

A RETROSPECTIVE STUDY ON PRE-GRAVID DETERMINANTS AND PREVALENCE OF GESTATIONAL DIABETES MELLITUS AND ITS IMPACT ON MODE OF FOETAL DELIVERY.

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ABSTRACT

High blood sugar, or glucose, known as gestational diabetes, is a condition that often goes away after delivery. While it can occur at any point during pregnancy, the second or third trimester is when it occurs most frequently. Put differently, the disease known as gestational diabetes mellitus (GDM) is caused by a hormone produced by the placenta that interferes with the body's ability to use insulin. There are two types of GDM: A1GDM and A2GDM. Diet-controlled gestational diabetes (GDM), also known as A1GDM, is gestational diabetes treated without medication and responsive to nutritional therapy. Conversely, A2GDM is gestational diabetes treated with medicine in order to attain appropriate glycaemic control. Based on inclusion and exclusion criteria, out of 1500 patients 150 were included in the research. According to the study, the prevalence of gestational diabetes in mothers who are pregnant was estimated to be close to 10%, and it was discovered that the condition increased with increasing maternal age, BMI, and family history. Additional research on the total number of LSCS cases showed that gestational diabetes mellitus (GDM) significantly affects the method of foetal delivery (63% of GDM cases undergone LSCS). Furthermore, the chi-square test indicated that this link was statistically significant (p - value = 0.046499). that is, $p < 0.05$, demonstrating the statistical significance of the research. In this study, the over prevalence of gestational diabetes mellitus among expectant mothers was 10%. Pre-gravid predictors of GDM included high BMI, family history, and advanced maternal age.

This study also discovered that the method of foetal delivery is significantly impacted by GDM.

KEYWORDS: GDM, LSCS, OHA, Insulin, MNT.

1. INTRODUCTION

Diabetes mellitus is a heterogeneous group of disorders characterized by hyperglycaemia due to an absolute or relative deficit. It is a metabolic condition marked by unnecessarily high blood glucose levels. Type 1, Type 2, Maturity-Onset Diabetes of The Young (MODY), Gestational Diabetes, Neonatal Diabetes, and secondary causes resulting from endocrinopathies, steroid use, etc. are some of the different types of DM. Type 1 diabetes mellitus (T1DM) and Type 2 diabetes mellitus (T2DM) are the two primary subtypes of DM, and both are typically brought on by faulty insulin secretion (T1DM) and/or action (T2DM).

Gestational diabetes is high blood sugar (glucose) that develops during pregnancy and usually disappears after giving birth. It can happen at any stage of pregnancy, but is more common in

the second or third trimester. In other words, Gestational diabetes mellitus (GDM) is a condition in which a hormone made by the placenta prevents the body from using insulin effectively. GDM can be classified as A1GDM and A2GDM. Gestational diabetes managed without medication and responsive to nutritional therapy is diet-controlled gestational diabetes (GDM) or A1GDM. On the other side, gestational diabetes managed with medication to achieve adequate glycaemic control is A2GDM.

GESTATIONAL DIABETES AND INSULIN RESISTANCE:

Insulin is the primary hormone produced in the beta cells of the islets of Langerhans in the pancreas. Insulin is key in the regulation of the body's blood glucose level. Insulin stimulates cells in the skeletal muscle and fat tissue to absorb glucose from the bloodstream. In the presence of insulin resistance, this uptake of blood glucose is prevented and the blood sugar level remains high. The body then compensates by producing more insulin to overcome the resistance and in gestational diabetes, the insulin production can be up to 1.5 or 2 times that seen in a normal pregnancy. Several pregnancy hormones are thought to disrupt the usual action of insulin as it binds to its receptor, most probably by interfering with cell signalling pathways. The glucose present in the blood crosses the placenta via the GLUT1 carrier to reach the foetus. If gestational diabetes is left untreated, the foetus is exposed to an excess of glucose, which leads to an increase in the amount of insulin produced by the foetus. As insulin stimulates growth, this means the baby then develops a larger body than is normal for their gestational age. Once the baby is born, the exposure to excess glucose is removed. However, the newborn still has increased insulin production, meaning they are susceptible to low blood glucose levels.

