Prevalence of Gestational Diabetes using International Association of Diabetes and Pregnancy Study Groups (IADPSG) Criteria in a North Indian Population

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Abstract

Back ground: There is debate as to the most appropriate diagnostic criteria to diagnose gestational diabetes mellitus (GDM). The proposed International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria have recently been endorsed by various bodies, but there remains no national consensus. We studied the prevalence and associations of GDM in North Indians, diagnosed by the IADPSG criteria.

Patients and Methods: We conducted a prospective observational study on 417 pregnant women. The women were screened for GDM between 24 weeks and 28 weeks of gestation by 75g oral glucose tolerance test (OGTT) and GDM diagnosed by the IADPSG criteria.

Results: The prevalence of GDM was 17.7% [95% Confidence interval (CI) 21.4 -14.1%] using the IADPSG criteria. Amongst the women diagnosed to have GDM, 64.9% had abnormal fasting plasma glucose (FPG), while 1-h and 2-h post-glucose (PG) levels were abnormal in 43.2% and 28.4% of women, respectively. Factors like age and family history of diabetes were significantly associated with GDM.

Conclusions: There is a very high prevalence rate of GDM using the IADPSG criteria in North Indian women. Further studies are needed to assess the utility of applying these criteria in our setting.

Keywords: Gestational Diabetes Mellitus (GDM), International Association of Diabetes and Pregnancy Study Groups (IADPSG), Pregnancy.

Introduction

Gestational diabetes mellitus (GDM) is one of the most common medical problems in pregnancy. It has become an important public health problem owing to its growing prevalence and its association with adverse pregnancy outcomes and type 2 diabetes mellitus later in life. The prevalence of Gestational diabetes mellitus (GDM) is increasing, fuelled by advancing maternal age, racial/ethnic shifts in childbearing, and obesity.

The global prevalence of hyperglycaemia in pregnancy in women (20–49 years) is 16.9% or 21.4 million live births in 2013. An estimated 16.0% of those cases may be due to diabetes in pregnancy. The highest prevalence of GDM was found in the South-East Asia Region at 25.0% compared with 10.4% in the North America and Caribbean Region. More than 90% of cases of hyperglycaemia in pregnancy are estimated to occur in low- and middle-income countries.(1)

The hyperglycaemia and adverse pregnancy outcome (HAPO) study was conducted to clarify the associations between maternal hyperglycaemia and adverse pregnancy outcomes. The study showed associations between increasing levels of fasting blood glucose (FBG), 1-hour and 2-hour plasma glucose obtained following an oral glucose tolerance test (OGTT), and birthweight >90th centile and cord-blood serum C-peptide level >90th centile.(1) The secondary outcomes of premature delivery, shoulder dystocia or birth injury, admission to intensive neonatal care unit, hyperbilirubinemia, and preeclampsia were also increased by maternal hyperglycaemia.(2) The consideration of HAPO data led to a recommendation in 2010 by the International Association of Diabetes and Pregnancy Study Groups (IADPSG) for the FBG and 1 h and 2 h glucose levels to diagnose GDM.(3) The diagnostic threshold values were the average glucose values at which the odds for birthweight >90th centile, cord C-peptide >90th centile, and percent body fat >90th centile reached 1.75 times the estimated odds of the outcomes at mean glucose values.(2,3) Based upon an consensus process of decision making, a task force of the International Association of Diabetes in Pregnancy Study Groups (IADPSG) recommends that the diagnosis of gestational diabetes be made when any of the following three 75 gram 2-hour OGTT thresholds are met or exceeded: Fasting 92 mg/dL, one hour 180 mg/dL, two hours 153 mg/dL.(3)

The IADPSG) criteria for gestational diabetes mellitus (GDM) has been adopted by most associations across the world including the American Diabetes Association and World Health Organization (WHO).(4) The prevalence of GDM increases by two- to threefold if the IADPSG criterion is adopted for screening. There is an ongoing debate whether such an increase in prevalence allows identification of previously ignored risks, or results in over medicalization of healthy pregnancies.(4) The IADPSG criteria aim to improve the perinatal outcomes and should also be used for the sake of uniform reporting.

Reporting of the prevalence rates of GDM using IADPSG criterion from Indian population are few and they report high prevalence of GDM as compared to

earlier studies, In recent studies, prevalence rates as high as 35% from Punjab[5] and 41% from Lucknow have been reported.[6] The geographical differences in prevalence have been attributed to differences in age and/or socioeconomic status of pregnant women in these regions and many more studies are needed to understand, the enormity of the situation, and its management. As per the WHO, each health care facility needs to assess their burden of hyperglycemia in pregnancy and decide whether and how it will implement programs to test for and treat such women.[4]

The present prospective observational study was thus conducted to study the prevalence of GDM using IADPSG criteria in a North Indian population.

Material and Methods

Consecutive pregnant women with singleton pregnancy at 24th to 28th week of gestation attending the ante-natal clinics in the Department of Gynaecology and Obstetrics, Santosh Hospital, Ghaziabad, for a period of one year, were recruited for the study. Women known to have pre-existing diabetes were excluded from the study.

Women were advised to come for testing after >8 h overnight fast. Their blood samples were taken in fasting state and 1-h and 2-h after 75-g oral glucose load. Plasma glucose was estimated by glucose-oxidase-peroxidase (GOD-POD) technique.

The women were classified as GDM and non GDM, based on the IADPSG criteria [fasting plasma glucose (FPG)≥92 mg/dL, 1-h post-glucose (PG) value ≥180 mg/dL and 2-h PG value ≥153 mg/dL].[2] Written consent was obtained from all the patients and the study was approved by the Ethics Committee of the Institute.

Statistical Analysis: The continuous variables were expressed as mean and standard deviation (SD). The categorical variables were expressed as number and percentage. Student's t-test was used for the comparison of groups.

Observations and Results

A total of 450 pregnant women were recruited for the study out of which 417 women completed the study and their data were analysed.

The prevalence of GDM was 17.7% [95% Confidence interval (CI) 21.4 -14.1%] using the IADPSG criteria,. High Fasting Plasma Glucose (FPG) was seen in the 48(64.9%) participants, high 1-h plasma glucose levels was revealed in 32 (43.2%) of the participants, high 2-h plasma glucose occurred in 21(28.4%) of the participants.

Table 1: Prevalence of GDM by IADPSG Criteria

Criteria	IADPSG n (%)
Number of GDM	74 (17.7%)
Abnormal FPG alone	48(64.9%)
Abnormal 1-h PG alone	32 (43.2%)
Abnormal 2-h PG alone	21(28.4%)
Any two abnormal values	34(8.1%)
All three abnormal values	6(1.4%)

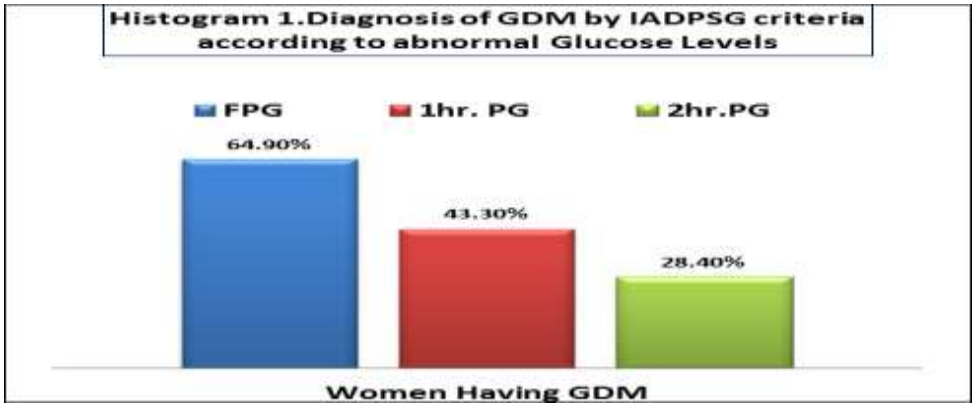

Table 2: Demographics Summary

	GDM present	GDM not present	Total	P value
n (Number of cases)	74	343	417	
Age (mean±SD)	26.4±3.6	25.1±3.8	26±3.9	0.3
FPG (mean±SD)	95.9(17.2)	78.1(6.4)	81.2(11.4)	0.001
BMI (mean±SD)	24.6±4.1	23.8±3.7	23.8±3.8	0.66
Family History of Diabetes				
Yes n (%)	8(10.8)	8 (2.3)	16 (3.8)	0.003
No n(%)	66(89.1)	336(97.9)	402(96.4)	
Previous Spontaneous Abortion n(%)	21 (28.3)	119 (34.6)	140(33.5)	0.34
No Previous Spontaneous Abortion n(%)	53 (71.6)	224 (65.3)	277 (66.4)	
Nullipara n(%)	31(41.8)	127 (37.0)	211 (50.5)	
Multipara n(%)	43(58.1)	216 (62.9)	6 (1.4)	0.43
Class				
Upper n(%)	14 (18.9)	48 (13.9)	62 (14.8)	
Upper Middle n(%)	24 (32.4)	94 (27.4)	118 (28.2)	
Upper Lower n(%)	2 (2.7)	14 (4.08)	16 (3.8)	0.45
Lower Middle n(%)	15 (20.2)	101 (29.4)	116 (27.8)	
Lower	19 (25.6)	86 (25.0)	105 (25.1)	

Table 3: Prevalence of GDM according to age of the subjects

Age group (years)	GDM	Non GDM	Total	P value
< 20	1	23	24	
21-25	36	149	185	
26-30	25	127	152	
31-35	11	41	52	0.39
≥ 36	1	3	4	
Total	74	343	417	

The 74 cases diagnosed as GDM were then categorized across seven groups based on the number of values over IADPSG thresholds: 1) FPG only (34 cases,45.9%), 2) 1-h plasma glucose only (no cases, 3) 2-h plasma glucose only (3 cases,4.1%), 4) FPG and 1-h plasma glucose (13 cases, 17.6%), 5) FPG and 2-h plasma glucose (6, cases, 8.1%), 6) 1-h plasma glucose and 2-h plasma glucose (15 cases, 20.3%), and 7) FPG and 1-h plasma glucose and 2-h plasma glucose (6 cases, 8.1%).

The mean ± SD FPG value in women with GDM was 95.9±17.2 and 78.1± 6.4 in women without GDM, a statistically significant difference (p=0.001).

Main characteristics of pregnant women enrolled in the study are presented in **Table 2.** Out of 417 women in study population 52 women were in the age group of ≥ 30 years; 12 women (21.4%) had GDM as compared to 62(17%) women out of 365 women in the age group ≤ 30 years. Prevalence of GDM was comparable between the age groups (P = 0.39). (**Table 3)**

Variables such as age and family history of diabetes were significantly different between the GDM and the non-GDM groups. (**Table 2)** Gravida number, BMI and history of spontaneous abortion were not significantly different between the GDM and the non-GDM groups. (**Table 2**) The mean±SD FPG value in women with GDM was 95.9±17.2 and 78.1±6.4 in women without GDM, a statistically significant difference (p=0.001).

Discussion

The prevalence of GDM was 17.7% [95% Confidence interval (CI) 21.4 -14.1%] using the IADPSG criteria, in our study population.

The frequency of GDM in our study population is similar to that of the HAPO study (17.8%). Indian women were not represented in the HAPO cohort. Among the collaborating centres in the HAPO study, the prevalence rates of GDM differed widely, varying 9-25.5%.[7]

In an Indian study by Seshiah et al.[8]; on 1463 consecutive pregnant women GDM was diagnosed in 14.6% of women by International Association Of The Diabetes And Pregnancy Study Group (IADPSG) criteria[8].

In a retrospective analysis of South Asian women in the United Arab Emirates, Agarwal et al.[9] reported a very high prevalence of GDM (38%) by the IADPSG criteria when compared with the ADA 2010 criteria (13%).

A rule-in and rule-out algorithm[9] was used by Agarwal et al for the FPG to predict GDM. Briefly, this approach involves considering two FPG cut off values. The higher threshold, with an inherently increased specificity, rules in GDM; the lower threshold, with its

innate increased sensitivity, rules out GDM. They suggested that, women who have FPG values in between these two thresholds are indeterminate and would need the diagnostic OGTT.

In the present study using the IADPSG diagnostic criteria, 64.9% (11.5% of the total population)of GDM was diagnosed by an FPG ≥ 5.1 mmol/L (92 mg/dl), whereas 51% and 40% of GDM was diagnosed by an FPG > 5.1 mmol/L (92 mg/ dl), in the HAPO study and that of Mahdavian et al., respectively.[7,10] Analysing the results of HAPO Study Sacks et al.[7] recommended that in populations in which FPG is diagnostic in more than half of those with GDM, it may be reasonable to perform an accurately measured FPG as an initial step, reserving a full OGTT for those with a non-diagnostic FPG. In a recent study from Pondicherry in South India conducted at a government hospital, the prevalence of GDM was as high as 27.3% as per the IADPSG criteria and FPG alone detected 63.9% of GDM cases.[11] Though the prevalence of GDM was not as high but the detection rate by FPG alone was similar in our study. GDM was diagnosed in 41.9%, (36.6-47.2%, 95% CI)] women in a study from Lucknow.[6] Also, of all the GDM women diagnosed by the IADPSG criteria, 91.4% had abnormal FPG.[6] Results of our study, where FPG was diagnostic in 64.9% of cases, make a strong case, that FPG can be used as a first step for screening GDM.

One of the biggest criticisms of the IADPSG criteria has been that it increases the number of women diagnosed as GDM, as it uses a rather low fasting plasma glucose cut-off. This obviously has several implications such as increasing health care costs. In a recent study by Meek et al.[12] it was reported that IADPSG criteria identified women at substantial risk of complications who would not be identified by the NICE 2015 criteria. They further opined that women with fasting hyperglycaemia, shown in their study to be at risk of adverse outcomes, would not have been readily identified using a GCT, which relies on a 1 h post-load test only.[12]

In our study population of North India, there is a high frequency of GDM using the IADPSG criteria. Due to the small number of patients in our study, further studies with larger sample size in different Indian populations are required before arriving at a definitive conclusion. According to our study FPG estimation has a potential to be used as a screening test for GDM.

Conclusion

In light of the recent studies and their recommendations, and in order to obtain international standardization, we recommend that, wherever possible, a single-step fasting OGTT using 75g glucose, and the IADPSG criteria should be used for diagnosis of GDM.

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References

1. Guariguata L, Linnenkamp U, Beagley J, Whiting DR, Cho NH. Global estimates of the prevalence of hyperglycaemia in pregnancy. Diabetes Res Clin Pract. 2014 Feb;103(2):176-85.
2. Metzger BE, Lowe LP, Dyer AR, Trimble ER, Chaovarindr U, Coustan DR, et al.; HAPO Study Cooperative Research Group. Hyperglycemia and adverse pregnancy outcomes. N Engl J Med 2008;358:1991-2002.
3. Metzger BE, Gabbe SG, Persson B, et al; International Association of Diabetes and Pregnancy Study Groups Consensus Panel. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care 2010;33:676–682.
4. World Health Organization. Diagnostic criteria and classification of hyperglycaemia first detected in pregnancy. Diabetes Res Clin Pract. 2014;103(3):341–363.
5. Arora GP, Thaman RG, Prasad RB, Almgren P, Brøns C, Groop LC, et al. Prevalence and risk factors of gestational diabetes in Punjab, North India: Results from a population screening program. Eur J Endocrinol 2015;173:257-67.
6. Gopalakrishnan V, Singh R, Pradeep Y, Kapoor D, Rani AK, Pradhan S, et al. Evaluation of the prevalence of gestational diabetes mellitus in North Indians using the International Association of Diabetes and Pregnancy Study groups (IADPSG) criteria. J Postgrad Med 2015;61:155-8.
7. Sacks DA, Hadden DR, Maresh M, et al. Frequency of gestational diabetes mellitus at collaborating centers based on IADPSG consensus panel–recommended criteria: the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) Study. Diabetes Care 2012;35:526–528.
8. Seshiah V, Balaji V, Shah SN, et al.; Diagnosis of gestational diabetes mellitus in the community. J Assoc Physicians India 2012;16:15-17.
9. Agarwal MM, Dhatt GS, Shah SM (2010) Gestational diabetes mellitus: simplifying the international association of diabetes and pregnancy diagnostic algorithm using fasting plasma glucose. Diabetes Care 33:2018–2020.
10. Mahdavian M, Hivert MF, Baillargeon JP, Menard J, Ouellet A, