Original Research Article

Screening of gestational diabetes mellitus (GDM) and gestational glucose intolerance (GGI) in pregnant woman from rural population

Shivakumar[1*], Nishi Kailash[2], Sudhya P[3], Chellamma VK[4]

[1]Assistant Professor, Department of Obstetrics and Gynecology, KMCT Medical College, Manassery Mukkam Kozhikode, Kerala, India
[2]Assistant Professor, Department of Obstetrics and Gynecology, KMCT Medical College, Manassery Mukkam Kozhikode, Kerala, India
[3]Senior Resident, Department of Obstetrics and Gynecology, KMCT Medical College, Manassery Mukkam Kozhikode, Kerala, India
[4]Professor and HOD, Department of Obstetrics and Gynecology, KMCT Medical College Manassery Mukkam Kozhikode, Kerala, India

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Abstract

Introduction: Gestational diabetes mellitus (GDM) is defined as carbohydrate intolerance with recognition or onset during pregnancy irrespective of treatment with diet or insulin.[1] Maternal metabolic adaptation is to maintain mean fasting plasma glucose of 74.5 +/- 11 mg/dl and postprandial peak 108.7+/- 16.9 mg/dl.[1] This fine tuning is possible due to compensatory hyperinsulinemia as normal pregnancy is characterized by insulin resistance. Pregnancy induces progressive changes in maternal carbohydrate metabolism. **Materials and Methods:** The present study was a cross sectional study undertaken to study prevalence of gestational diabetes mellitus (GDM) and gestational glucose intolerance (GGI) in pregnant women from rural population. The present study was done in antenatal clinic of Obstetrics & Gynecology (OBGY) department, at Tertiary Care Hospital. The present study was conducted from December 2017 to November 2019 for a period of 24 months. The study population was ante-natal mothers attending antenatal clinic of Obstetrics & Gynecology (OBGY) department. Therefore 700 antenatal mothers were included in the study population fulfilling inclusion and exclusion criteria. **Results:** It was observed that majority 485(69.28%) of the antenatal mothers were multi-gravida followed by 215 (30.71%) antenatal mothers were primigravida. It was observed that majority 345(49.29%) of the antenatal mothers were in third trimester followed by second trimester (35.57%) and first trimester (15.14%). It was observed that among 700 antenatal mothers screened 13 (1.86%) found to be GGI positive, 57 (8.14%) found to be GDM positive while 630 (90%) antenatal mothers were negative for OGTT. **Conclusion:** The rise in prevalence of Gestational Diabetes in the community and its associated increased risk of pregnancy and delivery complications justifies a need to screen pregnant mothers who attend the antenatal clinic. The results suggest that a policy of universal screening for GDM should be adopted in all antenatal clinics. This single step procedure is a simple economic and feasible method. It serves both for the purpose of screening and diagnosis at the same time. Due to the simplicity, acceptability, sensitivity and cost effectiveness of OGTT, it is the best method to detect gestational diabetes mellitus in high risk group.

Key Words: Gestational diabetes mellitus, hyperinsulinemia, maternal carbohydrate metabolism.

Introduction

Gestational diabetes mellitus (GDM) is defined as carbohydrate intolerance with recognition or onset during pregnancy irrespective of treatment with diet or insulin[1]. Maternal metabolic adaptation is to maintain mean fasting plasma glucose of 74.5 +/- 11 mg/dl and postprandial peak 108.7+/- 16.9 mg/dl[1]. This fine tuning is possible due to compensatory hyperinsulinaemia as normal pregnancy is characterized by insulin resistance. Pregnancy induces progressive changes in maternal carbohydrate metabolism. As pregnancy advances insulin resistance and diabetogenic stress due to placental hormones necessitate compensatory increase in insulin secretion. When this compensation is inadequate gestational diabetes develops[1].

GDM is associated with multiple fetal, neonatal and maternal complications. The fetal complications are miscarriage, macrosomia, congenital malformations, still birth, unexplained intrauterine foetal death.The neonatal complications are respiratory distress syndrome, hypoglycemia, hypocalcemia, hypomagnesemia, hyperbilirubinemia, polycythemia, cardiomyophathy, inheritance of diabetes and impact on long term cognitive development. The maternal complications are diabetic nephropathy, diabetic retinopathy, diabetic neuropathy, pre-eclampsia, antepartum hemorrhage, diabetic ketoacidosis, infections, shoulder dystocia, increased genital tract injuries, increased rate of caesrean section[2].The prevalence of GDM in India varied from 3.8 to 21% in different parts of the country, depending on the geographical locations and diagnostic methods used[3]. GDM has been found to be more prevalent in urban areas than in rural areas. For a given population and ethnicity, the prevalence of GDM corresponds to the prevalence of Impaired Glucose Tolerance [IGT, in nonpregnant adult] within that given population[4,5].

There were very few studies regarding incidence of GDM in rural scenario, so we conducted a study in calculating incidence of GDM and gestational glucose intolerance (GGI) in average rural Indian pregnant women.

Materials and methods

Study Design

The present study was a cross sectional study undertaken to study prevalence of gestational diabetes mellitus (GDM) and gestational glucose intolerance (GGI) in pregnant women from rural population.

*Correspondence
Dr. Shivakumar
Assistant Professor, Department of Obstetrics and Gynecology, KMCT Medical College, Manassery Mukkam Kozhikode, Kerala, India
E-mail: shivkumar.hangargi@gmail.com

Study Place
The present study was done in antenatal clinic of Obstetrics & Gynecology (OBGY) department, at Tertiary Care Hospital.

Period of Study
The present study was conducted from December 2017 to November 2019 for a period of 24 months.

Study Population
The study population was ante-natal mothers attending antenatal clinic of Obstetrics & Gynecology (OBGY) department.
Therefore 700 antenatal mothers were included in the study population fulfilling inclusion and exclusion criteria.

Inclusion criteria
- Includes all pregnant women visiting hospital.
- Pregnant women of all age groups.

Exclusion Criteria
- Patients already diagnosed with diabetes mellitus.
- Patients not ready to get investigated.

Ethical Consideration
Approval from Institutional Ethics Committee was obtained.

Questionnaire
The questionnaire was pre-tested and Pre-structured. The questionnaire used to record the data regarding the various epidemiological factors in ante-natal mothers with gestational diabetes mellitus.

Data collection
The study subjects were explained about the purpose of the study. An informed consent was taken. Pre-structured questionnaire was used to obtain information on socio-demographic and epidemiological factors. All women attending antenatal care clinics were interviewed and information about them was collected. The information included demographic data, past obstetric history, past medical history and laboratory investigations. There was also information on the present pregnancy such as fundal height, type of pregnancy and maternal condition. At the time of visit to the antenatal clinic blood pressure, weight, symphysio fundal heights were taken. Every patient irrespective of her last meal timing given 75mg oral glucose. After 2 hours plasma glucose was estimated in central laboratory.
With 75mg oral glucose (according to DIPSI criteria):

	Plasma glucose after 2hours	Pregnant	Non pregnant
1.	>/= 200mg/dl	Diabetes	Diabetes
2.	140-199 mg/dl	GDM	IGT
3.	120-139 mg/dl	GGI	---
4.	< 120mg/dl	Normal	Normal

Study variables

Age
The age was recorded with the help of following-
- ANC card.
- Told by study subject.
- If study subjects were unable to state exact date of birth, it was calculated by asking leading questions and matching with local festivals or historical events.

Place of residence

Urban
A place having at least 75% of its male adult population employed in pursuits other than agriculture.

Rural
A place where agriculture is the main occupation for majority of the people.

Literacy Status
Guidelines given by Department of School Education and Literacy, Government of India were used to record literacy status of the subjects. Accordingly subjects were stratified as illiterate/ literate.

Illiterate
A person who could not read or write in any language was labeled illiterate. This category also includes those who could only sign or reproduce some writings mechanically and not educated at all.

Literate
Those who have taken formal education were labeled as literates. The subjects who were able to read & write with meaning in any language but had not taken any formal education in school were labeled as literates. Those who had received formal education were further inquired about exact years of education.

Primary Schooling
Those who had studied up to 4th standard.

Middle School
Those who had studied 5th to 7th standard.

High School
Those who had studied 8th to 10th standard.

Higher Secondary
Those who had studied up to 12th standard. .

Graduate
A person who had obtained a graduation degree in any subject and from any university.

Postgraduate
A person who had a post graduation degree in any subject and from any university.

Last Menstrual Period
First day of last menstruation period is enquired and noted by seeing an ANC card, case paper or asked directly to study subjects or by asking leading questions to pregnant women related to local festivals.

Expected Date of Delivery
Calculated from LMP by Naegele's formula (9month + 7days added to L.M.P.) or noted from Sonography report. .

Socio economic status
Socioeconomic status as suggested by BG Prasad was adopted and modified as per the all India consumer price Index (AICPI) of April 2016 .Each subject was asked about the total income in terms of cash and kind, if income was in kind, it was converted in terms of money as per the prevailing market price, as per subject's statement and counterchecked with occupation. Income of all earning family member was considered together. The per capita monthly income of family was calculated and families were classified according to BG Prasad's classification.
According following classification was made.

Socio-economic Status	Original Scale of 1961	Modified Classification of April 2016

I	Rs 100 & above	Rs 6186 and above
II	50-99	3093 – 6185
III	30-49	1856 – 3092
IV	15-29	928 – 1855
V	< 15	< 927

Monthly income of family
As per statement by the study subject their income was recorded. Income of all earning family members was considered together.

Per capita income
Total monthly income divided by total units in family.

Person > 12 years = 1 unit
Child 1-12 year = ½ Unit &
Infant = 0 unit

Dietary history
Dietary intake of study subject was assessed by 24 hour recall of food consumed; before admission to hospital.

Clinical examination
General examination
Each study subject was evaluated for health assessment. The height, weight, body mass index, temperature, pulse, respiratory rate and blood pressure was recorded.

Height
Height was measured in the standing position with bare foot against the wall with heels, buttocks and shoulders touching the wall and her gaze horizontal. The height was measured with the help of the markings on the wall, crown to the heel to the nearest 0.5 centimeter.

Weight
Weight was recorded with a portable type weighing machine and standardized every week with standard weight. The weight was recorded to the nearest 0.5 kilogram.

Body Mass Index
Was calculated by using the formula,
Body Mass Index =Weight (Kg)/ Height (m) × Height(m)

Systemic examination
Each study subject was examined system wise. Per abdominal examination was done in detailed.

Statistical Analysis
Statistical analysis was done by using proportions and percentage for qualitative characters and chi-square or z-test, ANOVA were applied for quantitative type of data where ever necessary. Data was compared and analyzed statistically for the significance of observed differences if any. The results were expressed as Mean ± Standard Deviation (SD) p value >0.05 was considered to be significant. Statistical package for social sciences (SPSS) version 22.0 for windows was used for statistical analysis and to draw conclusions.

Results

Table 1: Distribution of patients according to gravida

Gravida	No. of Patients	Percentage
Primi Gravida	215	30.71
Multi Gravida	485	69.28
Total	700	100

Above Table No.1 shows the distribution of antenatal mothers according to their gravidity. It was observed that majority 485(69.28%) of the antenatal mothers were multi-gravida followed by 215 (30.71%) antenatal mothers were primigravida.