Signs and symptoms include excessive thirst with dry mouth, frequent urination, recurrent infections including thrush or yeast infection, weakness, blurred vision. Most times women with GDM experience no symptoms.

The delayed or dysfunctional response of the beta cells to glycaemic levels in the pancreas and the marked insulin resistance brought on by placental hormone release are thought to be the two causes of gestational diabetes. The primary hormone associated with elevated insulin resistance in GDM is human placental lactogen. Growth hormone, prolactin, corticotropin-releasing hormone, and progesterone are additional hormones linked to the onset of this condition. These hormones help to promote insulin resistance and hyperglycaemia during pregnancy.

Some clinical risk factors for gestational diabetes have been documented. These clinical aspects comprise;

- Increased body weight
- Decreased physical activity
- A first degree relative with diabetes mellitus
- Prior history of gestational diabetes or a newborn with macrosomia, metabolic comorbidities like hypertension.
- Low HDL
- Triglycerides greater than 250
- Polycystic ovarian syndrome
- Haemoglobin A1C greater than 5.7
- Abnormal oral glucose tolerance test

- Any significant marker of insulin resistance (acanthosis nigricans)
- Past medical history of cardiovascular diseases.

PATHOPHYSIOLOGY

During pregnancy, the placenta secretes a hormone called the human placental lactogen. It has a similar structure to growth hormone and triggers crucial metabolic changes to promote the maintenance of the foetal nut. This hormone is capable of provoking alterations and modifications in the insulin receptors. The following molecular variations appear to have links to diminishing glucose uptake at peripheral tissues; 1) molecular alteration of the beta-subunit insulin receptor, 2) diminished phosphorylation of tyrosine kinase, 3) remodelling's in the insulin receptor substrate-1 and phosphatidylinositol 3-kinase. Maternal high glucose levels cross the placenta and produce foetal hyperglycaemia. The foetal pancreas gets stimulated in response to the hyperglycaemia. Insulin anabolic properties induce foetal tissues to growth at an increased rate.

The effects of GDM on neonates include

- Large birth weights
- Premature births
- Rebound hypoglycaemia
- Electrolyte imbalance
- Congenital malformation.

PROGNOSIS

A 75g oral glucose tolerance test is advised between 4 and 12 weeks after delivery to rule out the likelihood of developing type 2 diabetes, impaired fasting glucose, or impaired glucose tolerance test. The ADA and ACOG advise women who acquired GDM and had normal postpartum screening results to repeat testing every one to three years.

MANAGEMENT

The management of gestational diabetes mellitus mainly includes:

1. Medical nutrition therapy
 - ❖ A carbohydrate-restricted diet that promotes healthy weight gain, normoglycemia, and the absence of ketosis while offering optimal nutrition.
 - ❖ BMI, BMR, PAL, glucose levels, personal and cultural eating habits, and anticipated physiological consequences of pregnancy on mothers and foetuses are all taken into account in an individualised diet plan.
 - ❖ The total amount of carbs, how they are distributed during meals and snacks, their types (cereals, pulses, starchy vegetables, and fruits), and their glycaemic index can all be changed without having an impact on the total number of calories.
 - ❖ Calorie intake-based pre-pregnancy BMI and desirable weight gain.
 - 35-40 Cal/kg desirable body weight for underweight women.
 - 30-35cal/kg desirable body weight for normal weight women.
 - 25-30 Cal/kg desirable body weight for overweight women.
 - ❖ Do not exceed 35–45% of total calories from carbs.

