PREVALENCE AND RISK FACTORS ASSOCIATED WITH GESTATIONAL DIABETES MELLITUS - A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Introduction: GDM is defined as a metabolic disorder due to carbohydrate intolerance. The hyperglycemia in the second or third trimester of pregnancy in women without previously identified is Gestational diabetes. In worldwide, the prevalence ranges from 1% to 28%, It varying in population as per their life style modifications and regions. Hence, this study aimed to assess the risk factors associated with Gestational Diabetes Mellitus.

Methods: A prospective observational study was conducted with 140 pregnant women at Karpagam hospital, Coimbatore for the period of 6 months. Patients were included as per the study criteria.

Results: The study results that, 140 pregnant women, The significant risk factors interpreted in this study was found to be BMI (0.003), Previous C- section (0.018), Carbohydrate intake (0.032) and Previous Macrosomic baby (0.04) and it was done by using Chi-Square test. GDM prevalence was 20%, with higher rates in women with obesity (28%, $p = 0.03$) and hypertension (17%, $p = 0.01$). Urban living was significantly linked to obesity and hypertension ($p = 0.02$). Cesarean deliveries occurred in 15% of cases ($p = 0.02$), and term births accounted for 85% ($p = 0.01$).

Conclusion: The study recommends; the risk factors were minimized by creating awareness by providing the patient information leaflet. Improve the Pharmacists interventions on reduce the weight, glycemic control, and reduce risks factors and improve outcomes for mothers and infants.

Keywords: Gestational Diabetes Mellitus, glycemic control, carbohydrate intolerance, interventions.

INTRODUCTION

Diabetes is described as high blood glucose intolerance because of failure of insulin secretion or due to the abnormalities of organic characteristic. It is one of the most usual metabolic diseases in the worldwide. Diabetes has turn out to be the widely caused disorder, after cancers and various cardiovascular ailments, due to its increasing morbidity and fatality rate among the various human race. Healthcare professionals these days observed that diabetes includes an expansion of heterogeneous sicknesses and results in a broader variety of diseases. *(Abbas Alam Choudhry et al., 2021).*

Gestational diabetes mellitus (GDM) is defined as glucose intolerance at numerous levels, this is first detected at some stage during pregnancy. GDM is detected via the screening of pregnant girls for medical risk elements and, among other at-hazard ladies, testing for odd glucose tolerance. This is typically, however not always, mild and asymptomatic. GDM appears to result due to the vast spectrum of physiological and genetic abnormalities that characterize diabetes during pregnancy. Indeed, ladies with GDM are at excessive chance for having or developing diabetes also while they're not pregnant. As a consequence, GDM provides a unique possibility to study the early pathogenesis of diabetes and to expand interventions to prevent the ailment *(Thomas A. Buchanan1 and Anny H. Xiang et al., 2005).*

In 1972 a similar update was made wherein, GDM become covered in elegance "A" and sophistication "D", which turned into 5 subdivided categories. The contemporary modification applied to White's type includes the addition of GDM as a distinct separate elegance and the deletion of instructions "E" and "G". The Yank University of Obstetricians and Gynaecologists (ACOG) proposed some other type for GDM, including a observe for the presence or absence of metabolic headaches, doubting the usefulness of the White's class in scientific practice *(Abdel Hameed Mirghani Dirar et al., 2017).*

GDM can be classified as A1GDM and A2GDM.

- **A1GDM:** The category of gestational diabetes controlled without medicinal drug and aware of nutritional remedy is weight-reduction plan-controlled gestational diabetes (GDM) or A1GDM.
- **A2GDM:** Conversely, gestational diabetes controlled with medication to achieve adequate glycaemic management is classified as A2GDM *(Bryan S. Quintanilla Rodriguez et al., 2022).*

