Original Article

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Prevalence of Gestational Glucose Intolerance and Gestational Diabetes in a Tertiary Care Centre in Northern India

Obstetrics and Gynaecology Section

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ABSTRACT

Introduction: Many centres in India have adopted a one-step method known as Diabetes in Practice Study Group in India (DIPSI) criterion to diagnose Gestational Diabetes Mellitus (GDM). Prevalence of GDM is increasing and becoming a public health problem in our country. However, data regarding prevalence of Gestational Glucose Intolerance (GGI), which is considered a precursor to developing GDM is lacking.

Aim: To determine the prevalence of gestational diabetes and GGI in a Tertiary Care Centre in Northern India.

Materials and Methods: All the pregnant women attending antenatal outpatient department at Department of Obstetrics and Gynaecology, KGMU, Lucknow, Uttar Pradesh, India, from January 2016 to December 2016 underwent blood sugar testing 2 hours after taking 75 gm glucose by glucometer irrespective of last meal (DIPSI criterion advocated by Government of India guidelines). Test was done at first prenatal visit and again at 24-28 weeks of gestation, if initially negative. Women were diagnosed with GDM if blood sugar ≥140 mg/dL and managed accordingly. Women with blood sugar ≥120-139 mg/dL were diagnosed with GGI.

Results: A total of 5855 tests using DIPSI criterion were performed at the centre over one year. Prevalence of GDM was 13.9% (814/5855). Prevalence of women with GGI was 19.8% (1164/5855). Women in last quarter of year (Oct-Dec) had the highest prevalence (279/1285; 21.7%) of GDM.

Conclusion: The DIPSI criterion detected high prevalence of GDM and GGI at a tertiary care centre in Northern India. Almost one-third (33.7%) pregnant women attending this centre either had GDM or GGI. Glucose intolerance was seen more often in winter months.

Keywords: DIPSI criterion, Gestational diabetes mellitus, High prevalence

INTRODUCTION

Gestational diabetes mellitus is defined as carbohydrate intolerance, detected for the first time in pregnancy. It is a common medical disorder, if not treated may have an adverse effect on mother and foetus [1]. Testing of GDM dates back to 1964 when O Sullivan JB and Mahan CM, conducted a 3-hour Oral Glucose Tolerance Test (OGTT) with 100 gm glucose in a cohort of 752 pregnant women. The author published 97th centile values of whole blood glucose and suggested that two values of four were used to diagnose GDM [2].

Subsequent cohort studies and conversion of whole blood values to plasma values led National diabetes Data Group and Carpenter MW et al., to propose a criteria for American college of Obstetricians and Gynaecologists in the year 1979 and 1982 respectively [3,4]. Various international organisations since then have proposed different diagnostic criteria to diagnose GDM; however a single uniform diagnostic criterion remains elusive. International Federation of Obstetricians and Gynaecologists endorses IADPSG criteria and recommends its use in all nations [5]. Worldwide, GDM prevalence is noted to range from <1% to 28%. Prevalence is reported to be higher in Blacks, Latino, Native Americans and Asian women than in white women [6].

Indian women per se have high tendency to develop diabetes in pregnancy possibly due to their genetic disposition. In a community based study by Seshiah V et al., prevalence of GDM in Southern India was noted to be 17.8% in urban women, 13.8% in semi-urban women and 9.9% in rural women using a single blood glucose following 75 gm glucose ingestion in fasting state [7]. In a multi-centric random survey conducted on 3,674 women, prevalence of GDM was 16.2% in Chennai, 17.5% in Ludhiana, 15% in Trivandrum and 12% in Bengaluru [8]. Overall, the prevalence of GDM was 16.5% in urban women, thus advocating universal screening of all women in India. In India many centres are using criteria advocated by 'Diabetes in Practice Study Group India' known as DIPSI. The blood glucose value is measured two hours after 75 gm glucose administration irrespective of the last meal. A single step method done on non-fasting women enables to make a quick diagnosis and prevents loss of patients who do not come in fasting state. This criterion is endorsed by FIGO and recommended by government of India guidelines [9].

There are many studies done to evaluate the prevalence of GDM in pregnancy, however its precursor condition termed as GGI is not known. Perhaps knowing the prevalence of GGI will enable the policy makers to shift attention to precursor of GDM.

DIPSI criterion advocated by Government of India is adopted in this large tertiary care centre of Northern India. Hence, this study was planned to know the prevalence of GGI and GDM in women attending tertiary care centre in northern India.