- ❖ A daily minimum of 175g, distributed throughout 3 meals and 2-4 snacks.
 - ❖ Fibre 28 grammes per day reduces cholesterol levels and spikes in blood sugar.
 - ❖ Fats 10% of total calories, proteins 1 gm/kg + 23 gms.
2. Pharmacological therapy
- Insulin Therapy
- Insulin is needed when blood glucose targets cannot be met by MNT or OADs.
 - Combine insulin with intermediate or long-acting times.
 - Using an insulin syringe or prefilled insulin pen to inject human insulin premix 30/70 or 40IU/ml.
 - Keep insulin in the refrigerator door at 4 to 8 °C, and utilise any open vials within a month.
 - The amount of insulin needed during pregnancy rises, from 0.7 units/kg/day in the first trimester to 0.8 units/kg/day between weeks 18 and 26 to 0.9 units/kg/day from weeks 26 to 36 to 1.0 units/kg/day from week 36 to delivery.
- Oral Hypoglycaemic Agents (Oral Antidiabetic Drugs)
- Now considered in NICE, ACOG and FOGSI guidelines for GDM
- Glyburide: There was no distinction in glycaemic control between the groups receiving insulin and glyburide. However, foetal macrosomia, 2-fold increased neonatal hypoglycaemia, and higher birth weight.
- Metformin: It easily passes the placental barrier. The outcome of the pregnancy was unaffected by glycaemic management. PIH, weight increase, new-born hypoglycaemia, and NICU admission are all decreased. As a result, OAD/OHA are more practical, more affordable, do not need extensive instruction, and have higher treatment adherence than insulin. If MNT is unsuccessful, it may be administered in place of insulin during the second and third trimesters.
- In terms of OAD/OHA, metformin may be preferable than glyburide
3. Glycaemic monitoring: SMBG and targets
 4. Foetal monitoring: ultra sound
 5. Planning on delivery.

MODE OF DELIVERY

The different types of mode of delivery are:

1. Unassisted Vaginal Delivery/Natural Childbirth: it includes induced labour.
2. Assisted Vaginal Delivery: It includes Forceps delivery, Vacuum extraction, Episiotomy, Amniotomy.
3. Caesarean Section.
4. Vaginal Birth After C-Section (VBAC).

2.METHODOLOGY

2.1 STUDY TYPE

This was a retrospective observational study.

2.2 STUDY SITE

This study was conducted in Kumaran Medical Centre Kurumbapalayam Coimbatore. The study was approved by Institutional Ethical Committee.

2.3 STUDY DURATION

The study was conducted over a period of 6 months.

2.4 STUDY POPULATION

From a total of 1500 pregnant women, about 150 GDM women were included in the study as per inclusion and exclusion criteria.

2.5 INCLUSION CRITERIA

- All inpatients diagnosed with GDM.
- Pregnant women with age 20 years and above.
- Pregnant women with high blood glucose level.

2.6 EXCLUSION CRITERIA

- Patients who are in emergency and outpatient department.
- Pregnant women which are below 20 years of age.
- Pregnant women with normal glucose level.
- Pregnant women with previous history of type 1 and type 2 diabetes mellitus.

2.7 STUDY PARAMETER

Diabetic parameters like FBS, RBS, PPPG, HbA1c, glucose tolerance test, BMI, maternal age, family history, mode of delivery.

2.8 STUDY TOOLS

1. Designed data collection form.
2. SPSS
3. Chi-square

3.RESULT

In this study, a total of 1500 medical records from Obstetrics & Gynaecology (OG) were received and 150 GDM cases were included in the study as per inclusion and exclusion criteria. The cases were collected between the periods of 2020-2022. The case records were analysed and the details like Age, Weight, Family history, Mode of delivery, Treatment were collected.

