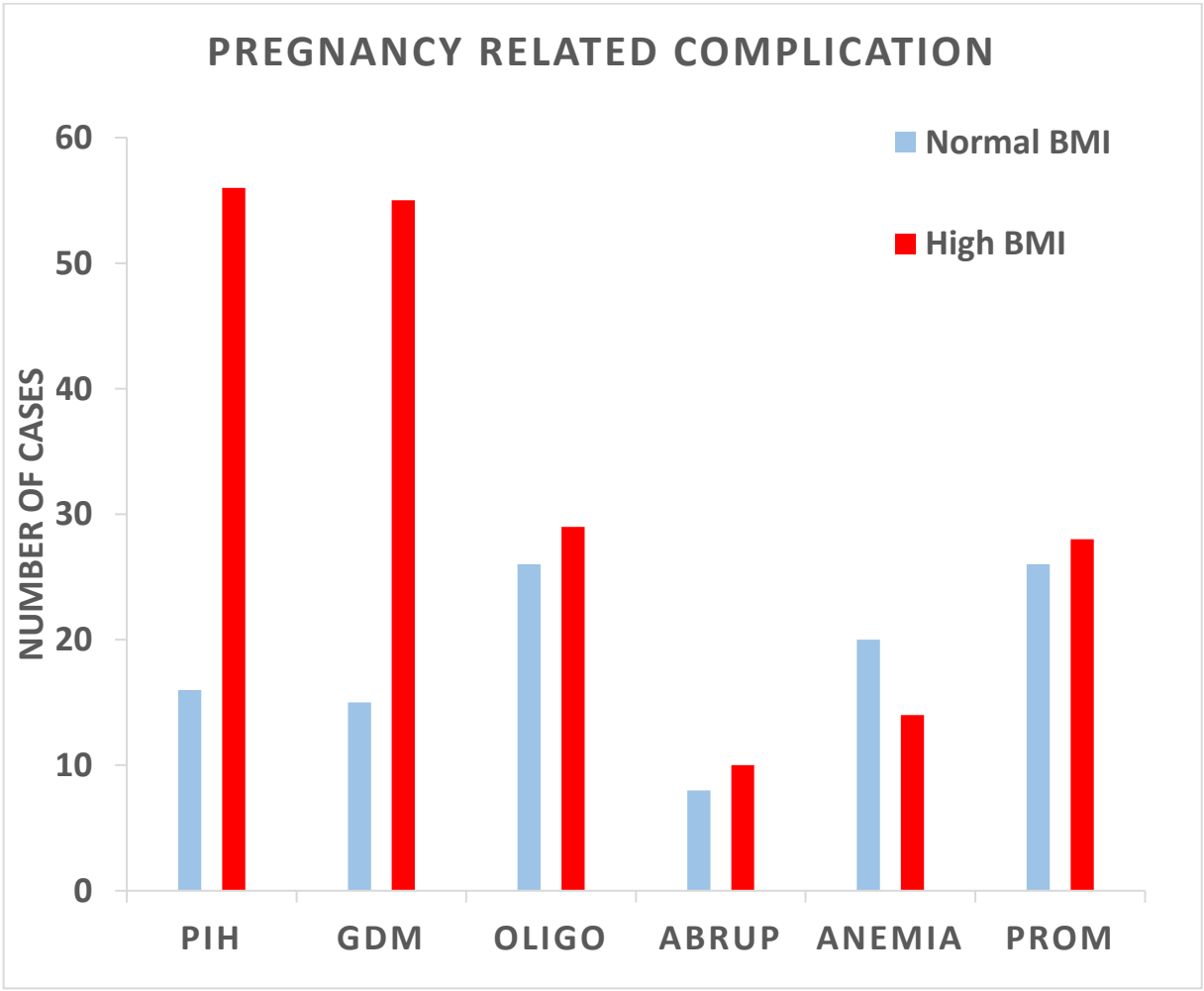
Chi square = 0.086, p = 0.770(p>0.05)

In our study, women with high BMI had 14% incidence of PROM and those with normal BMI had 13% incidence.

As the p-value is less than 0.05, BMI and gestational diabetes mellitus were found to be independent of each other.

9. ANTEPARTUM PARAMETERS

Complications	Normal BMI (n = 200)		High BMI (n = 200)		P value	Chi - square
	No	Percentage (%)	No	Percentage (%)		
Pre-eclampsia	16	8	56	28	<0.05	27.1
GDM	15	7.5	55	27.5	<0.05	27.7
Oligo	26	13	29	14.5	0.66	0.19
Abruption	8	4	10	5	0.63	0.23
Anemia	20	10	14	7	0.28	1.15
PROM	26	13	28	14	0.77	0.09


PREGNANCY RELATED COMPLICATION
NUMBER OF CASES
60
50
40
30
20
10
0
Normal BMI
High BMI
PIH
GDM
OLIGO
ABRUP
ANEMIA
PROM

10. INDUCTION OF LABOUR

	Normal BMI		High BMI	
	No	Percentage	No	Percentage
Induced	52	26.39	71	36.78
Non induced	145	73.60	122	63.21

Among the patients with high BMI, the induction rate was 36.78% and for normal BMI, the induction rate was 26.39%.

11. REASON FOR INDUCTION

	Normal BMI		High BMI	
	No	Percentage(%)	No	Percentage(%)
GDM	6	11.50	20	28
Pre-eclampsia	11	21.12	22	30.81
Oligo	13	24.96	6	8.42
IUGR	11	21.12	13	18.23
Post dated	2	3.84	4	5.6
PROM	9	17.28	6	8.4
Total	52	99.92	71	99.89

In our study, the most common cause for induction of labour among mothers with high BMI was pre-eclampsia with a percentage of 30.81% and in mothers, with normal BMI it was oligohydramnios with a percentage of 24.96 %.

GDM accounted for 28% of induction in mothers with high BMI and for 11.5% of induction in mothers with normal BMI

Pre-eclampsia accounted for 30.81% of induction in mothers with high BMI and for21.12 % of induction in mothers with normal BMI

Oligohydramnios accounted for 8.4 % of induction in mothers with high BMI and for 24.96 % of induction in mothers with normal BMI

IUGR accounted for 18.23% of induction in mothers with high BMI and for 21.12 % of induction in mothers with normal BMI

Post dated accounted for 5.6 % of induction in mothers with high BMI and for 3.84% of induction in mothers with normal BMI.

PROM accounted for 8.4 % of induction in mothers with high BMI and for 17.28 % of induction in mothers with normal BMI