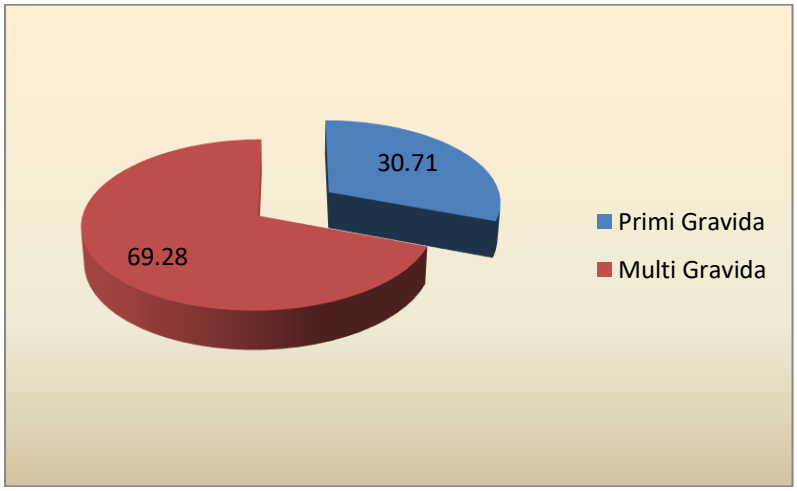

Figure 1: Showing patients according to gravid:

Table 2: Distribution of patients according to trimester

Trimester	No. of Patients	Percentage
1st trimester	106	15.14
2nd trimester	249	35.57
3rd trimester	345	49.29
Total	700	100

The above table shows the distribution of antenatal mothers according to their trimester. It was observed that majority 345(49.29%) of the antenatal mothers were in third trimester followed by second trimester (35.57%) and first trimester (15.14%)

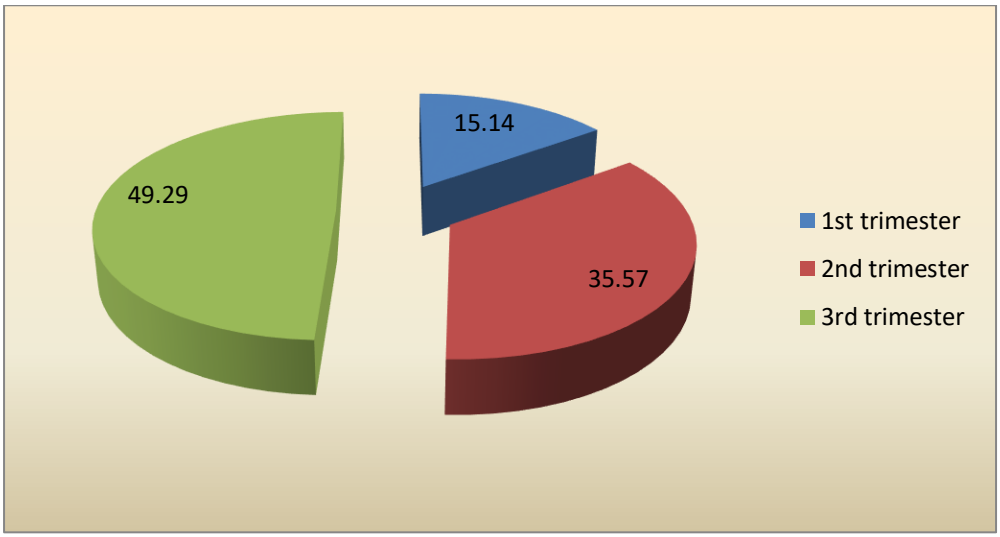

Figure 2: Showing patients of GGI and GDM:

Table 3: Distribution of patients according to GGI and GDM

Variable	No. of Patients	Percentage
GGI	13	01.86
GDM	57	08.14
Normal	630	90.00
Total	700	100

The above table shows distribution of antenatal mothers according to Gestational Glucose Intolerance (GGI). It was observed that among 700 antenatal mothers screened 13 (1.86%) found to be GGI positive, 57 (8.14%) found to be GDM positive while 630 (90%) antenatal mothers were negative for OGTT.

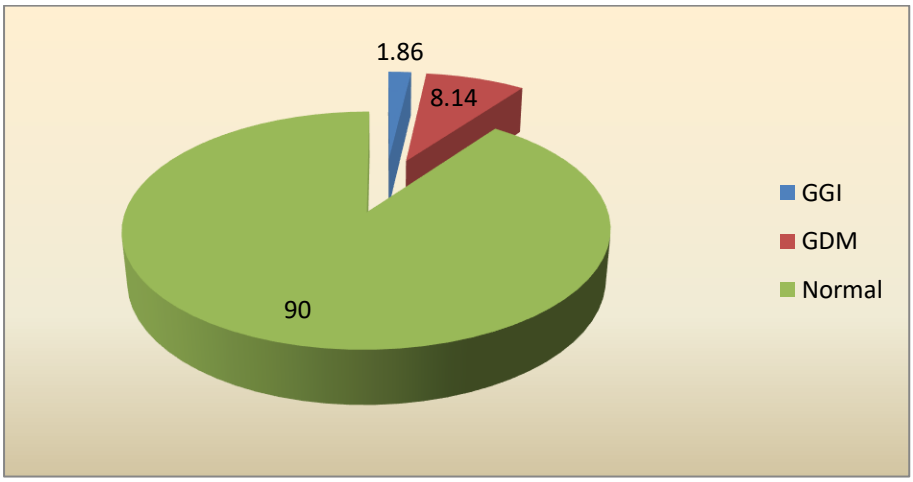

Figure 3: Showing patients of GGI and GDM

Table 4: Distribution of patients according to trimester in GDM and GGI

Trimester	GGI (%)	GDM (%)
1st trimester	01 (07.69)	11 (19.30)
2nd trimester	07 (53.85)	36 (63.16)
3rd trimester	05 (38.46)	10 (17.54)
Total	13 (100)	57 (100)

The above table shows distribution of antenatal mothers according to trimester with GGI and GDM. Among antenatal mothers majority were from second trimester with GGI (53.85%) and GDM (63.16%). When trimester was compared with GGI and GDM antenatal mothers the difference was not statistically significant (p>0.05).

