PREVALENCE OF GDM AND THEIR RISK FACTORS IN A TERTIARY HOSPITAL- A PROSPECTIVE STUDY
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ABSTRACT

BACKGROUND
Detecting the evidence of gestational diabetes mellitus is a major challenge as the condition is associated with diverse range of adverse maternal and neonatal outcome. Also, women detected with gestational diabetes mellitus have an increased incidence of diabetes especially type 2 diabetes mellitus in the later life and future development of obesity and diabetes in the offspring. Studies conducted in different populations and with different methodologies consistently reported an increase in GDM prevalence. A true increase in the prevalence of GDM aside from its adverse consequences for the infant and newborn period might reflect or contribute to the ongoing pattern of increasing diabetes and obesity.¹²

The aim of the study is to-
1. Validate the Diabetes in Pregnancy Study Group of India (DIPSI) recommended 75 grams glucose test for the diagnosis of gestational mellitus by comparing with the WHO criteria and ADA criteria.
2. Study the prevalence of gestational diabetes in antenatal population attending Government Kilpauk Medical College Hospital.
3. Study the prevalence of following risk factors in GDM.

MATERIALS AND METHODS
This prospective study was conducted in 350 antenatal women of 24-28 weeks gestational age who attended antenatal clinic in Government Kilpauk Medical College Hospital, Chennai. This study was done after getting clearance from ethical committee of Government Kilpauk Medical College Hospital.

RESULTS
Incidence of GDM was 4%. DIPSI criteria had a diagnostic accuracy, sensitivity and specificity of 98.86%, 100% and 98.82%. WHO criteria had a diagnostic accuracy, sensitivity and specificity of 99.43%, 100% and 99.41%. In both, the negative predictive value was 100%. From binary logistic regression, the associated risk factors were previous history of GDM, polyhydramnios and recurrent pregnancy loss evolved as significant risk factors. Polyhydramnios has an odds ratio of 13, previous history of GDM has an odds ratio of 45 and RPL has an odds ratio of 5.

CONCLUSION
DIPSI criterion requires estimation of plasma glucose in one blood sample to diagnose GDM. It is cost effective and convenient to the patient and meets our responsibility of offering a single-step definitive glucose test to every pregnant women belonging to any socioeconomic status. This study has validated the credibility of DIPSI criterion. The associated risk factors were previous history of GDM, polyhydramnios and recurrent pregnancy loss. Further studies are warranted to substantiate this suggestion.³

KEYWORDS
Gestational Diabetes, DIPSI Criterion and Risk factors.

obesity and diabetes in the offspring. Studies conducted in different populations and with different methodologies consistently reported an increase in GDM prevalence. A true increase in the prevalence of GDM aside from its adverse consequences for the infant and newborn period might reflect or contribute to the ongoing pattern of increasing diabetes and obesity.\textsuperscript{1,2}

Gestational diabetes mellitus offers an unique opportunity for the development, testing and implementation of clinical strategies for diabetes prevention. Timely action taken towards screening all pregnant women for glucose tolerance, identifying glucose tolerance, effectively achieving euglycaemia in them and assuring adequate nutrition may prevent in all probability the vicious cycle of transmitting glucose intolerance from one generation to another.\textsuperscript{1,2}

Successful screening tests require that the condition should be prevalent in the target population, that treatment improves the prognosis and that treatment is effective. Various screening guidelines have been introduced depending upon the suitability of the test to the population, characteristics, cost and screening accuracy. Still there are lot of controversies as to which test to be used, when should the screening be done and on whom it should be applied. The search for ideal screening strategy is ongoing, factors like clinical judgement and available resources play an important role in choosing best possible mode for evaluation of aims to briefly review the existing data regarding the risk factors for gestational diabetes mellitus, the different screening and diagnostic practices for GDM and finally outline the best suitable option for our economy and population.\textsuperscript{4,5,8,9}

**Diabetes in Pregnancy Study Group of India (DIPSI) Guidelines**- Universal screening at 24-28 weeks using a 75 g oral glucose load without regard to last meal. A venous sample is collected at 2 hours for estimating glucose by GOD-POD method. GDM is diagnosed if 2 hrs. plasma glucose >140 mg/dL.

Performing this test procedure in nonfasting state is rational as glucose concentrations are affected little by the time of last meal in a glucose tolerant women. Whereas, it will in a woman with gestational diabetes mellitus. After a meal, a normal glucose tolerant woman would be able to maintain euglycaemia despite glucose challenge due to brisk and adequate insulin response, whereas a woman with GDM who has impaired tolerance with a meal and with glucose challenge, the glycaemic excursion exaggerates further. Therefore, the procedure assumes clinical relevance as WHO criteria to correctly identify subjects with GDM.\textsuperscript{1,2,4,5,8,9}

**Advantages**

a. The pregnant woman need not be fasting.

b. Causes least disturbance to pregnant women’s routine activities.

c. Serves as both screening and diagnostic procedure.