MATERIALS AND METHODS

It was a cross-sectional study conducted at antenatal clinic at Department of Obstetrics and Gynaecology KGMU, Lucknow, Uttar Pradesh, India, from January 2016 to December 2016. Permission was taken from Institute's Ethical Committee. All pregnant women attending antenatal outpatient department underwent blood sugar testing using DIPSI criteria for diagnosing GDM at first prenatal visit. Informed consent was taken prior to enrolment in study. The test was repeated at 24-28 weeks of gestation, if negative earlier as suggested by Government of India guidelines [9]. Women with pre-existing diabetes and not consenting to test were excluded from the study. Women were asked to be seated comfortably and were given 75 gm of glucose in 200 mL of water over 5-10 minutes. Blood sugar testing was done 2 hours later by glucometer (ACCU-CHEK

by Roche-standardised and plasma calibrated). Blood sugar ≥140 mg/dL was taken as abnormal and women were diagnosed with GDM and managed accordingly. Women with blood sugar ≥120-139 mg/dL were diagnosed with GGI. Age of women presenting for this test was noted. An attempt was made to analyse if there was a difference in prevalence of GDM and GGI in women attending outpatient department in different months/quarter of the year.

STATISTICAL ANALYSIS

Statistical analysis was carried out using SPSS version 20. Categorical data are presented as n (%). Chi-square test was used to evaluate difference between groups for categorical variables. A value of $p<0.05$ was taken as statistically significant.

RESULTS

A total of 5855 tests by DIPSI were performed at the centre. Most of the women 2521/5855 (43%) were in age group of 25-29 years followed by 1937/5855 (33%) women in age group of 20-25 years. Age distribution of women undergoing the test and test outcome is shown in [Table/Fig-1]. In all age groups, proportion of women diagnosed with GDM was 10-15% except in women ≥35 years where 28.8% women were diagnosed with GDM ($p<0.001$).

Prevalence of GDM (blood sugar ≥140 mg/dL) was 13.9% (814/5855). Prevalence of women with GGI (blood sugar ≥120-139 mg/dL) was 19.8% (1164/5855).

Range of DIPSI test was 49 mg/dL to 384 mg/dL. Abnormal glucose testing (i.e., either GDM or GGI) was seen in 33.6% (1978/5855) women.

[Table/Fig-2] depicts the prevalence of GDM and GGI in different months of year. On analysing if there was any difference in prevalence of GDM in different quarters of year, it was seen that women in last quarter of year (Oct-Dec) had the highest prevalence of 21.7% in comparison to 14.9%, 11.1%, 9.3% in 3rd (July-Sept), 2nd (April-June), and 1st quarter (Jan-Mar) respectively [Table/Fig-3].

S. No.	Age group	n (%)	GDM n (%)	GGI n (%)
1.	<20 years	83 (1.41%)	8/83 (9.6%)	12/83 (14.4%)
2.	20-24 years	1937 (33.08%)	232/1937 (11.9%)	312/1937 (16.1%)
3.	25-29 years	2521 (43.05%)	381/2521 (15.1%)	517/2521 (20.5%)
4.	30-34 years	1037 (17.71%)	113/1037 (10.8%)	271/1037 (26.1%)
5.	≥ 35 years	277 (4.73%)	80/277 (28.8%)*	52/277 (18.7%)*
Total		5855	814	1164

[Table/Fig-1]: Age distribution of women undergoing the test and the test outcome. $\chi^2=118$ (df=8); *p<0.001

S. no	Month	Total number of women	GDM N (%)	GGI N (%)
1.	January	490	60 (12.2)	100 (20.4)
2.	February	555	52 (9.3)	105 (18.9)
3.	March	512	33 (6.4)	74 (14.4)
4.	April	523	56 (10.7)	72 (13.7)
5.	May	567	73 (12.8)	94 (16.5)
6.	June	522	51 (9.7)	84 (16.0)
7.	July	402	63 (15.6)	66 (16.4)
8.	August	500	57 (11.4)	96 (19.2)
9.	September	499	90 (18.0)	124 (24.8)
10.	October	353	75 (21.2)	80 (22.6)
11.	November	475	92 (19.3)	138 (29.0)
12.	December	457	112 (24.5)	131 (28.6)
Total		5855	814	1164

[Table/Fig-2]: Month-wise distribution of women with GDM and GGI.

S. no	Months	Total number of women	GDM n (%)	GGI n (%)
1	Jan-Mar	1557	145/1557 (9.3%)	279/1557 (17.9%)
2	April-June	1612	180/1612 (11.1%)	250/1612 (15.5%)
3	July-Sept	1401	210/1401 (14.9%)	286/1401 (20.4%)
4	Oct-Dec	1285	279/1285 (21.7%)	349/1285 (27.1%)
	Total	5855	814	1164

[Table/Fig-3]: Yearly quarter-wise distribution of women with GDM and GGI.

DISCUSSION

India has a very high prevalence of GDM. However, the exact prevalence of GGI is unknown. This study showed that at least one-third of pregnant women attending tertiary centre of Northern India either have GDM or GGI. Since a large percentage of population do not have easy access to hospital facility, the WHO criteria was modified by DIPSI and adopted by Government of India. Glucose is administered irrespective of last meal followed by the blood sugar testing to allow easy and single step detection of GDM.