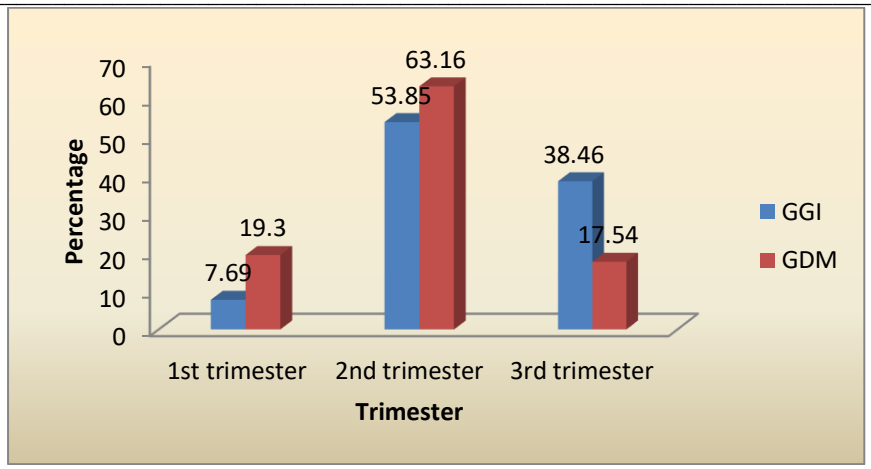

Figure 2: Showing patients according to trimester in GDM and GGI

Table 5: Distribution of patients according to gravid in GDM and GGI

Gravida	GGI (%)	GDM (%)
Primi	02 (15.38)	05 (8.77)
Multi	11 (84.62)	52 (91.23)
Total	13 (100)	57 (100)

The above table shows distribution of antenatal mothers according to gravida with GGI and GDM. Among antenatal mothers majority were multigravida with GGI (84.62%) and GDM (91.23%). When gravid was compared with GGI and GDM antenatal mothers the difference was not statistically significant (p>0.05).

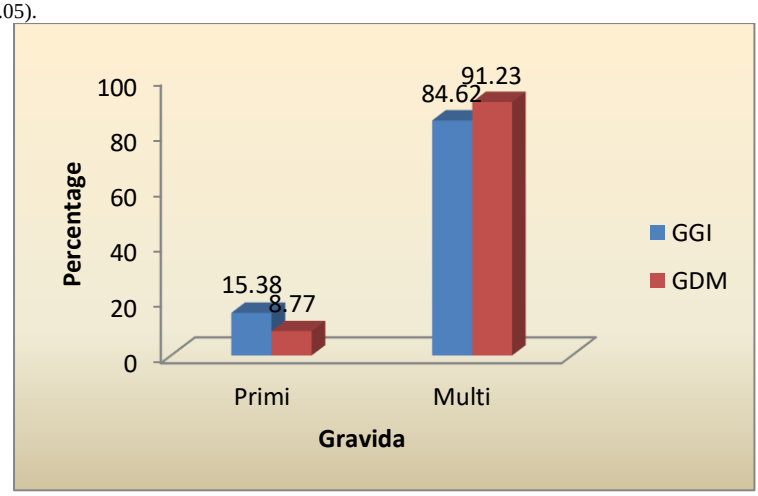

Figure 3: Showing patients according to gravid in GDM and GGI

Table 6: Distribution of patients according to age of GDM and GGI

Age	GGI (%)	GDM (%)	Total (%)
<19	00 (00)	04 (7.02)	04 (5.71)
19-22	01 (07.69)	05 (8.77)	06 (8.57)
23-27	06 (46.15)	25 (43.46)	31 (44.30)
28-32	02 (15.39)	10 (17.54)	12 (17.14)
33-37	03 (23.08)	09 (15.79)	12 (17.14)
>37	01 (7.69)	04 (7.02)	05 (7.14)
Total	13 (100)	57 (100)	70 (100)

The above table shows distribution of antenatal mothers according to age with GGI and GDM. Among antenatal mothers majority were from age group 23-27 years with GGI (46.15%) and GDM (43.46%). When age was compared with GGI and GDM antenatal mothers the difference was not statistically significant (p>0.05).