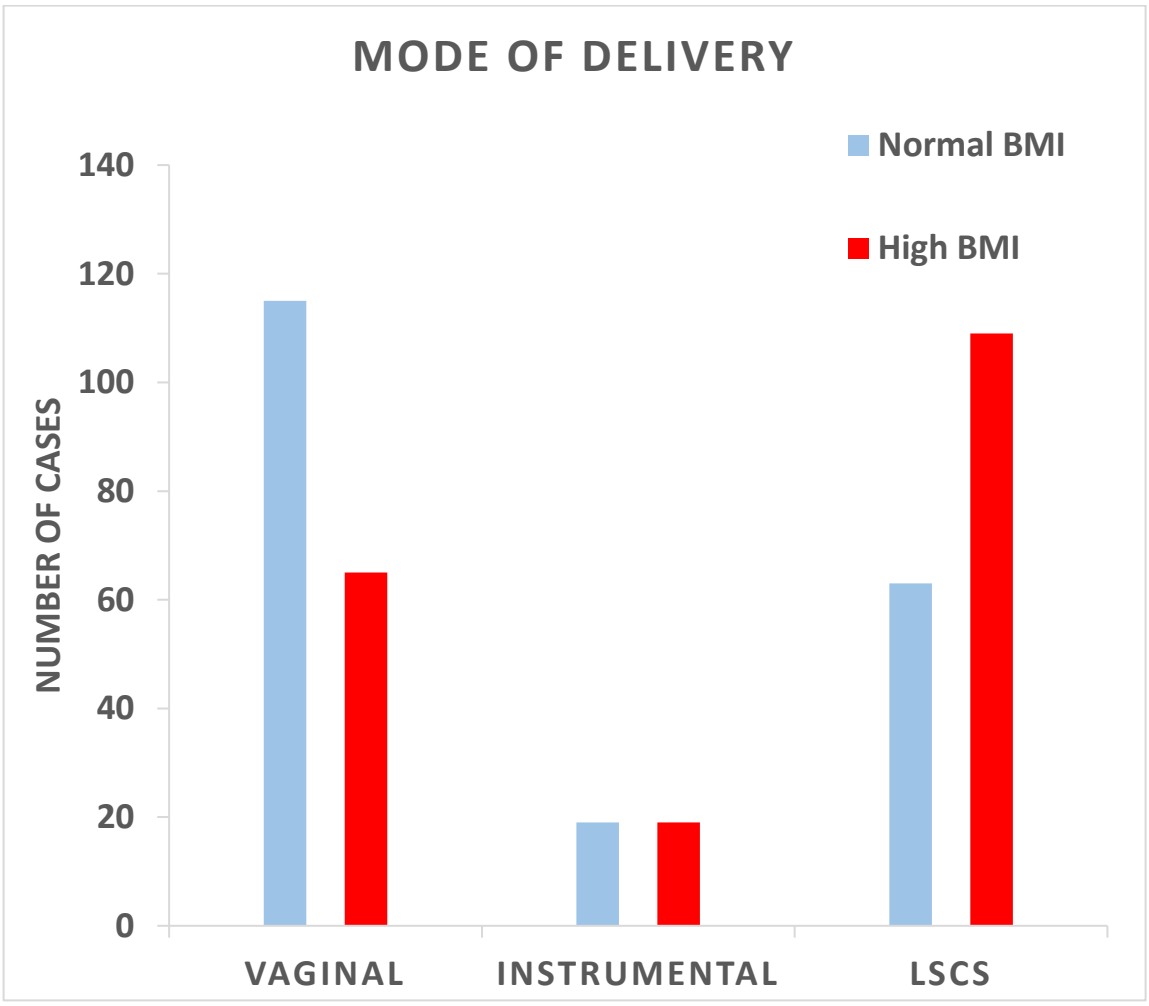
12. MODE OF DELIVERY

Complications	Normal BMI		High BMI		P value	Chi Square
	No	%	No	%		
Vaginal	115	57.5	65	32.5	0.001	25.25
Instrumental	19	9.5	19	9.5	1	0
LSCS	63	31.5	109	54.5	0.001	21.58

The incidence of vaginal delivery, instrumental delivery and LSCS was found to be 57.5%, 9.5% and 31.5% respectively in women with normal BMI and 32.5%,9.5% and 54.5% in women with high BMI respectively.

The table shows that vaginal delivery and LSCS are dependent on BMI as their corresponding P value is found to be less than 0.05.

Instrumental delivery was found to be equal in both the groups and the p-value was found to be 1(not statistically significant).


MODE OF DELIVERY
Normal BMI
High BMI
NUMBER OF CASES
140
120
100
80
60
40
20
0
VAGINAL
INSTRUMENTAL
LSCS

13. INDICATION FOR CAESERIAN SECTION

Causes		Normal BMI		High BMI
	No	Percentage (%)	No	Percentage(%)
Fetal distress	12	18.96	18	16.56
Failed induction	15	23.7	27	24.84
Cephalopelvic disproportion	14	22.12	30	27.62
Failure to progress	6	9.48	11	10.12
Imminent eclampsia	-	0	4	3.68
Malpresentation	11	17.38	14	12.7
Failed instrumental delivery	2	3.16	2	1.74
Deep transverse arrest	1	1.58	2	1.84
Placenta previa	2	3.16	1	0.92
Total	63	99.59	109	99.92

In our study, failed induction was the most common cause of indication of the primary caesarian section in normal BMI with 23.7% .cephalopelvic disproportion was the most common cause of primary caesarian section in high BMI group with 30%

14. POSTPARTUM COMPLICATION

Complications	Normal BMI		High BMI		P value	X^2
	No	Percentage	No	Percentage		
PPH	11	5.5%	7	3.5%	0.335	0.931
Pyrexia	1	0.5%	2	1%	0.562	0.336
Wound Gaping	3	1.5%	9	4.5%	0.079	3.093
Prolonged stay	1	0.5%	6	3%	0.057	3.635
Lactation Dysfunction	0	0	5	2.5%	0.024	5.063

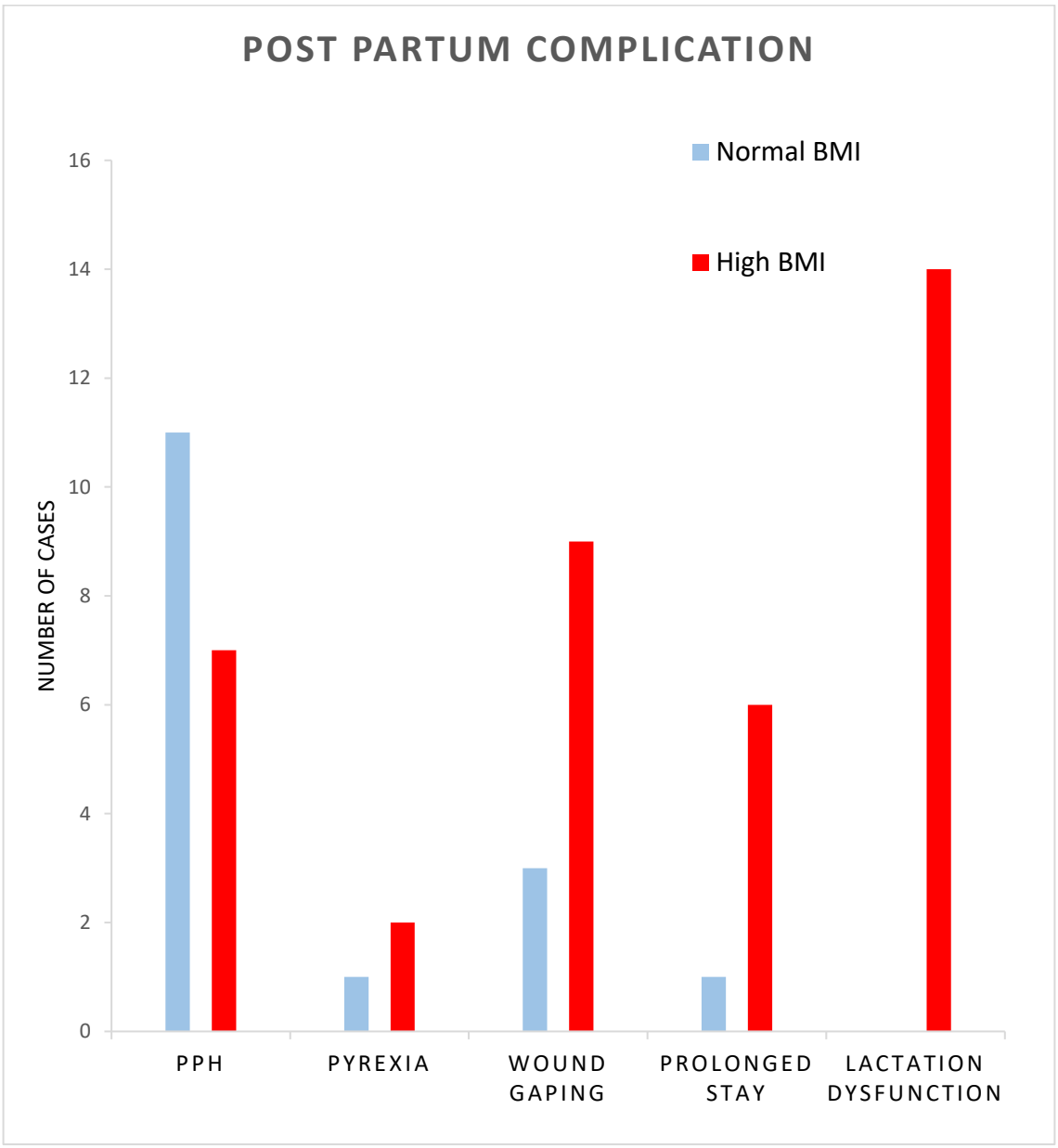
The incidence of PPH in women with high BMI was found to be 3.5% and the incidence of women with low BMI was 5.5%, the p-value was more than 0.05(not statistically significant).

The incidence of pyrexia in women with high BMI was found to be 1% and the incidence of women with low BMI was 0.5%, the p-value was more than 0.05(not statistically significant).