**Aims and Objectives**

a. To validate the Diabetes in Pregnancy Study Group of India (DIPSI) recommended 75 grams glucose test for the diagnosis of gestational mellitus by comparing with the WHO criteria and ADA criteria.

b. To study the prevalence of gestational diabetes in antenatal population attending Government Kilpauk Medical College Hospital.

c. To study the prevalence of associated risk factors in GDM.

**MATERIALS AND METHODS**

This prospective study was conducted in 350 antenatal women of 24-28 weeks gestational age who attended antenatal clinic in Government Kilpauk Medical College Hospital, Chennai. This study was done after getting clearance from ethical committee of Government Kilpauk Medical College Hospital.

**Inclusion Criteria**- All pregnant women attending antenatal clinic in Government Kilpauk Medical College Hospital during 24-28 weeks gestation.

**Exclusion Criteria**- Known diabetes or GDM patients.

**Techniques**- Detailed history was taken to reveal all risk factors. BP was recorded in right upper limb in sitting posture to detect gestational hypertension. Complete general and obstetric examination were carried out. Examination of gravid uterus and USG abdomen were done to detect polyhydramnios.

All women were subjected to 75 g glucose test irrespective of last meal and 2 hrs. venous sample was collected. Blood sugar was estimated by Siemens AUTOPAK GOD-POD method.

All the women were again subjected to 75 g OGTT after at least 72 hours. Their fasting venous blood glucose, 1 hr. and 2 hrs. samples were collected. Patients were advised to take a balanced diet for 3 days. They were advised not to eat, drink, smoke or exercise strenuously for at least 8 hours and be in rest during the test.

The results were analysed taking into consideration the criteria recommended by DIPSI for single step glucose test in comparison with WHO and ADA criteria.

DIPSI recommends a 75 g glucose test irrespective of last meal and the diagnosis of GDM is made if the plasma glucose level after two hours exceeds 140 mg/dL (7.8 mmol/L).

WHO recommends a 75 g OGTT and the diagnosis of GDM is made if the plasma glucose level after 2 hours exceeds 140 mg/dL.\textsuperscript{5}

ADA recommends a 75 g OGTT with plasma glucose measurement at fasting 1 hr. and 2 hrs. GDM diagnosis is made when any of the following plasma glucose values are exceeded; fasting >92 mg/dL, 1 hr. >180 mg/dL and 2 hrs. >153 mg/dL.\textsuperscript{6}

The data was analysed by comparing DIPSI criteria and ADA criteria and sensitivity, specificity and diagnostic accuracy calculated. Similarly, sensitivity, specificity and diagnostic accuracy calculated by comparing WHO and ADA criteria.
Data of all the risk factors were expressed as percentages. Statistical comparison was performed by Student’s t-test and Chi-square test. P value <0.05 was taken as statistically significant. Significant risk factors were determined by binary logistic regression.

RESULTS AND DISCUSSION

Bivariate analysis of the following risk factors were done with respect to prevalence of GDM or no GDM.

A. Age >30 years.
B. Family history of GDM in first-degree relative.
C. Previous history of GDM.
D. Parity >3.
E. Previous delivery of large baby (macrosomia).
F. Previous stillbirth.
G. Previous delivery of child with birth defects.
H. Polyhydramnios.
I. Gestational hypertension.
J. Recurrent pregnancy loss.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>GDM</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>&lt;20 years</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>% within GDM</td>
<td>3.6%</td>
<td>0%</td>
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<tr>
<td>% of total</td>
<td>3.4%</td>
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</tr>
<tr>
<td>21-25 years</td>
<td>181</td>
<td>8</td>
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<tr>
<td>% within GDM</td>
<td>53.9%</td>
<td>57.1%</td>
</tr>
<tr>
<td>% of total</td>
<td>51.7%</td>
<td>2.3%</td>
</tr>
<tr>
<td>26-30 years</td>
<td>115</td>
<td>1</td>
</tr>
<tr>
<td>% within GDM</td>
<td>34.2%</td>
<td>7.1%</td>
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<tr>
<td>% of total</td>
<td>32.9%</td>
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<tr>
<td>&gt;30 years</td>
<td>28</td>
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<tr>
<td>% within GDM</td>
<td>8.3%</td>
<td>35.7%</td>
</tr>
<tr>
<td>% of total</td>
<td>8.0%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Total count</td>
<td>336</td>
<td>14</td>
</tr>
<tr>
<td>% within GDM</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>% of total</td>
<td>96%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Table 1. Age Group

Patients with GDM mainly belong to 2 age groups. 57.1% belong to age group 21-25 years. 35.7% belong to age group >30 years. Among the non-GDM group, only 8.3% belong to group >30 years.

The distribution of age classification among GDM and non-GDM group is statistically significant. Chi-square = 14.188; p = 0.003.

<table>
<thead>
<tr>
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<tr>
<td>No</td>
<td>Count 277</td>
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<td>% within GDM</td>
<td>82.4%</td>
<td>64.3%</td>
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<tr>
<td>% of total</td>
<td>79.1%</td>
<td>2.6%</td>
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<tr>
<td>Yes</td>
<td>Count 59</td>
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<tr>
<td>% within GDM</td>
<td>17.6%</td>
<td>35.7%</td>
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<tr>
<td>% of total</td>
<td>16.9%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Total Count</td>
<td>336</td>
<td>14</td>
</tr>
<tr>
<td>% within GDM</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>% of total</td>
<td>96%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Table 2. Family History of GDM

64.3% of GDM population do not have a positive family history and 35.7% have a positive history. Among non-GDM group, 17.6% have positive family history.