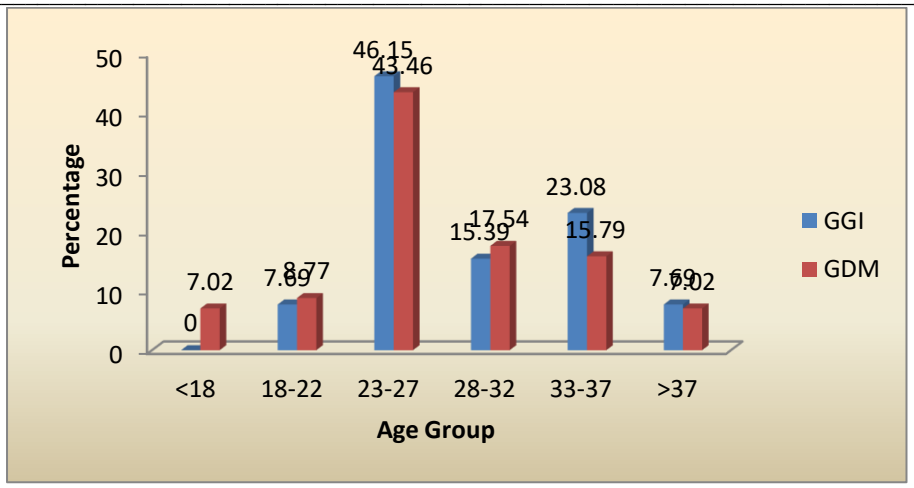

Figure 4: Showing patients according to age

Table 7: Distribution of patients according to BMI

BMI	GGI (%)	GDM (%)	Total (%)
<18.5	01 (7.69)	05 (8.77)	06 (8.57)
18.5-25	02 (15.39)	11 (19.30)	13 (18.57)
25-30	03 (23.08)	17 (29.82)	20 (28.57)
>30	07 (53.84)	24 (42.11)	31 (44.29)
Total	13 (100)	57 (100)	70 (100)

The above table shows distribution of antenatal mothers according to BMI with GGI and GDM. Among antenatal mothers majority were having BMI >30 kg/m2 with GGI (53.84%) and GDM (42.11%). When BMI was compared with GGI and GDM antenatal mothers the difference was not statistically significant (p>0.05).

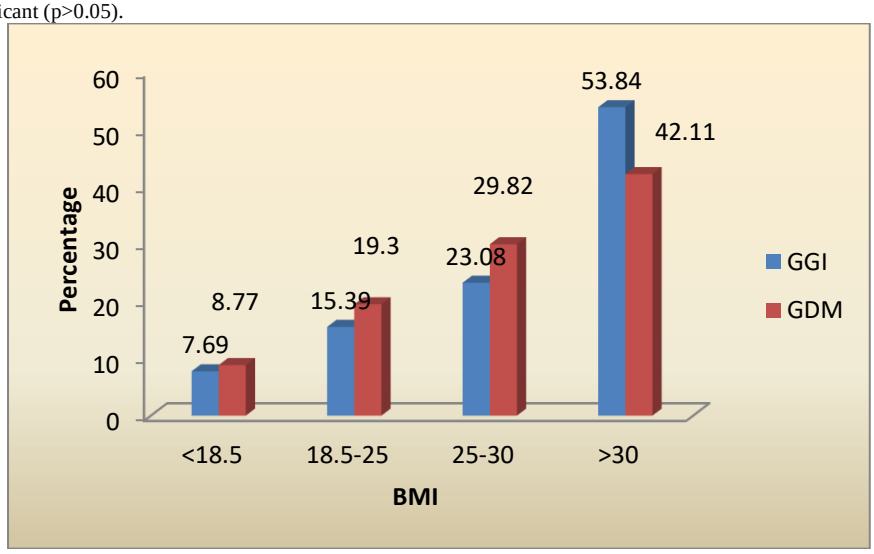

Figure 5: Showing patients according to BMI

Table 8: Distribution of patients according to Socioeconomic status

Socioeconomic status	GGI (%)	GDM (%)	Total (%)
Class 1	05 (38.46)	21 (36.84)	26 (37.14)
Class2	04 (30.77)	15 (26.32)	19 (27.15)
Class3	02 (15.39)	08 (14.04)	10 (14.29)
Class 4	01 (7.69)	07 (12.28)	08 (11.42)
Class 5	01 (7.69)	06 (10.52)	07 (10.00)
Total	13 (100)	57 (100)	70 (100)

The above table shows distribution of antenatal mothers according to SES with GGI and GDM. Among antenatal mothers majority were from class I (Upper class) with GGI (38.46%) and GDM (36.84%). When SES was compared with GGI and GDM antenatal mothers the difference was not statistically significant (p>0.05).

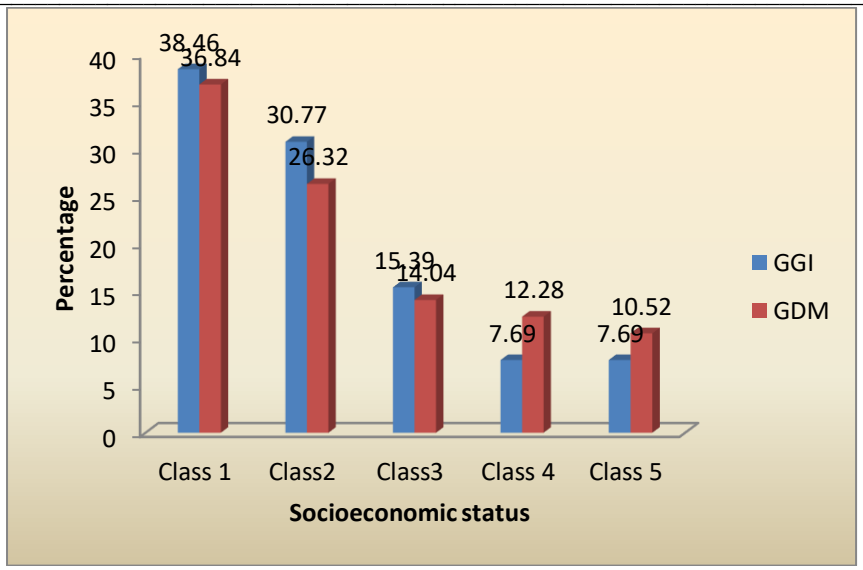

Figure 6: Showing patients according to Socioeconomic status

Table 9: Distribution of patients according to high risk factor

High risk factor	GGI (n=13) (%)	GDM (n=57) (%)	Total (n=70) (%)
GDM in previous pregnancy	01 (7.69)	03 (5.26)	04 (5.71)
IUD	00 (00)	01 (1.75)	01 (1.43)
RPL/ early tri. Abortion	00 (00)	01 (1.75)	01 (1.43)
Macrosomic baby	01 (7.69)	03 (5.26)	04 (5.71)
Malformed baby	00 (00)	01 (1.75)	01 (1.43)