RISK FACTORS RELATED TO GESTATIONAL DIABETES MELLITUS

Potential danger factors for GDM,

- **Advanced maternal age, ≥ 40 years:**
  Multiplied charges of gestational diabetes mellitus have been visible in every maternal age organization, and fees rose regularly with maternal age; in 2021, the rate for moms aged ≥forty years (15.6%) turned into almost six instances as high as the fee for mothers aged <two decades (2.7%).
- **Acknowledged history of diabetes mellitus:**
  Diabetes Mellitus is called a metabolic ailment, regarding inappropriately multiplied blood glucose stages.
- **History of pre-time period delivery:**
  Untimely (additionally called preterm) birth is when a infant is born too early earlier than 37 weeks of pregnancy had been completed. The earlier a baby is born, the better the chance of demise or critical incapacity. In 2020, preterm start and coffee start weight accounted for about sixteen% of toddler deaths.
- **History of spontaneous abortion:**
  The slack of being pregnant evidently before twenty weeks of gestation. Colloquially, spontaneous abortion is referred to as a 'miscarriage' to keep away from association with induced abortion. Early pregnancy loss refers best to spontaneous abortion within the first trimester.
- **History of stillbirths:**
  The dying or lack of a baby before or at some stage in shipping. Each miscarriage and stillbirth describe being pregnant loss, however they differ according to while the loss occurs.
- **History of pervious macrosomia:**
  The boom beyond a specific threshold, no matter gestational age. In excessive-profits nations, the maximum generally used threshold is the burden above 4500 g (nine lb 15 oz).
- **Records of alcohol consumption:**
  Consuming alcohol for the duration of being pregnant increases the chance of miscarriage, premature delivery, and the child having a low beginning weight. It may additionally affect the child after they are born. Ingesting in the course of being pregnant can purpose the child to expand a critical lifestyles-long condition referred to as foetal alcohol spectrum disorder (FASD).
- **Previous records of GDM:**
  History of GDM can be a marker for early atherosclerosis independent of pre-being pregnant obesity amongst ladies who have no longer advanced type 2 diabetes or metabolic syndrome.
- **Own family records of diabetes mellitus:**
  Own family history of diabetes can consist of environmental in addition to genetic threat elements. Obesity and a few lifestyle elements, such as alcohol intake and eating regimen, had been suggested to be related to a circle of relative’s history of diabetes, and those non-genetic factors provide an explanation for a big part of the association between family records and danger of kind 2 diabetes.
- **Records of smoking:**
  Smoking before pregnancy was related to an expanded danger of GDM requiring

insulin therapy. It was additionally determined that a dose–response dating between the lifetime quantity of smoking and the threat of GDM requiring insulin remedy. Smoking may also trigger inflammatory responses, oxidative pressure, and insulin resistance. For instance, an evaluation of skeletal muscle biopsy specimens discovered that smokers had decreased expression of peroxisome proliferator-activated receptor-gamma and greater Ser636 phosphorylation of insulin receptor substrate-1 in comparison with non-people who smoke. Smoking is likewise implicated as a risk component for metabolic syndrome2, and metabolic abnormalities may be modulated by means of the direct bad effect of smoking on insulin resistance. *(Fabian P Mghanga et al., 2020).*