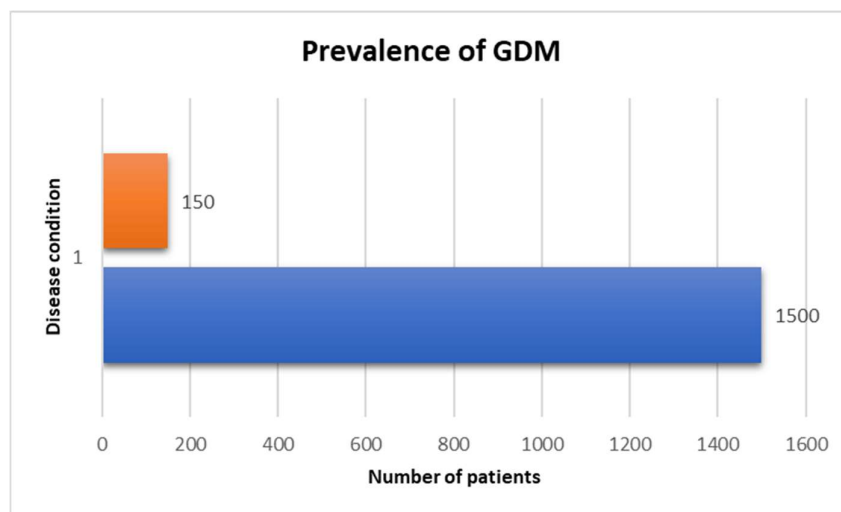
3.1 PREVALENCE OF GDM

The prevalence of GDM in pregnant women in the time period from 2020-2022 in the surveyed tertiary care hospital was found to be 10% (figure 1).

Table number 1 Prevalence of GDM

DISEASE CONDITION	NUMBER OF PATIENTS
Total number of pregnant women	1500
Number of GDM patients	150

Figure number 1 Prevalence of GDM



*Prevalence = Number of people with the disease/Number of people in the defined population x100

$$=150/1500 \times 100$$

Prevalence =10%

3.2 AGE WISE DISTRIBUTION

As shown in the figure 2 most of the GDM patients belonged to the age group of 26-30 years (46%) followed by age group of 31-35 years (31%), 36-40 years (14%) and 20-25 years (9%) of subjects in the age group of 20-40 years. In figure 2, the graph showed a rapid increase of GDM cases in patients with age group of 26-30 and a gradual decrease in GDM cases in patients of age group 31-40.

Table 2 Age distribution of GDM patients

AGE GROUP	TOTAL
20-25	14
26-30	69
31-35	46
36-40	21

Figure 2 Age distribution of GDM patients.

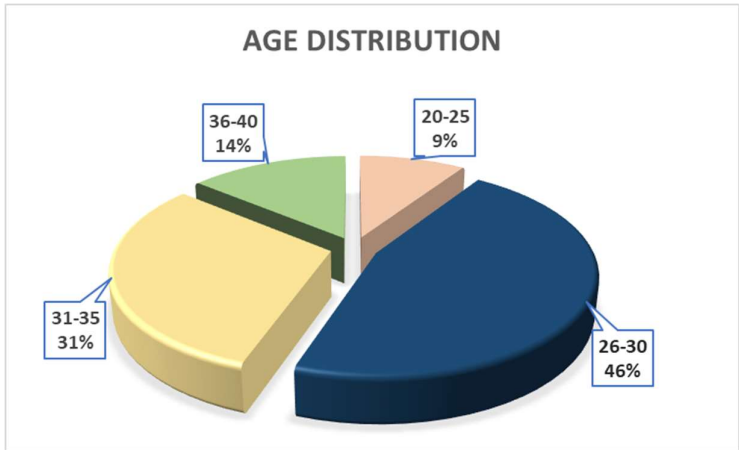
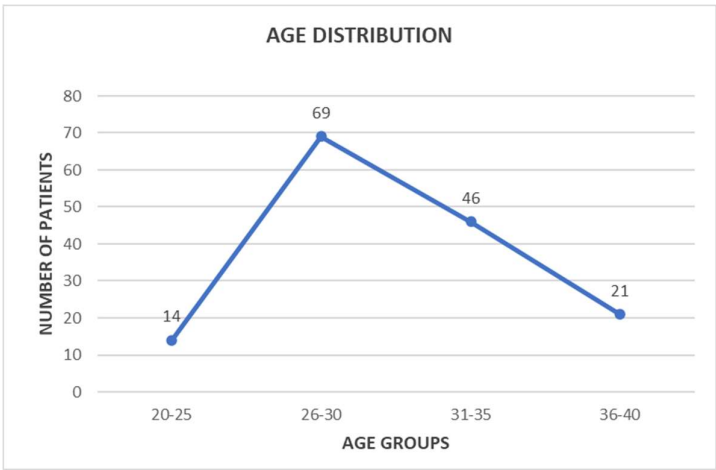