The above table shows distribution of antenatal mothers according to high risk factor in GGI and GDM. The GDM in previous pregnancy with GGI and GDM was observed in 1 (7.69%) and 3 (5.26%) respectively with statistical significance. (P<0.05) The IUD was observed in only GDM antenatal mothers (1.75%) with statistical significance. (P<0.05) The early abortion and malformed baby was observed in only GDM antenatal mothers (1.75%) with statistical significance. (P<0.05)

Table 10: Distribution of patients according to Family history of DM

Family history of DM	GGI (%)	GDM (%)	Total (%)
Positive	01 (7.69)	10 (17.54)	11 (15.71)
Negative	12 (92.31)	47 (82.46)	59 (84.29)
Total	13 (100)	57 (100)	70 (100)

The above table shows distribution of antenatal mothers according to family history of DM with GGI and GDM. Among antenatal mothers with GGI had 01 (7.69%) family history of DM as compared to 10 (17.54%) in GDM. When family history of DM was compared with GGI and GDM antenatal mothers the difference was statistically significant (p<0.05).

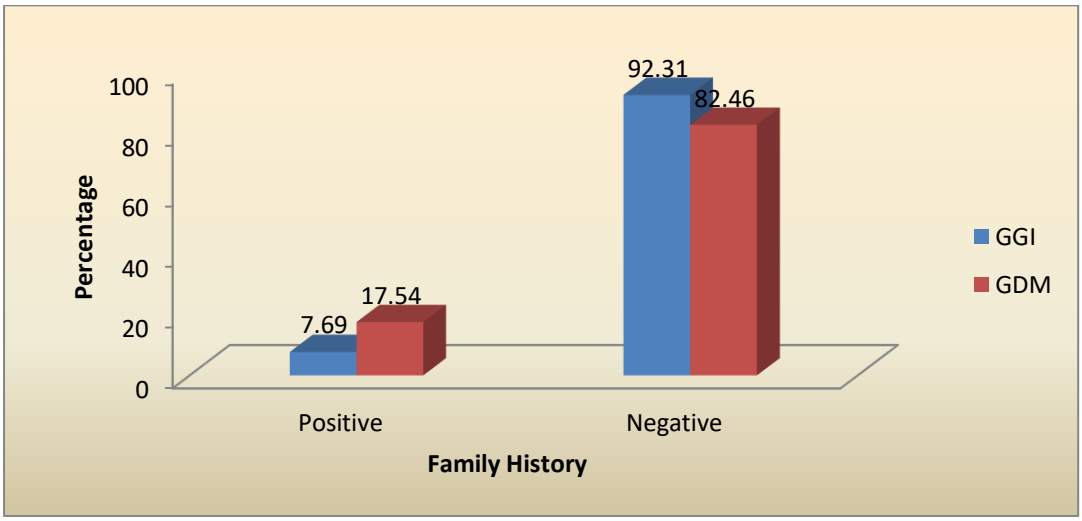

Figure 7: Showing patients according to Family history of DM

Table 11: Distribution of patients according to history of PIH

History of PIH	GGI (%)	GDM (%)	Total (%)
Positive	01 (7.69)	02 (3.51)	03 (4.29)
Negative	12 (92.31)	55 (96.49)	67 (95.71)
Total	13 (100)	57 (100)	70 (100)

The above table shows distribution of antenatal mothers according to history of PIH with GGI and GDM. Among antenatal mothers with GGI had 01 (7.69%) history of PIH as compared to 2 (3.51%) in GDM. When history of PIH was compared with GGI and GDM antenatal mothers the difference was not statistically significant (p>0.05).

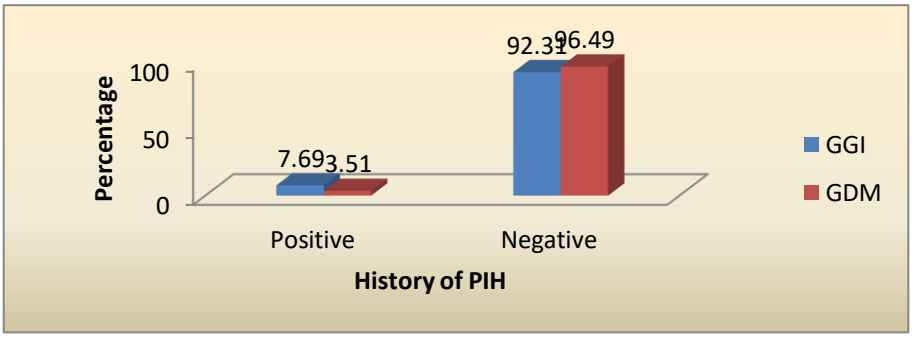

Figure 8: Showing patients according to history of PIH

Discussion

Pregnancy is a diabetogenic state manifested by insulin resistance and hyperglycemia and is implicated to be associated with significant obstetric complications. Diabetes complicates 3-4% pregnancies according to various researchers in America, Europe and Asia. Gestational diabetes has a rising trend in the recent times and depending on the type of population, it is said to complicate pregnancies.

A total of 700 ANCs were enrolled in the study. The study was conducted after obtaining clearance from the institutional ethics committee. The data collection was done by using pre structured and pretested questionnaire. All the information regarding socio demographic factors, past and present obstetric history, was collected.