- **Pre-pregnancy body Mass Index (BMI):**
  Having a BMI of 30 or higher at some point of pregnancy can increase the chance of complications for the mom and the infant.
- **Emergency caesarean phase:**
  Ladies with gestational diabetes mellitus (GDM) have a better risk of caesarean transport (CD) than glucose-tolerant ladies. Even though a caesarean segment is a not unusual surgical treatment that may correctly prevent maternal and foetal mortality and morbidity while indicated, the complications of the procedure are well diagnosed, especially in an emergency setting, and consist of obstetric haemorrhage, postpartum contamination, and the long-time period consequences of caesarean phase scarring.
- **Pre-eclampsia:**
  Preeclampsia and gestational diabetes mellitus (GDM) are diseases that have an effect on the perinatal consequences of both the mother and child [1–4]. Even though preeclampsia and GDM may additionally appear to be unrelated ailment entities because their medical manifestation and diagnostic standards do no longer overlap, many research have shown a correlation between preeclampsia and GDM.
- **Polyhydramnios:**
  In polyhydramnios, excessive amniotic fluid accumulates inside the uterus in the course of pregnancy. Slight cases of polyhydramnios may work away on their very own. It's far when the mom has too much amniotic fluid. Amniotic fluid is the fluid that surrounds the toddler whilst they're in the frame earlier than birth. It's very essential for the child's development. Many girls with polyhydramnios don't have signs. This clinical condition is associated with a excessive threat of poor pregnancy effects. The reported prevalence of polyhydramnios tiers from 0.2 to 1.6% of all pregnancies.
- **Neonatal hyperbilirubinemia:**
  Neonatal jaundice or neonatal hyperbilirubinemia consequences from accelerated general serum bilirubin (TSB) and clinically manifests as yellowish discoloration of the pores and skin, sclera, and mucous membrane. About 60% of full-time period newborns and eighty% of premature babies get jaundice. *(Azam Kouhkhan et al., 2021).*
- **Pre-pregnancy low physical activity:**
  Bodily state of being inactive in pregnancy has been related to immoderate gestational weight advantage, hypertensive problems, gestational diabetes mellitus, and postpartum melancholy. Notwithstanding those risks, bodily inaction degree remains high, especially in higher-profits countries. Regular exercising throughout pregnancy can also decrease the risk of pregnancy- associated headaches which include pregnancy-

precipitated high blood pressure and pre- eclampsia. *(Fatemeh Nasiri Amiri et al., 2018).*

PREVALENCE OF GESTATIONAL DIABETES MELLITUS

According to the global Diabetes Federation (IDF), GDM occurs in about 14% globally. The superiority of GDM in Asia became 11.5%. Globally, the superiority of GDM is growing in recent years and influences 1%–14% of all pregnancies. GDM became previously taken into consideration to be a main public health hassle in developed countries, however it is now a growing problem in developing countries.

Evidence indicates that the superiority of GDM is 11% higher among women from the Indian subcontinent than Europe. Among Asia, the highest prevalence is mentioned in China and India. Proof suggests that the superiority of unfavourable pregnancy effects including preeclampsia, previous C-section, previous macrosomia, underweight, stillbirths, and IUGR is high in South Asia. As an example, Poudel (2020) mentioned that the pooled stillbirth rate in India, Bangladesh, Nepal, and Pakistan turned into 25.15 in line with 1,000 births. Another study stated that the prevalence of C-section is around 13% in South Asia.
The prevalence of type 2 diabetes mellitus is comparable in Asian and Western nations, even though the prevalence of obesity is decreased in Asia. The high prevalence of diabetes in the particularly lean Asian population might be defined by using a distant variation in fat distribution and decreased pancreatic β-cell function as compared with Western populations than insulin resistance. *(Shahad Abualhamael et al., 2019).* Pharmacotherapy management includes insulin regimens and oral hypoglycaemic agents. This prospective observational study focuses on determining the prevalence and risk factors associated with gestational diabetes mellitus (GDM).

METHODOLOGY

This prospective observational study was carried out at Department of Obstetrics and Gynecology, Karpagam Faculty of Medical Science and Research, Coimbatore. This study was approved by the institutional ethical committee Ref No: **IHEC/279/KCOP/04/2023** and was conducted for 6months (April 2023 to October 2023). A total of 140 patients were included for the study, sample size was calculated using Cochran’s Formula. Samples were collected according to the inclusion and exclusion criteria. Data Collection form including questionnaire and patient information leaflet was used in this study to collect the patient dates.

Inclusion criteria:

- Age 18 years and above.
- Pregnant women only.
- Patient diagnosed with diabetes mellitus during pregnancy.

- Pregnant women preferably undergoing screening test for gestational diabetes.

Exclusion criteria:

- Diabetes diagnosed prior to pregnancy.
- Patient associated with renal disease (GFR<30ml/min).
- Patient with psychiatric and neurologic disability.
- Patient who lost to follow up after initial checkup.