Figure 3 Graphical representation of Age distribution in GDM patients



3.3 WEIGHT DISTRIBUTION

As shown in the figure 3 most of the GDM patients belonged to the category of Obesity (70%), followed by Over weight (23%) and Normal (7%) of subjects in the weight category of Normal to Obese based on BMI calculation. Figure 4 shows numbers of cases of GDM increases with increase in BMI.

*BMI = WEIGHT (in kg)/(HEIGHT)² in m²

Normal = 18.5-24.9 kg/m²

Overweight = 25-29.9 kg/m²

Obese = >30 kg/m²

Table 3 Weight distribution in GDM patients.

PARAMETERS	NUMBER OF PATIENTS
Normal	11
Over weight	34
Obesity	105

Figure 4 Weight distribution in GDM patients.

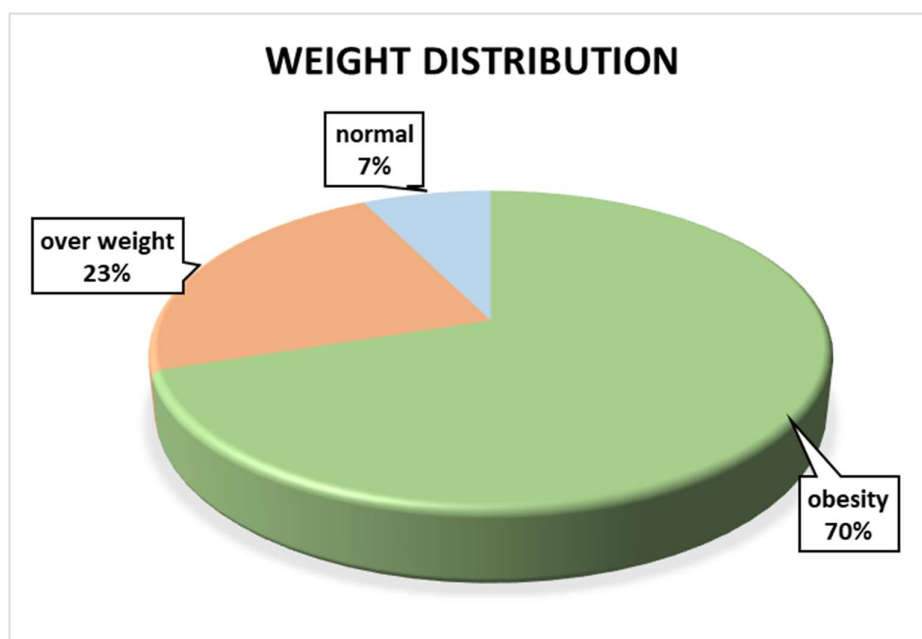


Figure 5 Weight Distribution Graph



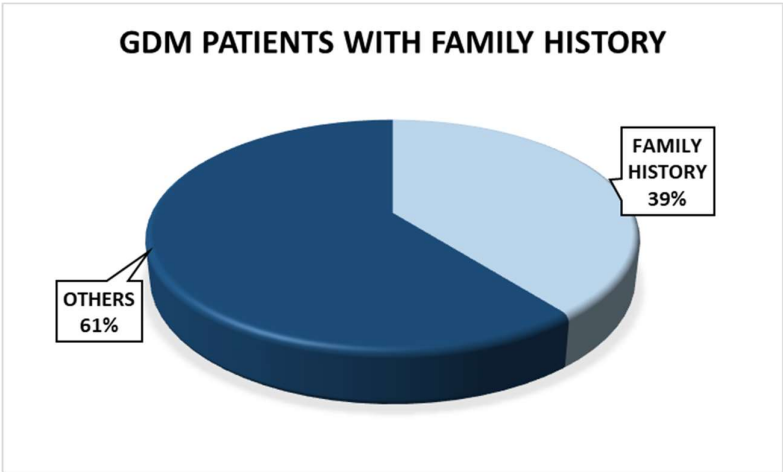
3.4 FAMILY HISTORY

As per the figure, of 150 GDM patients 39% (59) had family histories of diabetes mellitus and others 61% (91) doesn't have any previous family histories.