ANC characteristics

In the present study, the distribution of antenatal mothers according to their gravidity showed that majority 485(69.28%) of the antenatal mothers were multi-gravida followed by 215 (30.71%) antenatal mothers were primigravida

The distribution of antenatal mothers according to their trimester showed that majority 443(49.22%) of the antenatal mothers were in third trimester followed by second trimester (35.67%) and first trimester (15.11%)

In a study by Sudhanshu Sekhara Nanda et al on screening of Gestational Diabetes Mellitus with 75gm OGTT observed among 500 patients screened only 10% were primigravida while 90% were multigravida.

In a study done by Vijaya Lakshmi Udipi Badikillaya et al to assess the effectiveness of DIPSI recommended OGTT in diagnosing GDM observed that out of 200 healthy pregnant women comprising of109 primi and 91 multigravid women.

Prevalence of GGI

In the present study, it was observed that among 700 antenatal mothers screened 13 (1.86%) found to be GGI positive. The prevalence of GGI was 1.86% in the study population. Among antenatal mothers the prevalence of GGI was more in second trimester (53.85%).

In a study done by Orecchio A et al on incidence of gestational diabetes and birth complications in 1042 pregnancies observed GGI in 2.6% of all screened women of this study population.

The prevalence of GGI according to gravida was found majority in multigravida patients. (84.62%). The prevalence of GGI according to age showed majority were from age group 23-27 years (46.15%) Among antenatal mothers with GGI majority were having BMI >30 kg/m2 (53.84%) The prevalence of antenatal mothers with GGI found majority were from class I (Upper class) (38.46%)

Prevalence of GDM

In the present study, it was observed that among 700 antenatal mothers screened 57 (8.14%) found to be GDM positive.

In a study by Sudhanshu Sekhara Nanda et al on screening of Gestational Diabetes Mellitus with 75gm OGTT and its effects on feto-maternal outcome observed the prevalence of GDM of 5.2%.

In a study by V Seshiah et al on prevalence of Gestational Diabetes Mellitus in South India GDM was detected in 392(9.9%) in rural areas.

In a study done by A. P. Sawant et al to find out the efficacy of OGTT in detection of gestational diabetes in high risk group observed that the prevalence of 3.6% of gestational diabetes in the study population.

In a study done by Vijaya lakshmi Udipi Badikillaya et al to assess the effectiveness of DIPSI recommended OGTT in diagnosing GDM observed that out of 200 women 22 (11%) tested positive for the DIPSI recommended 75 g OGTT. The ADA recommended 75g OGTT revealed only 5 positive (2.5%) cases. This indicated a prevalence of 2.5% in the population.

The prevalence of GDM among antenatal mothers showed majority were from second trimester (63.16%). The prevalence of GDM among antenatal mothers showed majority were multigravida (91.23%).

In a study by V Seshiah et al[4] on prevalence of Gestational Diabetes Mellitus in South12.4% were detected within 16 weeks of gestation, 23%between 17 and 23 weeks and remaining 64.6 % more than 24 weeks of gestation.

In a study by Sudhanshu Sekhara Nanda et al GDM was high among multigravida women (G3+G4+G5 =69.23%) The prevalence of GDM according to age among antenatal mothers showed majority were from age group 23-27 years (43.46%).

In a study by V Seshiah et al on prevalence of Gestational Diabetes Mellitus in South distribution of women in the age group 20-24years was relatively higher (66.4%) in rural areas. In a study by Sudhanshu Sekhara Nanda et al on screening of Gestational Diabetes Mellitus with 75gm OGTT observed that the prevalence of GDM more in 26-30 years. (40%)[6].

The prevalence of GDM according to BMI among antenatal mothers showed majority were having BMI >30 kg/m2 (42.11%). In a study by Sudhanshu Sekhara Nanda et al 26.9% of GDM cases had BMI< 30 kg/m2.

In a study by V Seshiah et al[4] on prevalence of Gestational Diabetes Mellitus observed the highest prevalence in women with BMI ≥ 25

kg/m2, and it was 28.4% in urban area, 23.8% in semi urban area and 16.1% in rural area. The prevalence of GDM according to socioeconomic status among antenatal mothers showed majority were from class I (Upper class) (36.84%).

The other studies showed a prevalence of15% was obtained in another govt. maternity hospital affiliated to Madras Medical College in the city of Chennai. This trend of high prevalence of GDM was also found in other parts of the country, 15% in Trivandrum, 21% in Alwaye, 12% in Bangalore, 18.8% in Erode and 17.5% in Ludhiana. The total number of pregnant women screened in these centers was 3674 and an overall GDM prevalence of 16.55%was observed. This study documented a definite increasing trend in the prevalence of GDM compared to that of 2% in1982 and 7.62% in 1991. This trend is also seen in other countries. For example in Australia at one hospital where the same testing procedure and diagnostic criteria have been used for more than 2 decades, the prevalence has more than doubled[7].

GGI and GDM in hisk risk pregnancy

In antenatal mothers with GDM in previous pregnancy GGI and GDM was observed in 1 (7.69%) and 3 (5.26%). The IUD was observed in only (1.75%) antenatal mothers with GDM. The early abortion and malformed baby was observed in only (1.75%) antenatal mothers with GDM.

Similar findings were seen in a study, gestational diabetic women in comparison to non-diabetic women in Asian Indian women (2006) showed the following results, 82.3% of women who reported with GDM had a family history of diabetes in their first degree relatives, 2.7% of them had history of abortion, 1.4% of their children showed congenital anomalies, 8.2% of them gave birth to low birth weight babies and 27.6% of them gave birth to large babies in their previous pregnancy.