Statistical Analysis:

- The data were subjected to descriptive statistical analysis by using Microsoft Excel.
- IBM SPSS statistics software version 27.0.1 was used for the statistical analysis. The Chi-Square test was performed to find out the significant risk factors associated with GDM. A value of P (<0.05) was considered to be statistically significant.

RESULT

Prevalence of GDM (n=140)

Among the 140 pregnant women participated in the study, 75 (54%) were diagnosed with GDM and 65 (46%) were diagnosed as non-GDM.

Prevalence of GDM n=140

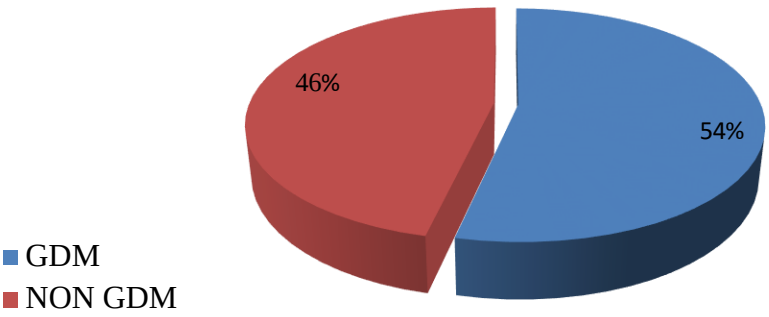

Figure 1: Prevalence of GDM

Pregnancy distribution (n=75)

Among the 75 GDM patients, 1st pregnancy GDM patients were considered to be in higher rate of **37% (28 patients).**

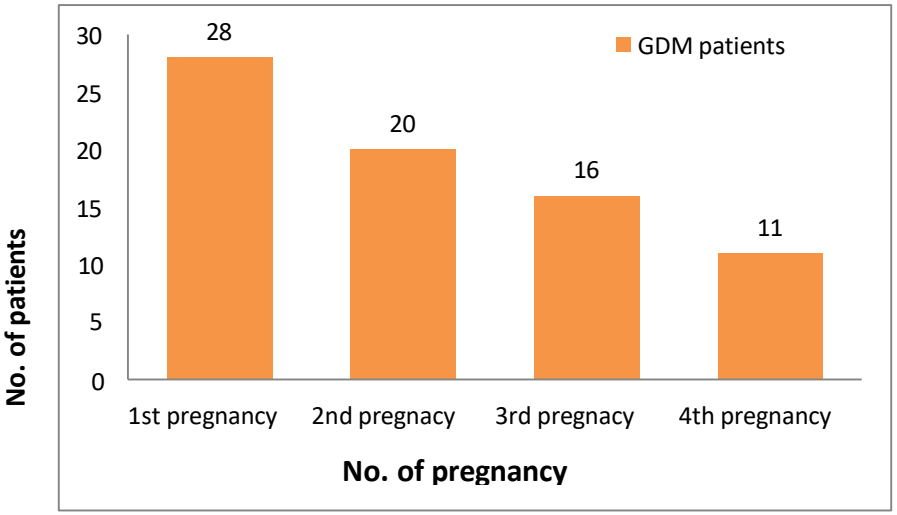

Figure 2: Pregnancy distribution

Risk factors associated with GDM (n=40)

Among the 40 GDM patients, the following risk factors were considered to be more prevailed in GDM patients:

S. No.	Risk factors	No. of patients n=40	Prevalence
1.	Family history	14	35%
2.	PCOD	8	20%
3.	Abortion	10	25%
4.	Perinatal outcomes	4	10%
5.	Previous GDM	11	27.5%
6.	Carbohydrate intake	21	52.5%
7.	Preterm delivery	3	7.5%
8.	Previous C-section	16	40%
9.	BMI	25	62.5%
10.	Age >25	18	45%
11.	Neonatal death	2	5%
12.	Previous Macrosomic baby	5	12.5%
13.	Preeclampsia	10	25%