The incidence of wound gaping in women with high BMI was found to be 4.5% and the incidence of women with low BMI was 1.5%, the p-value was less than 0.05(statistically significant).

the incidence of a prolonged stay in women with high BMI was found to be 3% and the incidence of women with low BMI was 0.5%, the p-value was more than 0.05(not statistically significant)

The incidence of lactational dysfunction in women with high BMI was found to be 2.5% and the incidence of women with low BMI was 0, the p-value was less than 0.05(statistically significant)


POST PARTUM COMPLICATION
Normal BMI
High BMI
NUMBER OF CASES
16
14
12
10
8
6
4
2
0
PPH
PYREXIA
WOUND GAPING
PROLONGED STAY
LACTATION DYSFUNCTION

15. BIRTH WEIGHT OF THE NEONATE

Birth weight	Normal BMI		High BMI	
	No	Percentage	No	Percentage
1.5 – 1.99	8	4	19	9.5
2 – 2.49	52	26	20	10
2.5 – 2.99	88	44	67	33.5
3 – 3.49	35	17.5	49	24.5
3.5 – 3.99	12	6	21	10.5
>4	2	1	17	8.5

In our study, the majority of the babies had a birth weight falling between 2.5 to 2.9 kg with 44% and 33.5% in normal BMI and high BMI group respectively.

Birthweight more than 4 kg was found to be 17% in the high BMI group and 2% in the normal BMI group, which was statistically significant.

Extremely low birth weight babies falling between birthweight 1.5 to 1.9 kg was found to be more in high BMI group with 9.5%compared to 4% of normal BMI group, accounting for induction of labour due to pre-eclampsia in mothers with high BMI

15. NEONATAL COMPLICATION

Complications	Normal BMI		High BMI		P value	X^2
	No	Percentage	No	Percentage		
IUGR	19	9.5%	20	10%	0.124	2.37
Pre term	25	12.5%	12	6%	0.025	5.033
Macrosomia	2	1%	17	8.5%	0.001	12.433
Still Birth	1	0.5%	5	2.5%	0.100	2.707
Post term	2	1%	4	2%	0.411	0.677
NICU stay	33	16.5%	49	24.5%	0.048	3.927

The incidence of IUGR in babies born to mother with normal BMI is 9.5%and those born to high BMI is 10%. the p-value is more than 0.05. (not statistically significant)

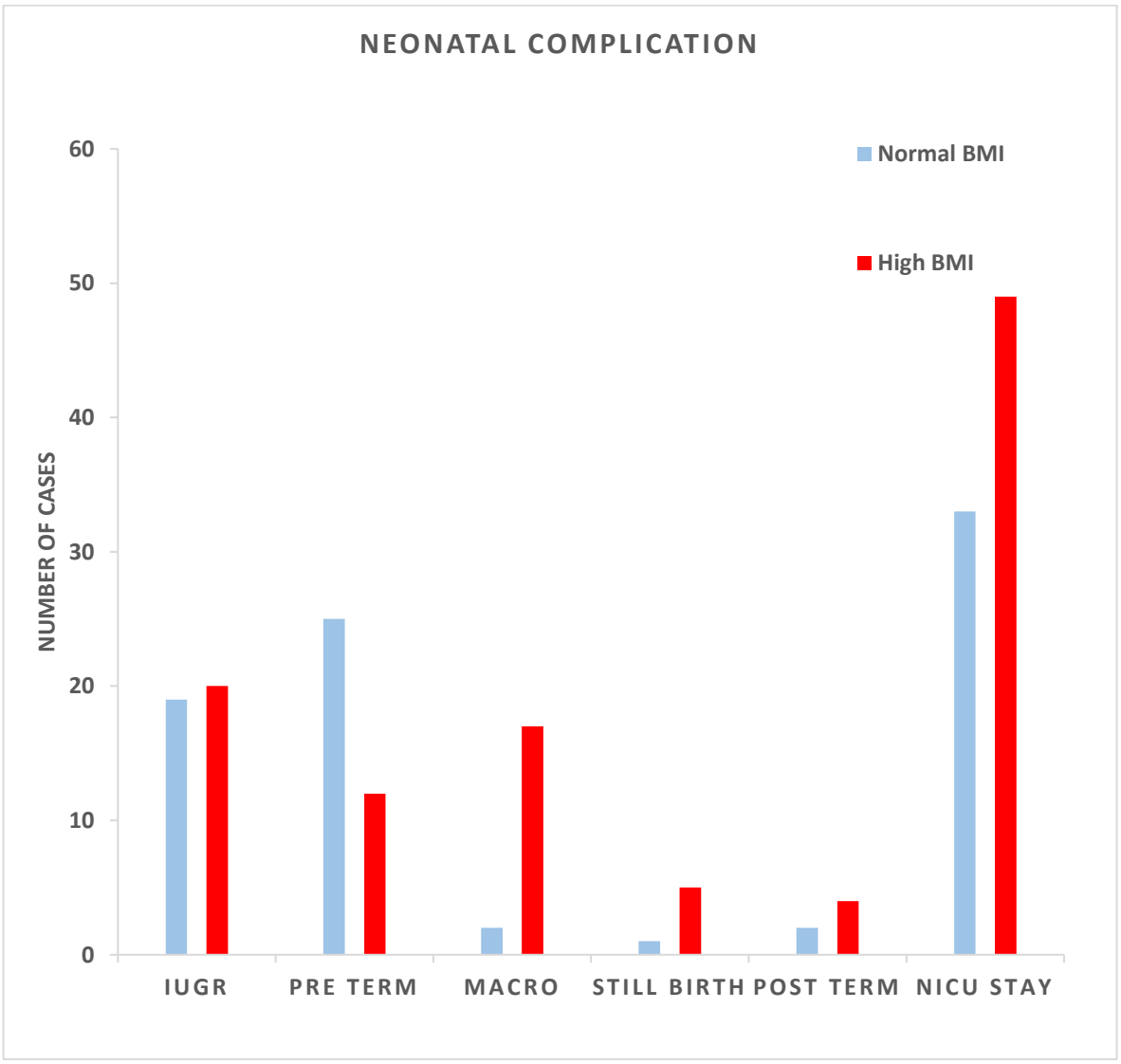
The incidence of preterm in babies born to mother with normal BMI is 12.5% and those born to high BMI is 6%. the p-value is less than 0.05. (statistically significant)

The incidence of macrosomia in babies born to mother with normal BMI is 1% and those born to high BMI is 8.5%. the p-value is less than 0.05.(statistically significant)

The incidence of still birth in babies born to mother with normal BMI is 0.5% and those born to high BMI is 2.5% .p value is more than 0.05.(not statistically significant)

The incidence of post dates in babies born to mother with normal BMI is 1% and those born to high BMI is 2%. the p-value is more than 0.05.(not statistically significant)

The incidence of NICU stay in babies born to mother with normal BMI is 16.5% and those born to high BMI is 24.5%. p-value is less than 0.05.(statistically significant)


NEONATAL COMPLICATION
Normal BMI
High BMI
NUMBER OF CASES
60
50
40
30
20
10
0
IUGR
PRE TERM
MACRO
STILL BIRTH
POST TERM
NICU STAY

DISCUSSION

AGE DISTRIBUTION:

The age distribution in our study showed that about 50% of women with normal BMI are in the age group between 20 to 24 years and in the high BMI group about 43.5% fall in the age group between 20 to 24 years. as age advances, the percentage of women in high BMI group are more than in normal BMI.

ABORTION:

Cavelcant et al in their meta-analysis studied that there was an association between obesity and recurrent pregnancy loss(or, 1.75; 95% ci, 1.24-2.47; $p = 0.001$). Threefold increased the risk of miscarriage was demonstrated in the study by Yu C et al.

In our study, abortion was found to be more in high BMI group when compared to normal BMI group in accordance with the above studies but p-value was found to be less than 0.05, may be owing to the small size of the sample.

PRE ECLAMPSIA:

Our study showed an increased incidence of pre-eclampsia in patients with high BMI (28% as compared to 8% of the normal BMI.p value was found to be less than 0.05 and was statistically significant in accordance with other studies.

Heather E. Robinson et al 2005 showed the incidence of 18.9 -22.6%

Glady et al 2005 showed the incidence of 16%. O'Brien and associates (2003) reported that preeclampsia risk doubles with each 5 -7 kg/m2 increase in prepregnancy BMI.

Kumari et al (2001) reported that preeclampsia in women with high BMI was 14-25%.

Catalano et al 2007 and beaten et al 2001 found two-fold increased the risk of pre-eclampsia in overweight and three-fold increased the risk in obese.

GESTATIONAL DIABETES MELLITUS:

Our study showed a higher incidence of Gestational diabetes mellitus among women with high BMI with a value of 27.5 % compared to a value of 7.5% in women with normal BMI.GDM on insulin was found to be 16.5% in the high BMI group and 1.5% in women with normal BMI. The p-value was found to be less than 0.05 and it was statistically significant.