The distribution of antenatal mothers according to family history of DM with GGI and GDM showed among antenatal mothers with GGI had 01 (7.69%) family history of DM as compared to 10 (17.54%) in GDM. When family history of DM was compared with GGI and GDM antenatal mothers the difference was statistically significant ($p<0.05$).

In a study by Sudhanshu Sekhara Nanda et al on screening of Gestational Diabetes Mellitus with 75gm OGTT and its effects on feto-maternal outcome observed positive family history of Diabetes in GDM is 61.53% as compared to9.91% in controls. Thus family history is a major factor in the occurrence of GDM and is statistically significant.

In the present study, the distribution of antenatal mothers according to history of PIH with GGI and GDM showed that among antenatal mothers with GGI had 01 (7.69%) history of PIH as compared to 2 (3.51%) in GDM. When history of PIH was compared with GGI and GDM antenatal mothers the difference was not statistically significant ($p>0.05$).

In a study done by Sajida Perveen et al on relationship between gestational diabetes and pregnancy induced hypertension (PIH) observed that PIH and GDM had no clear association except the way of insulin resistance, present in NIDDM due to β-cells dysfunction[8].

Pregnancy induced hypertension and gestational diabetes mellitus is due to a unifying factor, insulin resistance. Hyperglycemia generates the increase in blood pressure, due to insulin resistance which prolongs the extent of hypertension. That's why GDM may have a role in generating as well as precipitations of the complications of PIH.

The increase in the prevalence of GDM in our study could be attributed to increased BMI, as high maternal weight is associated with a substantially higher risk of GDM. In our study, the data from all the three areas showed that women had a BMI $\geq$ 30 kg/m2 which confirm that increased BMI is a risk factor for GDM. Similar to the finding of Dempsey *et al*, we also observed increased prevalence of GDM in less active women[9].Jang *et al* found that the GDM women were older, had higher pre pregnancy weight, higher BMI, higher parities and higher frequencies of known diabetes in the family. Of all the independent risk factors for GDM, BMI emerged as a modifiable risk factor.

The rise in prevalence of Gestational Diabetes in our community and its associated increased risk of pregnancy and delivery complications justifies a need to screen pregnant mothers who attend the antenatal clinic. Our results suggest that a policy of universal screening for GDM should be adopted in all antenatal clinics and DIPSI has a high predictive value .This single step procedure is a simple economic and feasible method. It serves both for the purpose of screening and diagnosis at the same time. So looking towards the sociodemographic characteristics of our patients it should be followed in our region to achieve a better outcome[10].

Conclusion

The prevalence of Gestational Diabetes Mellitus was 8.14% in the present study population. The increase in the prevalence of GDM in our study could be attributed to increase BMI, as high maternal weight is associated with a substantially higher risk of GDM.

The rise in prevalence of Gestational Diabetes in the community and its associated increased risk of pregnancy and delivery complications justifies a need to screen pregnant mothers who attend the antenatal clinic. The results suggest that a policy of universal screening for GDM should be adopted in all antenatal clinics. This single step procedure is a simple economic and feasible method. It serves both for the purpose of screening and diagnosis at the same time. Due to the simplicity, acceptability, sensitivity and cost effectiveness of OGTT, it is the best method to detect gestational diabetes mellitus in high risk group.

References

1. Metzger BE, Coustan DR. Summary and Recommendations of the Fourth International Workshop-Conference on Gestational Diabetes Mellitus. The Organizing Committee. Diabetes Care. 1998;21(Suppl 2):B161–7.
2. Bellamy L, Casas JP, Hingorani AD, Williams D. Type 2 diabetes mellitus after gestational diabetes: A systematic review and meta-analysis. Lancet. 2009;373:1773-9.
3. Ferrara A, Kahn HS, Quesenberry CP, Riley C, Hedderson MM. An increase in the incidence of gestational diabetes mellitus: Northern California, 1991-2000. Obstet Gynecol. 2004;103:526–33.
4. Ishak M, Petocz P. Gestational diabetes among Aboriginal Australians: Prevalence, time trend, and comparisons with non-Aboriginal Australians. Ethn Dis. 2003;13:55–60.
5. Dabelea D, Snell-Bergeon JK, Hartsfield CL, Bischoff KJ, Hamman RF, McDuffie RS, et al. Increasing prevalence of gestational diabetes mellitus (GDM) over time and by birth cohort: Kaiser Permanente of Colorado GDM Screening Program. Diabetes Care. 2005;28:579–84.
6. Montana Department of Public Health and Human Services Chronic Disease Prevention and Health Promotion Program Trends in diabetes in pregnancy among American Indian and White mothers in Montana 1989-2003: An update. 2005;2:1–8.
7. Thorpe LE, Berger D, Ellis JA, Bettegowda VR, Brown G, Matte T, et al. Trends and racial/ethnic disparities in gestational diabetes among pregnant women in New York City, 1990-2001. Am J Public Health. 2005;95:1536–9.
8. Zargar AH, Sheikh MI, Bashir MI, Masoodi SR, Laway BA, Wani AI, et al. Prevalence of gestational diabetes mellitus in Kashmiri women from the Indian subcontinent. Diabetes Res Clin Pract. 2004;66:139–45.
9. Seshiah V, Balaji V, Balaji MS, Paneerselvam A, Arthi T, Thamizharasi M, et al. Prevalence of gestational diabetes mellitus in South India (Tamil Nadu) – A community based study. J Assoc Physicians India. 2008;56:329–33.
10. Verma A, Singh B, Mengi V. Gestational diabetes in rural women of Jammu. Indian J Community Med. 2008;33:54–5.

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