The distribution of family history of among GDM and non-GDM is not statistically significant.

Chi-square = 2.965; p value = 0.08.

<table>
<thead>
<tr>
<th>Previous History of GDM</th>
<th>GDM</th>
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<td></td>
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<td>Yes</td>
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<tr>
<td>No</td>
<td>Count 334</td>
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<tr>
<td>% within GDM</td>
<td>99.4%</td>
<td>78.6%</td>
</tr>
<tr>
<td>% of total</td>
<td>95.4%</td>
<td>3.1%</td>
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<tr>
<td>Yes</td>
<td>Count 2</td>
<td>3</td>
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<tr>
<td>% within GDM</td>
<td>0.6%</td>
<td>21.4%</td>
</tr>
<tr>
<td>% of total</td>
<td>0.6%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Total count</td>
<td>336</td>
<td>14</td>
</tr>
<tr>
<td>% within GDM</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
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<td>4%</td>
</tr>
</tbody>
</table>

Table 3. Previous History of GDM

21.4% of patients with GDM have a previous history as compared to only 0.6% of non-GDM.

Previous history of GDM, thus appears to be a significant risk factor. Chi-square = 41.425; p value = 0.000.
In this study, pregnant women were given 75 g oral glucose irrespective of their last meal. They were again subjected to 75 g OGTT after at least 72 hrs. DIPSI criteria was validated by comparing with WHO and ADA criteria for the diagnosis of GDM.

Incidence of GDM was 4%.

DIPSI criteria had a diagnostic accuracy, sensitivity and specificity of 98.86%, 100% and 98.82%.

WHO criteria had a diagnostic accuracy, sensitivity and specificity of 99.43%, 100% and 99.41%. In both, the negative predictive value was 100%.

These results are similar to V. Seshiah et al and Wahi et al study.

In India, more than 70% population lie in rural settings and facilities for diagnosing diabetes is limited. In this scenario, performing OGTT recommended by other associations to diagnose GDM may not be feasible as the cost involved is prohibitive to perform several tests and ask the pregnant women to come for repeated visits. This maybe one of the reasons why the programme for universal screening for all pregnant women is not implemented in many areas. In this context, DIPSI procedure of estimating plasma glucose from one blood sample is cost effective and evidence based as revealed by the outcome of this study.8

In this study, analysis of several risk factors for GDM was also studied. Age <30 years, previous history of GDM, parity >3, previous history of macrosomia, previous history of still birth, gestational hypertension, polyhydramnios and recurrent pregnancy loss had significant p values. After binary logistic regression, previous history of GDM, polyhydramnios and recurrent pregnancy loss evolved as significant risk factors. Polyhydramnios has an odds ratio of 13, previous history of GDM has an odds ratio of 45 and RPL has an odds ratio of 5.

The validity of DIPSI recommended single step glucose test in diagnosing GDM is assessed in this study. 350 antenatal mothers attending antenatal clinic at Government Kilpauk Medical College Hospital, Chennai, were given 75 g of glucose and their 2 hrs. blood glucose measured. They were again asked to come after at least 72 hrs. and a 75 g OGTT performed. This study also documented the significance of several risk factors, which may help in the screening for GDM.

This study revealed that-

a. DIPSI recommended single step glucose test is a practical, cost effective approach, which will address patient needs and it can be performed in conjunction with a population specific profile.

b. Incidence of GDM in antenatal patients attending Government Kilpauk Medical College Hospital, Chennai, was 4%.

c. Previous history of GDM, recurrent pregnancy loss and polyhydramnios are significant risk factors for screening of GDM.

### DISCUSSION

In this study, pregnant women were given 75 g oral glucose irrespective of their last meal. They were again subjected to 75 g OGTT after at least 72 hrs. DIPSI criteria was validated by comparing with WHO and ADA criteria for the diagnosis of GDM.

Incidence of GDM was 4%.

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Toronto Tri-Hospital study has established recurrent pregnancy loss as an important risk factor for screening of GDM. Narchi and colleagues, Panting-Kemp and associates have reported significant association between polyhydramnios and GDM. Previous history of GDM indicates a glucose intolerance in the previous pregnancy likely to be followed by GDM complication in the present pregnancy as well. So, this study reveals that it may be prudent to be more vigilant in screening for GDM in women with the above risk factors.9,10

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### CONCLUSION

DIPSI criterion requires estimation of plasma glucose in one blood sample to diagnose GDM. It is cost effective and convenient to the patient and meets our responsibility of offering a single step definitive glucose test to every pregnant women belonging to any socioeconomic status. This study has validated the credibility of DIPSI criterion. Further studies are warranted to substantiate this suggestion. After binary logistic regression previous history of GDM, polyhydramnios and RPL have evolved as significant risk factors.

### REFERENCES