Table 4 Patients with family history.

PARAMETER	NUMBER OF PATIENTS
Family history	59
Others	91

Figure 6 patients with family history.



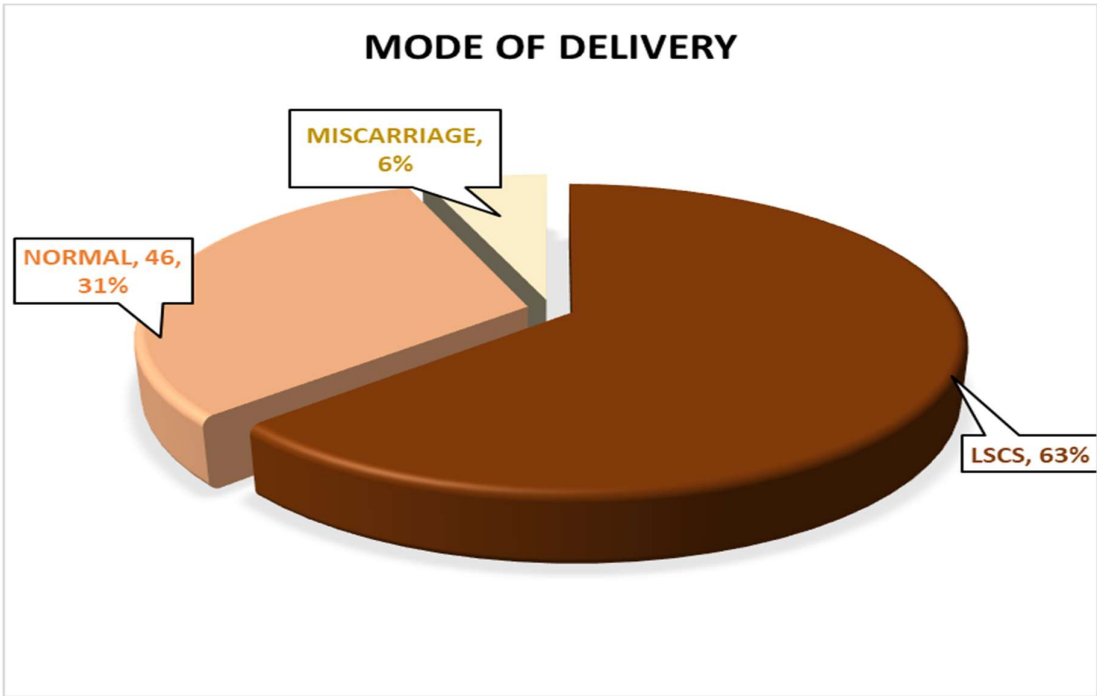
3.5 MODE OF DELIVERY

As depicted below, out of 150 GDM patients most of the patients had LSCS (63%), followed by Labour natural (31%) and miscarriage (6%).

Table 5 based on mode of delivery.