Weiss et al in the faster trial showed a marked increase in diabetes in women of high BMI with the incidence of 12.3%.

Gabee et al 1986 studied that in normal BMI only 1-3% are diagnosed with GDM, but in women with high BMI is 17%.

Sebire et al 2001 found that the odds ratio was 3.6 in women with high BMI. Mandal et al studied that odds ratio was found to be 19.43.

OLIGOHYDRAMNIOS:

Oligohydramnios was found to occur in 13% of women with normal BMI and 14.5% of women with high BMI. It was found that oligohydramnios occurs independently of BMI and was not statistically significant.

ABRUPTION:

In our study, placental abruption was found to occur in 4% of normal BMI group and 5% of mothers in higher BMI group. the result was not statistically significant, not conforming with the following studies, may be due to a small sample size.

Bainco et al showed an increased incidence of abruption, but results of Wolf HM et al 1994 including ours did not show an association.

Joel G.Ray et all studied that women with metabolic syndrome are at a high risk of abruption placenta.

ANAEMIA:

The incidence of anaemia in women with normal BMI was 10% and in high BMI was 7%. P value was not statistically significant.

PREMATURE RUPTURE OF MEMBRANES:

Naeye reported that overweight and obesity were associated with increased rates of chorioamnionitis in preterm deliveries and that this increase was larger at 24 to 30 weeks than at 31 to 37 weeks.

Cnattingus et al maternal overweight and obesity during pregnancy was associated with increased risks of preterm delivery, especially extremely preterm delivery.

Baeten et al 2001 too showed an increased risk of preterm delivery in women with high BMI. However, Sebire et al 2001 showed no difference.

In our study preterm delivery was found to be more in women with normal BMI with a value of 12.5% compared to the value of 6% in women with high BMI. As the p-value was less than 0.5, it was found that preterm delivery and BMI were dependent on each other.

INDUCTION OF LABOUR

Cedergren et al, 200465 in his study had an incidence ranging from 13.1% - 18.3% according to the severity of obesity. The risk of induction among obese women was increased by almost 2.5 fold according to Ekblad U et al 1992.

In our study, the most common reason for induction in women with high BMI was pre-eclampsia(30.81%).oligohydramnios(24.96%) was the main factor leading to induction in the normal BMI group. labour induction was done in 36.7% of women with high BMI and in 26.3% of women with normal BMI. Induction was done more in the high BMI group.

. This also correlates well with the study of Sebire et al (2001) who reported increased rates of labour induction in obese women. But in another study, Bianco et al (1998) reported the rate of oxytocin augmentation was similar in both the groups.

MODE OF DELIVERY:

L-Weiss et al 2001 and Marie Cedergren 2004 have demonstrated an increased risk for cesarean delivery in patients with high BMI.

Joshua. L. Weiss et al, 2001, Marie. I Cedergren 2004 demonstrated an increased number of instrumental delivery in women with high BMI However Sebire NJ, et al 2001 studied that no increased risk of instrumental delivery was seen among women with high BMI.

Our study is in accordance with the study of Hugh.Ehrenberg (2004) who reported a higher chance of cesarean delivery in obese women (13.8% versus 7.7%, P< 0.0001). Lynch and associate (2008), Poobalan and colleagues (2009) also found that obese women have an increased rate of cesarean delivery. Sebire (2001) and Baeten et al (2001) and Bianco et al (1n 1998) reported an increased cesarean rate in obese women of more than 30%.

WEISS JL et al21 2004 found the rate of cesarean section to be 34% in obese and 30% in overweight.

DIETZ et al15 2005 found a rate of camera section to be 14.3% for lean individuals (BMI<20)and 42.6% for obese (BMI>35).Also, the relative risk of cesarean without any other complications is 1.4 for overweight and 1.5 for obese.

In our study, caesarian delivery was found in 54.5% of the high BMI mothers compared to 31.5% in normal BMI mothers.p-value was less than 0.05, and was statistically significant. Vaginal delivery was found to occur more in normal BMI mothers with a percentage of 57.5 compared to 32.5% in the high BMI group. vaginal delivery and BMI are dependent on each other as suggested by p value<0.05.

Instrumental delivery was equal in both groups with 19% which is contradictory to the studies that say that instrumental delivery is higher in high BMI group. the

increased rate of caesarian deliveries may explain the decrease in instrumental deliveries.

The most common indication for lscs in high BMI mothers was cephalo-pelvic disproportion(27.62%). Failed induction (23.7%) is the most common indication in normal BMI group.

Other indications are fetal distress(18.96% and 16.56%),failure to progress(9.48% and 10.12%),malpresentations (17.38% and 12.7%),deep transverse arrest(1.58 %and 1.84%),placenta previa(3.16% and 0.92%),failed instrumental delivery(3.16% and 1.74%) in normal BMI group and high BMI group respectively.

Imminent eclampsia(3.68%) was also an indication in high BMI group

POSTNATAL COMPLICATIONS

Sebire et al (2001) reported a higher incidence of PPH and prolonged labour in high BMI Mothers. Usha Kiran et al in studies outcome of pregnancy in a woman with high BMI found that adverse maternal and fetal outcome proceed with labour and delivery. The odds ratio for Postpartum haemorrhage was found to be 1.5.

In our study, PPH was found in 3.5% of mothers with high BMI and in 5.5% of mothers with normal BMI. The result was not statistically significant as the p-value was less than 0.05.

In studies on short and, long-term implications of maternal obesity on mother and offspring found an increased risk of postoperative complications like wound infection, excessive blood loss and postpartum endometritis.

Myles et al 2002, Wolf HM et al 1998, cataleno et al women with high BMI to be at a greater risk of post-operative wound infection and wound dehiscence. Obese women had 2.47 fold and 3.12 fold increased the risk for wound infection and dehiscence respectively.

In our study, pyrexia was found in 1% of mothers with high BMI with a p-value of 0.5. Wound gaping was found with an incidence of 4.5% in high BMI mothers with a p-value of 0.079 (statistically significant). There was prolonged stay in 3% of mothers with high BMI and lactational dysfunction was found in 2.5% ($p < 0.05$).

Also, thromboprophylaxis is routinely practised in our Hospital for women with prepregnant body mass index more than or equal to 25 regardless of the mode of delivery and also early ambulation is advised to our patients and so there are nil cases of deep venous thrombosis.

NEONATAL COMPLICATION

Sibire et al 2001 studied that women with high BMI had increased risk of delivering high birth weight babies. Similarly, Hugh M.Ehrenberg et al (2004) showed that obese women were at a higher risk of delivering large for gestational age babies (LGA) compared to women with normal weight(16.8% vs. 10.5%; $P<0.0001$).

Sebire et al (2001), Baeten et al (2001) and Ray et al (2001) also reported that high maternal BMI is associated with an 18% incidence of LGA neonates, which is a two-fold increase over rates found in non-obese controls.

In our study, the birth weight of babies born to women with high BMI as well as normal BMI fell between 2.5kg to 3kg with 44% of babies in normal BMI group and 33.5% of babies in high BMI group mothers. as the birth weight increases from above 3 kg, the percentage of babies in high BMI group is increasing.more than 4 kg baby was found in 8.5% of babies born to high BMI mothers compared to 1% in normal BMI group.

According to Hood et al 1993, obese women had prolonged hospital stay, which may be due to associated medical complications, wound infection and NICU admission.

In our study, IUGR was found in 10% of babies of women with high BMI with a p-value of 0.124, macrosomia was found in 8.5% of babies of a mother with high BMI with a significant p-value of less than 0.05. Still birth occurred in 2.5% of deliveries of high BMI mothers compares to 0.5% in mothers of normal BMI group supporting the study of Cedergren et al with an odds ratio for stillbirth in BMI > 35kg/m2 to be 2.79. Maternal obesity more often leads to intrauterine fetal death. A recent Swedish study found a three-fold higher risk in women with morbid obesity.

Our study has similar results with that of Stephansson et al. The risk of intrauterine fetal death obviously seems to be influenced by the degree of obesity.

NICU admission was found in 24.5% of babies born to mothers with high BMI compared to 16.5% of babies born to mothers with normal BMI with a significant p-value of less than 0.05.

SUMMARY

Our study was conducted involving 200 primi gravida with normal body mass index and 200 primi gravida with high body mass index, who were booked at their first trimester, excluding women with medical disorders and multiple pregnancies.

They were followed up prospectively for the antepartum, intrapartum, postpartum and post-natal variables.