Table 1: RisK factors associated with GDM

PERCENTAGE ANALYSIS OF RISKFACTORS ASSOCIATED WITH GDM

Age > 25

Valid		Frequency	Percent	Valid Percent	Cumulative Percent
	N	22	55.0	55.0	55.0
	Y	18	45.0	45.0	100.0
	Total	40	100.0	100.0	

Table 2: Percentage analysis of Age >25

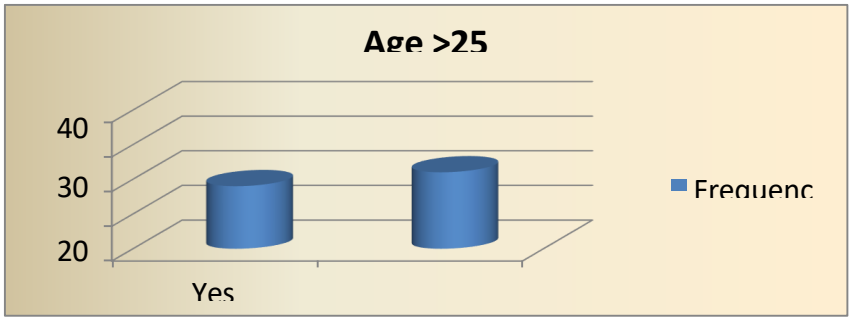

Figure 3: Frequency of Age >25

BMI

Valid		Frequency	Percent	Valid Percent	Cumulative Percent
	N	15	37.5	37.5	37.5
	Y	25	62.5	62.5	100.0
	Total	40	100.0	100.0	

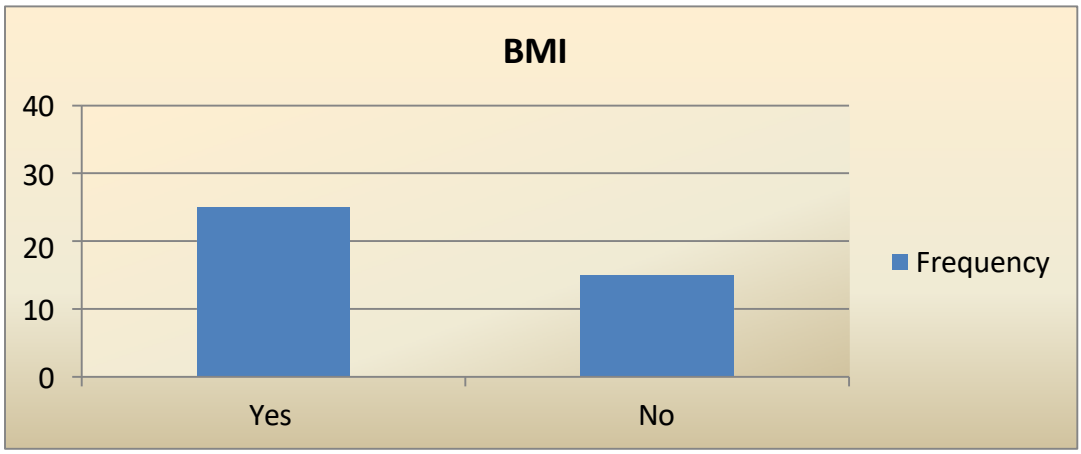

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Figure 4: Frequency of BMI

Preeclampsia

Valid		Frequency	Percent	Valid Percent	Cumulative Percent
	N	30	75.0	75.0	75.0
	Y	10	25.0	25.0	100.0
	Total	40	100.0	100.0	