PARAMETER	NUMBER OF PATIENTS
Labour Natural	46
LSCS	95
Miscarriage	9

Figure 7 based on mode of delivery



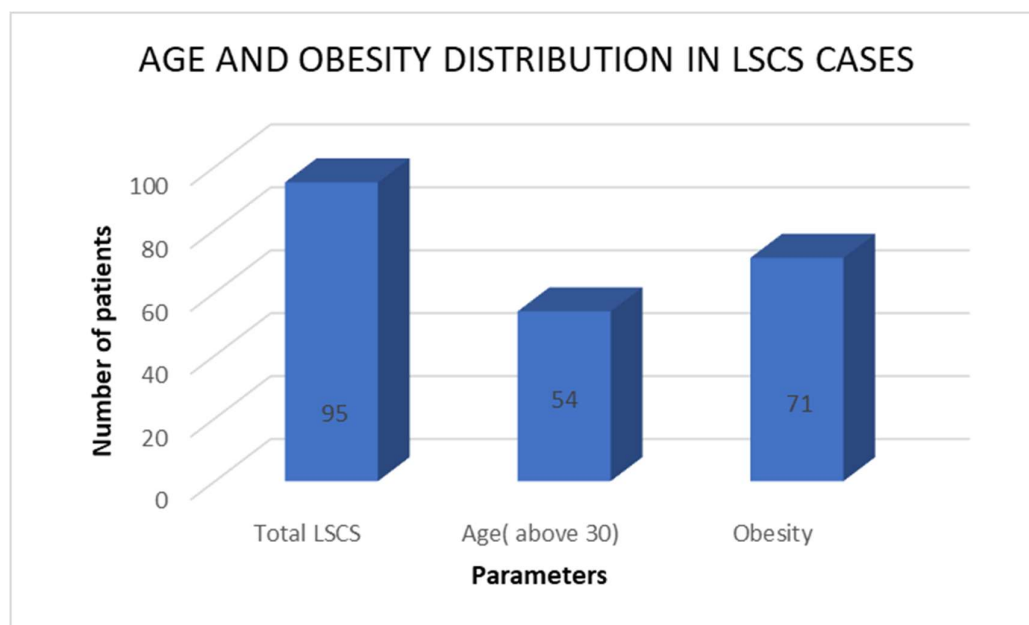
3.6 AGE AND OBESITY DISTRIBUTION IN LSCS CASES

As shown in the figure 6; among 95 LSCS cases, most of the patients who had LSCS procedure belonged to the obese category (74.70%) and the age group of above 30 years of age (56.80%).

Table 6 age and obesity distribution in LSCS.

PARAMETER	NUMBER OF PATIENTS
Total LSCS cases	95
Age above 30 years	54
Obesity	71

Figure 8 Age and Obesity distribution in LSCS



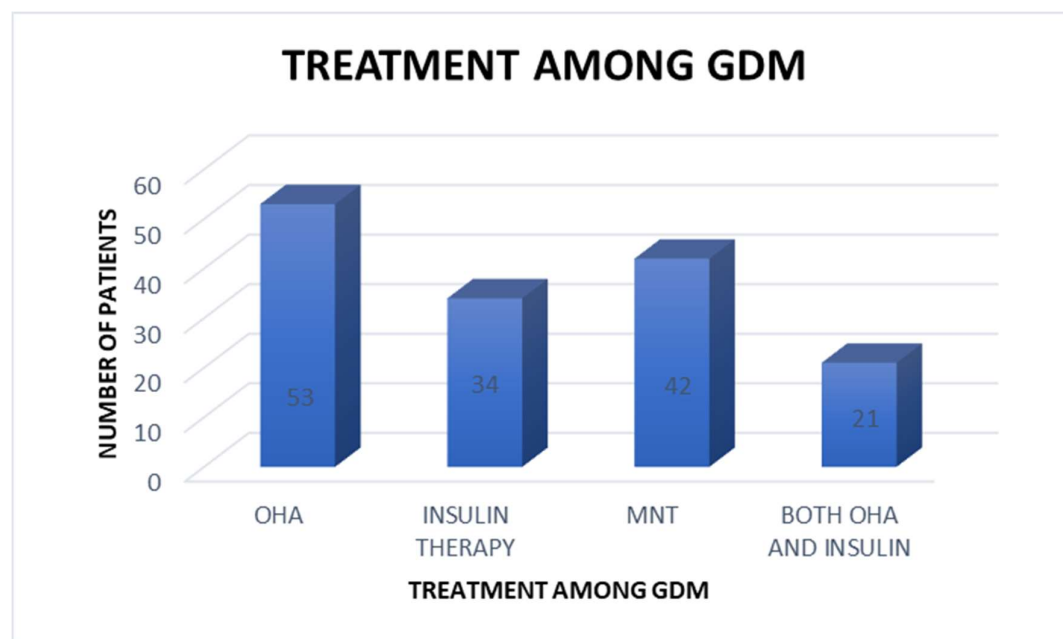
3.7 TREATMENT AMONG GDM

In the treatment plan among GDM patients (fig 7), most of the patients were given OHA (35%), followed by MNT (28%), insulin (23%) both OHA and insulin (14%).