The study demonstrated the following observation

1. Majority of the women with normal BMI and high BMI were in the age group between 20 to 24 years. this may reflect on the current change in food pattern and sedentary lifestyle with lack of exercise. This focuses on the need to give advice to adolescent girls to have healthy dietary pattern and lifestyle in order to curb this epidemic of increased body weight causing health burden.

2. As age advances, the percentage of women with high BMI were more than that of women with low BMI.

3. Miscarriage rate was higher in high BMI group with an incidence of 3.5% in accordance with previous studies, yet p-value was insignificant owing to a lesser number of the study population.

4. Pre-eclampsia was seen with a higher incidence in the high BMI group with an incidence of 28% of which 17.5% was the incidence of severe pre eclampsia.women in normal BMI group exhibited lesser incidence(8%) with nearly 6% having mild pre-eclampsia. Pre-eclampsia was found to be associated with high BMI as per previous studies with a statistically significant p-value.

5. The incidence of Gestational Diabetes mellitus was found as 55% in the high BMI group with nearly 33% on insulin.GDM was dependent on BMI as the previous studies declare with a significant p-value.

6. Oligohydramnios was found to have no significance with body mass index in our study.

7. Abruptio placenta incidence was 5% in high BMI group which was comparable to 4% in normal BMI group

8. Premature rupture of membranes was having almost equal incidence in both the groups in our study.(normal BMI -13%,high BMI-14%).

9. Anaemia was found to occur more in normal BMI group with an incidence of 10% than in high BMI group(7%). This may be due to the socio-economic class of the study population involved.

10. Induction rate was higher in the high BMI group in accordance with the previous studies with nearly 36.78% of women getting induced. Pre-eclampsia (30.81%) was the most common cause of induction in the high BMI group while oligohydramnios (24.96%)was the most common cause in the normal BMI group.

11. Vaginal delivery was found to occur with a higher incidence in normal BMI group(57.5%) while the caesarian section was found with a higher incidence in high BMI mothers(54.5%), both were statistically significant.

12. Instrumental deliveries were found to be equal in both the groups which are contradictory to previous studies that say that instrumental deliveries were higher

in high BMI group.this may be owing to the higher caesarian rates in high BMI group.

13. The most common indication for LSCS in high BMI group was cephalopelvic disproportion(27.62%), while in normal BMI group it was failed induction (23.7%), followed by cephalopelvic disproportion (22.12%) and fetal distress(18.96%).

14. Malpresentation was found in nearly 12.7% of women with high BMI.

15. Postpartum Haemorrhage incidence was3.5% in high BMI group

16. Wound gaping and lactational dysfunction were found to be statistically significant in the high BMI group.

17. Prolonged hospital stay was seen in 3% of women in high BMI group due to medical and neonatal complications.

18. Majority of babies born to mothers in both the group fell between 2.5 to 2.9kg, 44% in normal BMI, 33.5% in high BMI.

19. Birthweight more than 4 kg was found in 17% of babies born to mothers with high BMI in accordance with the previous studies and was found to be statistically significant.

20. Still birth rate was found in 2.5% of babies born to mothers with high BMI.

21. NICU admission was statistically significant in the high BMI group with an incidence of 24.5%.

22. The Preeclampsia, GMD, Vaginal Delivery, LSCS, Lactation Dysfunction, Preterm, Macrosomia and NICU Admission are found to be dependent with BMI as their corresponding p-value of chi-square test is less than 0.05.

CONCLUSION

The inference from our study is that the obstetric and neonatal complications are more in women with high body mass index and obesity, which pose a challenge to the obstetrician.in addition, the weight gained in pregnancy is continued as health issues in the late 40s and 50s. It is also proved that the weight gain in prepregnancy is continued more during pregnancy where these women are provided with plenty of rest and food.

So the obstetrician is needed to be well versed with dietary advice and life style pattern advice to the women of the reproductive age group in order to prevent the complications of high Body mass index in pregnancy. Hence, there is a lot of support needed from medical personnel to help these women to get counselled about the pre-pregnancy loss of weight, healthy food and exercise, and healthy life style pattern during pregnancy also in order to have a healthy mother and baby.

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PROFORMA

EFFECT OF HIGH BMI IN PREGNANCY

Name of patient : Age :
Hospital no : Patient No. :
Name of husband :
Permanent address :
Temporary address :
Contact no :
Date of visit to hospital
Socioeconomic status : Class I / II / III / IV / V
Educational status : Employment status :
Obstetric code : Primi
Primi -conceived spontaneously/after infertility treatment:
Menstrual cycles : Regular/Irregular
Lmp : Edd :
Marital history :
Married since
Consanguinuity : Non Consanguineous/I degree/2nd/3rd/4th
Diet history : Vegetarian/Non–VegeterianLifestyle
Exercise history : Regular Walking/ Labourer /Other forms
Known case of Diabetes Type 2 : Yes / No.
Known case of Hypertension : Yes / No
Any other significant past history : Yes / No
Family history of diabetes : Mother/Father/Both/none
Family history of hypertension : Mother/Father/Both/none
Family history of obesity: Mother/Father/Both/None

Examination:
Height(meters)
Weight(kg)
Body Mass Index(kg/m2)

Blood Pressure
CVS
RS
Anemia
Pedal edema
Per abdomen
Per vaginal

Investigations
Blood grouping and typing
HIV
Hb
Urine Albumin &Sugar
Blood Urea ,Serum creatinine
Liver function test
OGCT and OGTT (24-28 weeks)
(75 gm oral glucose)

Mode of delivery
Term/preterm :
Spontaneous/induced :
Labournaturals /Outlet Forceps/ Vacuum/ Cesarean
Complications during labour :
Maternal injury : Yes/ No
Shoulder Dystocia : Yes/No
PPH : Yes/No If yes, Medically managed / Surgically managed :
Postnatal period :
Difficulty in Lactation : Yes/No

If cesarean-elective/emergency
Indication for caesarean :
Type of incision : Pfannensteil/RPM/others
Closed with drain/not :

Postoperative period
Wound infection : Yes/No
If yes , Pus culture :
Thromboprophylaxis : Yes / No
Respiratory infection : Yes / No
Other complications if any :

Baby details
Term/preterm :
Alive/deadborn/stillbirth
Sex : Male / Female
Birth weight :
Apgar 1min : 5min :
Admission in NICU : Yes/No
If yes, reason and outcome :
Congenital anomalies : Yes/No
Type of anomaly :
Postnatal follow–up :

INFORMATION SHEET

- We are conducting a study on the impact of BMI on perinatal and pregnancy outcome
- We are selecting antenatal women according to the need for the study. We wish that you participate in this study.
- Your participation in this study will not affect your AN care or any treatment if needed .
- The privacy of the patients in the research will be maintained throughout the study.
- In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.
- Taking part in this study is voluntary. You are free to decide whether to participate in this study or withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.
- The results of the study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Signature of the Investigator Signature of the Participant

Date:

CONSENT FORM

STUDY TITLE : HIGH QUETELET'S BODY MASS INDEX AND ITS EFFECT IN PREGNANCY: MATERNAL AND FETAL OUTCOME

STUDY CENTRE : DEPARTMENT OF OBSTETRICS AND GYNECOLOGY, MADRAS MEDICAL COLLEGE, CHENNAI

PARTICIPANT NAME: AGE: MRD NO:

I confirm that I have understood the purpose of procedure for the above study, I have the opportunity to ask the question and all my questions and doubts have been answered to my satisfaction.

I have been explained about the possible complications that may occur during the procedure. I understand that my participation in the study in voluntary and that I am free to withdraw at any time without giving any reason.

I understand that investigator, regulatory authorities and the ethics committee will not need my permission to look at my health records both in respect to the current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I understand that my identity will not be revealed in any information released to third parties of published, unless as required under the law. I agree not to restrict the use of any or results that arise from the study.

I hereby consent to participate in this study of **"HIGH QUETELET'S BODY MASS INDEX AND ITS EFFECT IN PREGNANCY: MATERNAL AND FETAL OUTCOME".**

Signature of Investigator : Place : Chennai

Signature / Thumb Impression of patient : Date

KEY WORDS

Body mass index

Pre eclampsia

Gestational Diabetes mellitus

Premature rupture of membranes

Anemia

Abortion

Still birth

Macrosomia

Post partum haemorrhage

Caeserian delivery

Thromboembolism

Lactational dysfunction.