Table 4: Percentage analysis of Preeclampsia

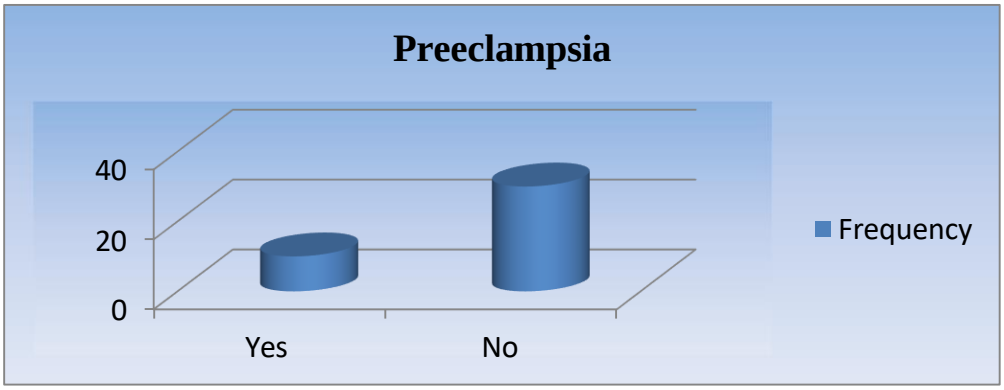

Figure 5: Frequency of Preeclampsia

Perinatal Outcome

Valid		Frequency	Percent	Valid Percent	Cumulative Percent
	N	36	90.0	90.0	90.0
	Y	4	10.0	10.0	100.0
	Total	40	100.0	100.0	

Table 5: Percentage analysis of Perinatal outcome

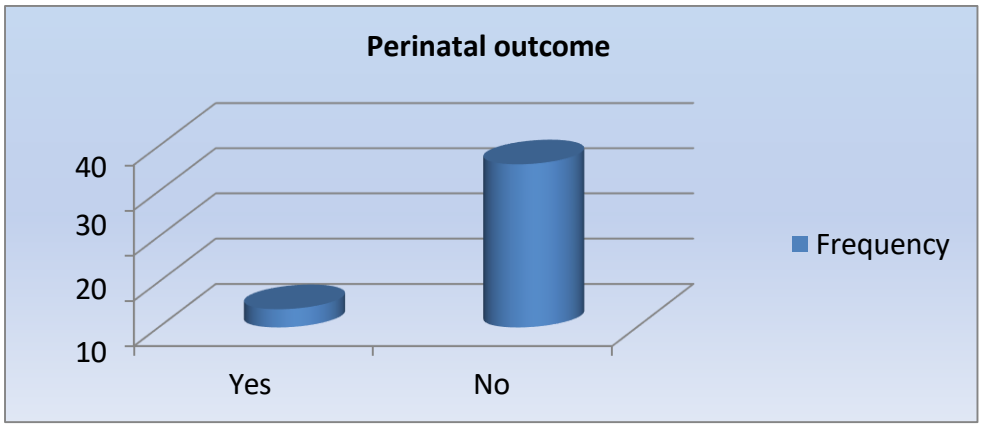

Figure 7: Frequency of Perinatal outcome

Neonatal Death

Valid		Frequency	Percent	Valid Percent	Cumulative Percent
	N	38	95.0	95.0	95.0
	Y	2	5.0	5.0	100.0
	Total	40	100.0	100.0	