Prevalence data available from Indian subcontinent shows prevalence of 6.6% in western Rajasthan using DIPSI criteria [10]. Nilofer AR et al., in Karnataka and Wahi P et al., in Jammu found a prevalence of 6% and 6.9% respectively using the same cut off [11,12]. Similar diagnostic criteria were used in rural population in western India in Pune, which showed prevalence of 9.5% [13]. On the other hand, on using 75 gm OGTT test as endorsed by WHO, in a community based program, population in rural Haryana was studied in which 913 women were enrolled and it showed 127 (13.9%) women were diagnosed as GDM [14]. In a tertiary care hospital in Haryana, however the incidence was much lower 43 of 607 women (7.1%) using 75 gm OGTT as per ADA criteria [15]. IADPSG criteria is studied in the north Indian population in a study by Gopalkrishnan V et al., in which the prevalence of GDM was 41.9% which is much higher than any of the studies done so far [16]. The author advocated further validation of this test before applying it in limited resource setting.

In a south Indian population, IADPSG criteria and DIPSI criteria were used concomitantly and a similar prevalence of 14.6% and 13.4% respectively was noted implying a close agreement between the two procedures [17].

With changing times, a criterion for diagnosing GDM has changed too. In this institute, an NDDG criterion was used for a long period of time. With the formulation of Government of India guidelines, the institute has adopted blood sugar criteria DIPSI. In Northern India in the same institute, the prevalence of GDM was 3.1% by glucometer in 2002 [18], 10.9% when NDDG criteria were used in 2009 [19]. In this study, prevalence was 13.9% using DIPSI criteria. This study followed the uniform protocol as proposed by DIPSI. Prevalence of GDM noted in this study is at tandem with other studies in literature albeit a little higher. The probable reasons may be that the institute is a tertiary referral centre and gets many referred cases with medical and obstetric complications and hence, a high prevalence rate. This high prevalence may not be extrapolated to general population and more community-based studies are required to understand if the population in urban and rural areas in Northern India also has high prevalence.

There is a high prevalence of GDM in north Indian population and especially from October to December quarter of year noted in this study. It could be a chance finding or also possible due to onset of winter months when lack of sunshine leading to vitamin D deficiency may lead to higher prevalence. A systematic review and meta-analysis by Poel YH et al., on association between vitamin D and GDM showed a significant inverse relation of serum 25(OH)D and the incidence of GDM. However, the association is causal and was still unclear [20]. In another community study in Southern Australia, there

was peak incidence of GDM when estimated delivery of conception was in winter months. This study showed a seasonal variation for GDM. The decline in temperature, physical activity and vitamin D levels was postulated to affect foetal and placental physiology at cellular level contributing to the development of GDM [21]. The present study also showed a significantly higher prevalence of GDM and GGI in winter months. However, vitamin D, sunlight exposure is not studied; hence it is difficult to comment on causal association.

Prevalence of GGI noted in present study is 19.8%. To our knowledge there are very few studies to diagnose the prevalence of GGI. These women may definitely have a higher tendency to develop gestational diabetes in future and thus, identifying this high-risk group has crucial implications. This study also highlighted the fact that there are a large number of women who have GGI and it needs to be studied if they later on develop gestational diabetes. Studies are underway in this institute to determine if any dietary and lifestyle modification in women with GGI will prevent the development of diabetes.

LIMITATION

The limitation of present study was that it was a cross-sectional study and no follow-up was available. Moreover, high prevalence of GDM was not correlated with the BMI and other risk factors like family history of diabetes, previous history of GDM, recurrent pregnancy losses and previous delivery of macrosomic baby. Moreover, this was a cross sectional study and the women diagnosed as diabetic were not followed and their outcome was not noted.

Many studies reported earlier have used different cut-offs leading to difficulty in comparing the prevalence of GDM in different subsets of population. This study followed DIPSI protocol now adopted in various centres and hence prevalence can be compared to other centres. Understanding the high prevalence of glucose intolerance as well as gestational diabetes in this particular population may help in targeting the resources appropriately for well-being of both mother and child. Future studies should be conducted on women who presented with normal blood sugar values at first prenatal visit and later developed any of them.

CONCLUSION

Diabetes in practice study group in india test offers a single step to diagnose GDM. The non-fasting status aids in easy application of this test in women who come from remote areas. DIPSI test detected GDM in 13.9% in pregnant women and GGI in 19.8% pregnant women. Almost one-third (33.7%) pregnant women attending this centre had abnormal glucose tests (either GDM or GGI). Efforts should be directed to plan interventions to diagnose GGI and take preventive measures to prevent development of GDM. Further large multicentric studies are needed to understand the contributing factors for high prevalence of GDM in winter months.

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