Wound gaping

Intra uterine growth retardation

Preterm birth

Oligohydramnios

Instrumental delivery

Pyrexia

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI 600 003

EC Reg.No.ECR/270/Inst./TN/2013
Telephone No.044 25305301
Fax: 011 25363970

CERTIFICATE OF APPROVAL

To
Dr.M.Shanthini
Post Graduate in M.S. O & G
Madras Medical College
Chennai 600 003

Dear Dr.M.Shanthini ,

The Institutional Ethics Committee has considered your request and approved your study titled **"HIGH QUETELET'S BODY MASS INDEX AND ITS EFFECT IN PREGNANCY: MATERNAL AND FETAL OUTCOME" - NO.15012017 (IV).**

The following members of Ethics Committee were present in the meeting hold on **31.01.2017** conducted at Madras Medical College, Chennai 3

1.Dr.C.Rajendran, MD.,	:Chairperson
2.Dr.M.K.Muralidharan,MS.,M.Ch.,Dean, MMC,Ch-3	:Deputy Chairperson
3.Prof.Sudha Seshayyan,MD., Vice Principal,MMC,Ch-3	: Member Secretary
4.Prof.B.Vasanthi,MD., Prof.of Pharmacology.,MMC,Ch-3	: Member
5.Prof.S.Suresh,MS, Prof. of Surgery,MMC,Ch-3	: Member
6.Prof.N.Gopalakrishnan,MD,Director,Inst.of Nephrology,MMC,Ch	: Member
7.Prof.S.Mayilvahanan,MD,Director, Inst. of Int.Med,MMC, Ch-3	: Member
8.Tmt.J.Rajalakshmi, JAO,MMC, Ch-3	: Lay Person
9.Tmt.Arnold Saulina, MA.,MSW.,	:Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary – Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003

URKUND

Urkund Analysis Result

Analysed Document:	Thesis book.pdf (D42329627)
Submitted:	10/9/2018 4:24:00 PM
Submitted By:	shanthinim15@gmail.com
Significance:	3 %

Sources included in the report:

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https://en.wikipedia.org/wiki/Body_mass_index
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13

CERTIFICATE – II

This is to certify that this dissertation work titled **"HIGH QUETELET'S BODY MASS INDEX AND ITS EFFECT IN PREGNANCY : MATERNAL AND FETAL OUTCOME"** of the candidate **Dr. SHANTHINI M,** with **Registration Number: 221616013** for the award of **M.S. Degree** in the branch of **Obstetrics and Gynaecology,** I personally verified the urkund.com website for the purpose of Plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows **3%** of Plagiarism in the dissertation.

Signature of the Guide

Dr. N. HEMALATHA, M.D., DGO.,
Professor in Obstetrics and
Gynaecology,
Institute of Social Obstetrics,
Govt. Kasturba Gandhi Hospital,
Madras Medical College,
Chennai-600003.

Sl No	Name	Age	BMI	Abortion	Preeclamps	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
1	Abirama	26	21.9								✓													
2	Tumaraich	27	24.24							✓	✓									✓				✓
3	Farzana	24	21.08										✓						✓					
4	Muniyammal	26	21.94				✓			✓	✓									✓				✓
5	Anbuseedar	26	19.22		✓							✓												
6	Meera Devi	30	20.43							✓	✓			✓										
7	Aishwarya	18	23.31								✓													
8	Noori Ajith	26	22.37			✓							✓										✓	
9	Kiruba	29	29.03								✓													
10	Sumathi	28	23.73								✓													
11	Amina	24	23.19				✓						✓											
12	Mala	19	22.40			✓					✓													
13	Roja	24	21.87							✓	✓													
14	Lakshmi	31	24.45								✓								✓					
15	Vijaya	22	22.77						✓		✓													
16	Fizun	29	24.65										✓											
17	Roja	24	20.38								✓													
18	Shyla	25	24.54				✓						✓											
19	Akila	23	19.15				✓	✓					✓											
20	Manimale	26	24.13									✓												

Sl No	Name	Age	BMI	Abortion	Preeclamps	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
21	Devi	22	22.77										✓											
22	Muthupriya	25	21.10										✓											
23	Elsy	19	23.4						✓	✓	✓									✓				✓
24	Punitha	27	24.73										✓										✓	
25	Vanitha	25	22.44		✓						✓													
26	Kamatchi	21	20.17							✓	✓								✓					✓
27	Thikyavathy	20	20.5								✓									✓				✓
28	Bharathy	20	22.0							✓	✓													
29	Maheshwari	22	21.03										✓											
30	Mythili	19	20.5									✓												
31	Shanthi	21	21.06								✓													
32	Sharmile	27	19.05			✓					✓													
33	Sivanthi	27	21.36				✓				✓													
34	Datchajini	20	20.08									✓												
35	Thayira Banu	24	20.44										✓						✓	✓				✓
36	Sandhya	22	21.4								✓													
37	Muniyammel	27	19.72			✓					✓									✓				
38	Divya	23	21.83								✓													
39	Subbulakshmi	22	21.48				✓					✓							✓					
40	Elamozhi	22	22.43								✓													

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrumen	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosom	Still Birth	Post Term	NIUC
41	Nagajothy	27	20.01							✓	✓													
42	Saraswathy	23	22.8						✓		✓								✓					✓
43	Sangeetha	22	23.07				✓						✓											
44	Hemavathy	27	24.03		✓			✓			✓									✓				✓
45	Shaheena	21	22.1								✓													
46	Elekya	23	24.24								✓													
47	Neelavathy	35	22.89							✓		✓												
48	Lekha	21	20.09					✓					✓											
49	Bhavani	22	20.03										✓											
50	Nandhini	20	24.05										✓											
51	Vaiseli	20	20.81				✓						✓							✓				✓
52	Pavithra	24	24.14		✓						✓													
53	Ayesha	20	21.68						✓		✓								✓					
54	Muniyamma	20	22.31										✓											
55	Bakiyalakshmi	25	21.91			✓			✓	✓	✓									✓				✓
56	Abirami	20	22.94								✓													
57	Priya	18	23.44								✓								✓					
58	Shabni	23	22.72										✓											
59	Shakile	26	23.78					✓			✓													
60	Reetha	22	20.78								✓													

Sl No	Name	Age	BMI	Abortion	Preeclamps	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
61	Valli	30	24.11								✓													
62	Amudha	37	20.45				✓				✓													
63	Kalaiyarasi	25	24.14						✓				✓	✓										
64	Sindhuja	23	24.41							✓	✓									✓				✓
65	Jenifer	24	23.11		✓								✓						✓					✓
66	Soundari	25	21.93										✓											
67	Keerthana	25	22.64								✓													
68	Lakshmi	22	22.03								✓													
69	Saradha	23	20.03							✓	✓													
70	Suganya	24	24.52								✓													
71	Kuttiyammal	21	24.14				✓					✓												
72	Revathy	20	24.39		✓								✓	✓										
73	Megeshwari	23	24.22										✓											
74	Shanmuga	19	22.03							✓	✓									✓				
75	Preethi	25	23.50			✓							✓											
76	Banumathi	27	21.08							✓			✓						✓					✓
77	Nadhya	28	21.91				✓				✓													
78	Lalitha	22	24.46						✓		✓													
79	Aruna	24	21.01								✓													
80	Selvi	21	23.01									✓												

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosom	Still Birth	Post Term	NIUC
81	Sridevi	38	22.31								✓													
82	Mahalakshmi	28	20.81										✓											
83	Parimala	27	22.94							✓			✓	✓						✓				✓
84	Leelevathy	29	23.81					✓					✓											
85	Kamatchi	29	22.06				✓					✓												
86	Akila	23	24.89		✓						✓								✓					✓
87	Shanthi	31	23.07										✓											
88	Satya	25	23.61							✓	✓													
89	Priya	30	23.15								✓													
90	Lavanya	20	23.11			✓					✓										✓			
91	Nagarani	30	23.92								✓													
92	Jansi	24	23.44								✓								✓					✓
93	Divya	26	21.94								✓													
94	Vinitha	20	24.24									✓												
95	Sumaya	20	24.78							✓	✓			✓						✓				✓
96	Lakshmi	30	20.83								✓													
97	Gomathy	23	23.83				✓			✓	✓													
98	Valli	30	23.63					✓					✓											
99	Sumathy	28	23.05								✓													
100	Sonia	22	23.01								✓													