Table 6: Percentage analysis of Neonatal death

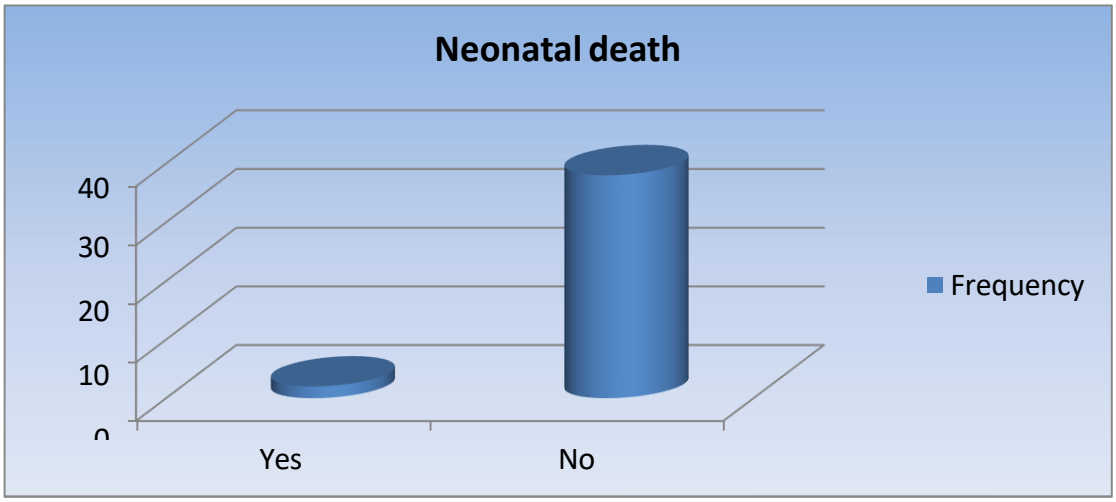

Figure 8: Frequency of Neonatal death

RISK FACTORS ASSOCIATED WITH STUDY POPULATION (n=140)

Variable	Frequency (n=140)	Percentage (%)
Age category (years) 18-24 25-35 36-45	58 78 4	41% 56% 3%
Family history of diabetes Yes No	52 88	37% 63%
History of abortion Yes No	24 116	17% 83%
Diagnosis of pregnancy related disorder (s) Yes No	22 118	16% 84%
Previous caesarean section Yes No	43 97	31% 69%
Previous delivery status None Term Preterm	40 92 8	28% 66% 6%
Previous birth outcomes Live birth Still birth	140 0	100% 0%
Previous macrosomic baby Yes No	16 124	11% 89%
Previous history of preeclampsia Yes No	24 116	17% 83%
Previous history of GDM Yes No	27 113	19% 81%

Variable	Frequency (n=140)	Percentage (%)
History of intrauterine fetal death Yes No	0 140	0% 100%
Regular exercise Yes No	57 83	41% 59%
Fast food intake Yes No	67 73	48% 52%
Carbohydrate intake Yes No	92 48	66% 34%
BMI status Underweight Normal Overweight	0 82 58	0% 59% 41%

Table 7: Baseline characteristics on clinical and lifestyle factors

SIGNIFICANT AND NON- SIGNIFICANT RISK FACTORS ASSOCIATED WITH STUDY POPULATION

- There are several risk factors associated with study population and they are categorized as significant risk factors and non- significant risk factors, analysed by Chi- Square test by using SPSS software.
- The significant and non- significant risk factors were determined by p- value (<0.05).
- If the p- value is <0.05, then it is considered to be the significant value.
- If the p- value is >0.05, then it is considered to be the non- significant value.

The significant risk factors in this study includes

- **BMI (0.003)**
- **Previous C-section (0.018)**
- **Carbohydrate intake (0.032)**

- **Previous Macrosomic baby (0.04)**

The non-significant risk factors in this study includes

- **Previous GDM (0.314)**
- **Preeclampsia (0.097)**
- **Family history (0.347)**
- **Perinatal outcome (0.634)**
- **PCOD (0.367)**
- **Abortion (0.380)**
- **Age >25 (0.063)**
- **Preterm Delivery (0.272)**
- **Neonatal Death (0.588)**

DISCUSSION

The present study was carried out to find out the Prevalence **a**nd Risk Factors Associated with Gestational Diabetes Mellitus in the department of Obstetrics and Gynecology, Karpagam Faculty of Medical Sciences and Research, tertiary care teaching hospital.

Out of 140 patients included in this study, 40 patients (29%) were diagnosed as gestational diabetes mellitus with OGCT. This result is similar to the study conducted by *Xie Yaping et al.*, among 2587 participated in the study 406 patients (15.69%) were diagnosed with Gestational Diabetes Mellitus and the diagnostic test used is the OGTT. In this study we found to have up to 4th pregnancy in which 1st pregnancy was found to be in higher rate of 48% (19 patients) among the 40 GDM patients.

Among 140 pregnant women in our study, they were categorized by three different age groups of 18-24, 25-35 and 36-45 in which the age group of 18-24 has 58 pregnant women (GDM-18, non- GDM-40) (31%), 25-35 has 78 pregnant women (GDM-21, non-GDM-57) (27%), 36-45 has 4 pregnant women (GDM-1, non-GDM-3) (25%) and this shows that at the age group of 18-24 years were found to be in high prevalence (31%) for GDM. This result is similar to the study conducted by *Roksana Darabi et al.*, in this study the highest prevalence (18.3%) of GDM were observed in the age group >35 years.

Among 40 GDM patients in our study population we found that 13 of the risk factors were the major cause for the GDM and the risk factors mentioned are 25 patients (62.5%) with BMI, 21 patients (52.5%) with carbohydrate intake, 18 patients (45%) with age >25, 16 patients (40%) with Previous C-section, 14 patients(35%) with family history, 11 patients (27.5%) with previous GDM, 10 patients (25%) with abortion and preeclampsia, 8 patients (20%) with PCOD, 5 patients(12.5%) with Previous Macrosomic baby, 4 patients (10%) with perinatal outcomes, 3 patient(7.5%) with preterm delivery and 2 patients (5%) with neonatal death. This result is similar to the study conducted by *Wina Ivy Ofori Boadu et al*.,in which

17 participants were diagnosed with GDM among 200 study participants and the risk factors contributed like preeclampsia (78.5%), over weight (46.2%), history of intrauterine fetal death (91%), carbohydrate food intake (61%) and soda drink consumption (58.5%) has been mentioned. Among the 40 GDM patients the percentage for the frequency of the GDM patients associated with risk factors were determined by using the SPSS software and the determined risk factors includes previous GDM, preeclampsia, preterm delivery, abortion, previous c- section, carbohydrate intake, PCOD, perinatal outcome, family history, previous macrosomic baby, BMI, neonatal death and age >25.

The risk factors of our study for 140 participants was categorized as age category (18-24) is 58, (25-35) is 78 and (36-45) is 4, family history of hypertension is 52, history of abortion is 24, diagnosis of pregnancy related disorder is 22, previous c-section is 43, previous delivery status is 42, previous live birth outcomes is 140, previous Macrosomic baby is 16, previous history of preeclampsia is 24, previous history of GDM is 27, history of intrauterine fetal death is 0, regular exercise is 57, fast food intake is 67, carbohydrate intake is 92 and BMI status (underweight) is 0, (normal) is 82 and (overweight) is 58.

The significance of the study was determined by the p- value (<0.05). The significance of the risk factors were analysed by using Chi-square test and the significance level for the majorly influencing risk factors for GDM are BMI (0.003), Previous C- section (0.018), Carbohydrate intake (0.032) and Previous Macrosomic baby (0.04).

In this study we have prepared the patient information leaflet, so that the GDM diagnosed patients and the pregnant women were given awareness about the diabetes during the time of pregnancy and the diet plan to be followed during the time of pregnancy.

CONCLUSION

The current study focus on the Prevalence and Risk Factors associated with Gestational Diabetes Mellitus.

The prevalence for our study population was concluded with 29% of GDM and 71% of non-GDM.

The prevalence for the age group of 18-24 years shows the higher rate (31%) of GDM, followed by 1st pregnant women were more prone to GDM (19 patients) (48%).
The Risk factors leading to Gestational Diabetes Mellitus like Family history, PCOD, Abortion, Perinatal outcome, Previous Gestational Diabetes Mellitus, Carbohydrates, Preterm Delivery, Previous C-Section and Previous macrosomic baby were commonly identified during our study period.

Furthermore, for the minimization of above mentioned risk factors the awareness was conducted among the patients through Patient Information Leaflet.

LIMITATIONS OF THE STUDY

The study was conducted in a single hospital and duration of the study was for a short period of only for 6 months and a less sample size of 40 patients were found. Further this study will be carried out with a large sample size to confirm the findings of this study.

Most of the patients were from poor socioeconomic status and were not able to afford the treatment cost. So they were referred to local government hospital and hence these patients could not be followed further.

Many patients were not recorded during the second visit and therefore, those patients were excluded from our study.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest for this work.

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