Table 7 Treatment among GDM patients

TREATMENT	NUMBER OF PATIENTS
OHA	53
Insulin therapy	34
MNT	42
Both OHA and Insulin	21

Figure 9 Treatment among GDM



3.8 STATISTICAL ANALYSIS

The proportion of GDM women undergone LSCS is found to be increased with advanced maternal age (Above 30 years), increased BMI (obese) and this association was found to be statistically significant by chi-square test (p -value = 0.046499). i.e., $p < 0.05$ which proves that the study is statistically significant.

* The result is the chi-square statistic is 3.9634. The p -value is 0.046499. significant at $p < 0.05$.

Results						
	LSCS	Others				Row Totals
Age above 30 years	54 (62.50) [1.16]	96 (87.50) [0.83]				150
Obesity cases	71 (62.50) [1.16]	79 (87.50) [0.83]				150
Column Totals	125	175				300 (Grand Total)

4. DISCUSSION

Gestational diabetes is condition that emerges in the 2nd and 3rd trimesters of pregnancy and is characterised by a significant insulin resistance due to the release of placental hormones. GDM can have impact on long term health of the mother and her offspring. National data suggests that the prevalence of GDM in Indian population are beginning to emerge. The frequency of GDM is roughly 7% national wide, which marks the importance for the study on GDM in current situation. This study is set out to analyse the various determining factors of gestational diabetes in women prior to pregnancy and its impact on mode of foetal delivery.

A total of 1500 pregnant patients were considered in the study, out of which 150 GDM patients were included based on inclusion and exclusion criteria and the required data were collected from the case reports. From figure 1 the prevalence rate of GDM among considered pregnant women was found to be 10%.

This retrospective study was carried out for a period of 6 months in a multi-speciality tertiary care hospital to analyse various factors such as the age distribution in GDM patients, the weight distribution, family history and its impact on mode of delivery.

In this study, patients of age group from 20 – 40 years of age were included and the majority of patients among our study population was within the age group of (25-30) > (30-35) > (36-40) (table 6). From the figure 2 the graph shows rapid increase in GDM cases with increase in age (till 30 years of age) then a gradual decrease (> 30 years of age) due to decreased conception rate. A study conducted by Samantha C Lean et al also found that out of 1940 identified titles; 63 cohort studies and 12 case-control studies, Advanced maternal age increased the risk of Gestational diabetes mellitus in the study population. Hence it can be concluded that advancing maternal age is a significant determinant factor of GDM.

When weight distribution was analysed, it (Fig 3) showed that the major proportion of GDM cases belonged to obese patients i.e., of higher BMI. As in Figure 4, the number of GDM cases increases with increase in weight parameter. And in analyzation of family history, fig 5 showed 39% of GDM patients had family histories with diabetes mellitus. To further support this study, The Data's from Sedigheh Hantoushzadeh et al's study also suggests that Obesity and being overweight prior to pregnancy were associated with 2.8-fold and 1.5-fold higher rates of developing GDM ($p < 0.001$, $p = 0.04$).

5. CONCLUSION

About 1500 cases surveyed in the study 150 patients were diagnosed with GDM. Hence the prevalence of GDM in the considered population is 10%. Surveying various pre-gravid factors in GDM women, individuals with advanced maternal age, obesity and family history were found to have higher proportion of GDM. As per our study it is concluded that these factors are significant during gestational period.

Further study on LSCS cases showed that population with advanced maternal age and obesity had higher proportion of LSCS cases. This association was found to be statistically significant by chi-square test (p -value = 0.046499). i.e., $p < 0.05$ which proves that the study is statistically significant.

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