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
101	Angelin	27	22.64										✓											
102	Narmadha	26	24.20										✓											
103	Nandhini	24	23.28	✓																				
104	Chithra	25	19.42						✓		✓			✓										
105	Sameera	29	24.14								✓								✓					✓
106	Meena	21	22.60		✓		✓				✓													
107	Sumithra	29	21.51									✓												
108	Mahalakshmi	26	20.24			✓							✓			✓								
109	Nandhini	25	23.44							✓	✓									✓				✓
110	Revathy	23	19.90								✓													
111	Asira Bee	19	22.94								✓													
112	Kavitha	24	21.86										✓											
113	Lalitha	28	24.76							✓			✓											
114	Kalaiyarasi	25	22.07				✓				✓			✓										
115	Sumathy	23	23.73								✓													
116	Hemavathy	34	23.56								✓													
117	Vaishalini	21	24.98								✓													
118	Nancy	25	23.83					✓	✓	✓			✓							✓				✓
119	Nandhini	25	22.89									✓												
120	Selvi	26	23.15								✓													

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrumen	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosom	Still Birth	Post Term	NIUC
121	Yasrrin	21	21.25										✓											
122	Analorpavam	31	22.01								✓													
123	Prameela	21	21.36						✓		✓									✓				✓
124	Saranya	24	19.48			✓					✓													
125	Pramila	21	24.44		✓						✓													
126	Sowmya	20	24.54								✓													
127	Arokyasasi	30	22.83				✓		✓			✓		✓						✓				✓
128	Harini	21	21.05								✓													
129	Revathy	25	24.52			✓					✓													
130	Uma	24	24.77										✓											
131	Matha Devi	25	24.11										✓											
132	Priyadharshin	20	21.36								✓													
133	Gayathri	24	24.17		✓								✓						✓					
134	Nagapriya	26	22.46								✓													
135	Narmedha	23	21.34				✓					✓												
136	Sabiya Begam	22	21.93							✓	✓									✓				✓
137	Nandhini	23	23.65		✓						✓													
138	Anandhi	26	24.91								✓													
139	Kamzhandai	27	21.33			✓							✓								✓			
140	Yasmeer	22	23.42								✓													

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrumen	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosom	Still Birth	Post Term	NIUC
141	Iswarya	21	20.81										✓											
142	Valermethy	23	21.64										✓											
143	Maheshwarn	24	24.91		✓						✓								✓					✓
144	Rashiya Banu	24	21.93						✓		✓													
145	Nandhini	22	21.21				✓						✓							✓				✓
146	Pushpa	25	24.84			✓					✓			✓										
147	Saraswathy	23	21.48								✓													
148	Nandhini	25	21.23								✓													
149	Roja	20	20.44								✓									✓				
150	Nandhini	23	21.78								✓													
151	Meera Devi	30	24.44				✓					✓												
152	Sandhiya	20	22.81								✓													
153	Iswarya	21	22.77								✓													
154	Lakshmi	22	24.34									✓												
155	Meenakshi	28	24.88							✓	✓													
156	Chithra	29	24.14										✓											
157	Jainap	25	23.12						✓				✓							✓				✓
158	Sumithra	19	21.46										✓											
159	sasi Rekha	27	23.78				✓			✓			✓											
160	Kalpana	28	24.89								✓													

Sl No	Name	Age	BMI	Abortion	Preeclamps	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
161	Devaki	21	23.83								✓											✓		
162	Priya	19	22.94	✓																				
163	Usha Rani	26	24.44				✓		✓		✓								✓	✓				✓
164	Varsha	20	24.65		✓								✓											
165	Janani	25	22.86								✓													
166	Bhavani	21	22.89								✓			✓										
167	Devi	29	23.61										✓											
168	Sangeetha	24	24.69			✓					✓				✓									
169	Vijayeshwari	22	20.45		✓				✓		✓						✓		✓					✓
170	Nithya	21	24.65									✓				✓								
171	Janaki	18	20.83				✓				✓													
172	Vinshiya	27	19.3								✓													
173	Padma	20	23.45										✓											
174	Yasmin	24	21.72								✓													
175	Muniammel	26	21.94							✓	✓									✓				✓
176	Kalpana	19	20.40				✓				✓													
177	Abitha	26	22.37						✓				✓											
178	Jamuna Rani	32	24.23										✓											
179	Deepika	24	23.42										✓											
180	Nirmala	25	23.44	✓																				

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
182	Vijayalakshmi	23	24.69										✓											
182	Meheshwari	20	20.27		✓				✓				✓						✓					✓
183	Vinotha	28	20.40				✓				✓													
184	Ruth	27	24.44										✓											
185	Jega Jothy	24	22.35								✓													
186	Sandhya	28	20.28			✓							✓											
187	Sangeetha	22	19.63				✓						✓											
188	Hemalatha	24	24.24						✓		✓			✓										
189	Dhanalakshm	20	19.56				✓				✓													
190	Thameena	19	23.35					✓		✓			✓							✓				✓
191	Kamatchi	23	19.57								✓													
192	Tharani	25	22.55			✓							✓			✓								
193	Thenmozhi	24	21.5								✓													
194	Shalini	23	23.4									✓												
195	Sowmya	19	22.5		✓							✓							✓					✓
196	Anbuselvi	23	21.9								✓													
197	Caroline	24	20.6						✓	✓	✓									✓				✓
198	Pradeepa	22	22.7								✓													
199	Nandhini	27	23.3						✓		✓													
200	Ashwini	25	22.6										✓											

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
1	Sricithra	22	28.1						✓	✓		✓					✓							✓
2	Siva Ranjini	26	26.22								✓													
3	Bhavani	29	25.28								✓													
4	Viji Priya	22	36.44		✓	✓	✓						✓						✓					✓
5	Padmashree	25	34.70			✓				✓			✓			✓	✓							
6	Anitha Shalini	27	35.25	✓					✓															
7	Vanitha	27	39.96		✓	✓					✓				✓				✓	✓	✓			✓
8	Gayathri	31	38.52	✓																				
9	Umma Salma	34	31.62			✓				✓		✓												
10	Gajalakshmi	37	35.94										✓											
11	Kanaga	28	36.68		✓		✓	✓					✓			✓	✓							✓
12	Sharmila	27	34.67		✓	✓							✓						✓					✓
13	Paramashwari	28	40.89		✓	✓							✓								✓			
14	Mangalalaks	32	26.58										✓											
15	Nirmala	31	33.33		✓								✓	✓				✓						
16	Nandhini	26	30.42			✓			✓		✓													
17	Saranya	18	27.26			✓				✓	✓					✓								
18	Jothi	28	34.23					✓					✓				✓							✓
19	Fathima	29	33.78								✓			✓										
20	Savitha	27	30.70			✓							✓											

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
21	Manju Baskar	33	34.17			✓			✓	✓			✓		✓	✓	✓							
22	Sudandra	30	28.89			✓						✓												
23	Baby	28	26.28			✓						✓												
24	Sabeera	27	27.04			✓				✓			✓											
25	Janath Banu	21	28.5								✓													
26	Shanthi	24	28.6		✓		✓				✓			✓										
27	Shiny	26	30.11		✓						✓								✓	✓				✓
28	Radhika	22	28.3								✓													
29	Chithradevi	22	26.94			✓					✓													
30	Kalaivani	23	27.11			✓					✓										✓			
31	Mubeena	24	31.7								✓													
32	Ikaya Rani	27	27.56	✓					✓															
33	Kalaiyarasi	29	27.7										✓										✓	
34	Uma	21	27.58		✓								✓						✓					✓
35	Kerthika	23	25.97		✓		✓			✓			✓						✓					✓
36	Deepa	19	27.47		✓					✓			✓						✓					✓
37	Bagyalakshmi	25	25.39										✓											
38	Banupriya	24	30.67		✓								✓									✓		
39	Menaga	23	29.7				✓						✓											
40	Rohini	22	29.43										✓											

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
41	Gayathri	20	25.71						✓		✓													
42	Vinodhini	23	26.3			✓				✓	✓													
43	Kousalya	21	28.13		✓		✓				✓								✓					✓
44	Girija	24	28.44								✓									✓			✓	
45	Mahalakshmi	32	26.16		✓	✓					✓								✓					✓
46	Dilshad	24	26.11										✓											
47	Kumudavalli	20	26.64	✓																				
48	Shaik Rihane	20	27.34		✓				✓				✓											
49	Pavithra	21	29.76							✓			✓											
50	Prabavathy	20	25.45			✓				✓			✓								✓			✓
51	Renjitha	20	25.58		✓		✓						✓						✓					✓
52	Mala	24	25.56			✓							✓								✓			
53	Nithya	23	29.43		✓			✓					✓									✓		
54	Pavithra	24	26.22								✓													
55	Anthonyma	23	30.1		✓					✓	✓													
56	Sasikala	22	32.39			✓	✓				✓													✓
57	Barkari	24	29.72								✓													
58	Sangeetha	27	30.48			✓			✓			✓												
59	Tamilselvi	24	28.19							✓			✓											
60	Jeevitha	27	26.03								✓													

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
61	Sivaranjini	23	31.23			✓							✓											
62	Muthu Priya	24	28.04						✓	✓			✓											
63	Vijitha	28	29.16	✓																				
64	Sasikala	22	25.96		✓		✓						✓						✓					✓
65	Clara	28	27.73		✓	✓				✓			✓						✓					✓
66	Kowsalya	22	25.3						✓			✓												
67	Aishwarya	24	29.42				✓				✓											✓		
68	Remya	27	30.44		✓			✓				✓							✓					✓
69	Vidhya	25	29.14										✓											
70	Geetha	23	27.41			✓							✓								✓			✓
71	Shanbagavalli	24	27.01										✓	✓										
72	Eldammel	20	25.97		✓	✓			✓	✓			✓											
73	Rekha	27	27.69										✓											
74	Selvi	32	28.30										✓											
75	Deepa	27	28.15		✓		✓						✓											✓
76	Manjula	30	35.02			✓				✓			✓											
77	Reena	27	32.28										✓											
78	Bhavani	24	34.70								✓													
79	Chandra	30	31.47								✓													
80	Madhana	29	29.97		✓						✓													

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
81	Kareema	29	28.40			✓					✓													
82	Sarala	25	30.13								✓								✓					✓
83	Sharmila	25	36.73		✓						✓								✓	✓				✓
84	Aruna	22	35.03		✓						✓									✓				
85	Punithvathi	40	32.32			✓				✓			✓								✓			
86	Shanthakumar	29	34.81		✓								✓				✓		✓					✓
87	Padmavathy	27	28,93				✓						✓											
88	Ranjitha	19	26.67		✓				✓			✓												
89	Kavitha	22	29.17									✓				✓								
90	Kanagalakshm	29	30.61								✓													
91	Sruthi	23	26.16			✓					✓										✓			
92	Rajeshwari	24	28.45		✓						✓													
93	Sowmya	22	25.20				✓						✓											
94	Sharmila	23	25.85							✓			✓											✓
95	Selvasani	22	28.89			✓							✓									✓		
96	Manju	23	26.49										✓											
97	Arul mozhi	24	28.83				✓						✓											
98	Kalaivani	27	27.95			✓				✓	✓													✓
99	Kowsalya	26	28.57	✓																				
100	Vijayalakshmi	24	28.04										✓											

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
101	Shaima	24	29.43		✓								✓											
102	Sainash	21	33.56			✓							✓											
103	Sivagami	22	30.86		✓		✓	✓					✓						✓					✓
104	Vinela	30	28.54			✓				✓			✓								✓			
105	Nagavalli	24	27.93						✓		✓													
106	Navasiya	30	30.82			✓							✓											
107	Durga Devi	26	27.77			✓					✓													
108	Yeseemani	31	27.93										✓											
109	Divya	24	32.84			✓							✓										✓	
110	Mahalakshmi	26	29.28										✓	✓										
111	Subitha	21	36.16								✓													
112	Maninozhi	27	27.77		✓							✓							✓					✓
113	Kaviya Shree	20	31.64		✓							✓												
114	Revathi	31	29.16		✓		✓						✓			✓			✓					✓
115	Chithra	29	27.06										✓											
116	Mohana	29	26.04			✓				✓			✓								✓		✓	✓
117	Meenakshi	28	27.83				✓						✓											
118	Mariya	26	27.56								✓													
119	Subashini	22	26.3								✓													
120	Praveena	27	31.62								✓													

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
121	Sathya	37	26.20		✓		✓						✓						✓	✓				✓
122	Sagundala	35	28.13			✓					✓													
123	Shamila	25	28.76								✓													
124	Kalaivani	26	30.08		✓	✓							✓											✓
125	Sumaya	27	27.05								✓													
126	Tamilmozhi	25	25.78			✓				✓			✓					✓						
127	Varalakshmi	23	26.90			✓						✓									✓			
128	Sherin	27	28.65								✓													
129	Kavitha	22	28.57		✓		✓				✓					✓			✓					✓
130	Deepa	19	29.35		✓								✓											
131	Mala	26	27.04									✓												
132	Shanthi	28	27.41										✓											
133	Kasthuri	31	26.74			✓				✓			✓								✓			
134	Devi	25	25.88										✓											
135	Nalini	22	32.89		✓		✓						✓					✓	✓	✓				✓
136	Rahima	25	29.04								✓													
137	Kalaiarasi	24	26.67								✓													
138	Kumudha	19	25.56		✓								✓											
139	Clarit Emelda	23	28.94				✓						✓						✓					✓
140	Chithra	23	32.84										✓	✓							✓			

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
141	Thaseen	26	29.27			✓				✓	✓													
142	Fathima	29	28.15										✓											
143	Dhivya	27	27.53		✓		✓						✓			✓			✓					✓
144	Madhusri	21	27.34										✓											
145	Jayarshre	24	27.43										✓											
146	Kalavathy	25	28.15					✓					✓											✓
147	Kanchana	22	27.94		✓																			
148	Deepthika	25	27.34			✓				✓	✓													
149	Sameemurish	27	26.22										✓											
150	Maareshwari	27	26.78		✓		✓						✓						✓					✓
151	Gayathri	24	26.44										✓											
152	Umasalma	24	27.41										✓											
153	Yasmin	28	27.56				✓						✓											✓
154	Nivetha	21	31.63			✓						✓												
155	Maniregale	22	28.93		✓							✓							✓					✓
156	Remya	27	32.05		✓	✓				✓	✓							✓			✓			✓
157	Nandhini	26	25.72										✓											
158	Revathy	22	39.11		✓	✓	✓	✓					✓									✓		
159	Vasanthi	25	26.13							✓	✓													
160	Sravanthi	24	25.78	✓																				

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
161	Sabeera	27	27.24		✓		✓						✓											
162	Nelathi	22	28.04			✓				✓		✓				✓			✓	✓	✓			✓
163	Archana	24	37.84										✓											
164	Sudandra	30	26.67		✓			✓			✓			✓										
165	Gajalakshmi	27	26.56										✓											
166	Sandhya	24	25.33						✓		✓													
167	Lavanya	22	25.33								✓													
168	Malathy	28	27.59		✓	✓						✓						✓		✓				✓
169	Revathi	23	26.57										✓											
170	Revathy	26	32.05			✓					✓										✓			
171	Radhika	24	30.02										✓											
172	Bhavani	30	26.16					✓					✓											✓
173	Kalpana	27	28.62										✓											
174	Kalaselvi	30	25.68		✓		✓				✓								✓	✓				✓
175	Muthupriya	25	27.59								✓													
176	Rubini	26	28.67										✓											
177	Bhuvaneshwa	22	28.91										✓											
178	Gayathri	28	27.27		✓								✓											
179	Anandhi	28	30.86								✓													
180	Jayanthi	24	27.77			✓							✓											

Sl No	Name	Age	BMI	Abortion	Preeclamp	GDM	Oligo	Abruption	Anemia	PROM	Vaginal	Instrument	LSCS	PPH	Pyrexia	Wound	Prolonged	Lactation	IUGR	Preterm	Macrosomi	Still Birth	Post Term	NIUC
181	Asha	31	32.46								✓													
182	Sangeetha	32	30.22			✓							✓											
183	Agalya	22	30.26		✓	✓							✓						✓					✓
184	Sudha	31	32.04										✓											
185	Arnula	32	26.44									✓												
186	Nishathi	29	26.67								✓													
187	Punitha	30	25.08										✓											
188	Ashwini	25	28.87		✓		✓				✓									✓				✓
189	Sunitha	19	26.7										✓											
190	Saranya	24	30.02			✓				✓		✓												
191	Praveena	22	29.80				✓						✓								✓			✓
192	Nandhini	27	27.08		✓								✓						✓	✓				✓
193	Suganya	20	26.58										✓											
194	Malar	23	29.42										✓											
195	Arulmozhi	21	32.05			✓							✓											
196	Jeyanthi	19	25.84		✓						✓													
197	Rita	26	29.76					✓			✓													✓
198	Mythili	24	27.04								✓													
199	Priyanka	22	30.68										✓											
200	Reshma	21	27.96		✓								✓											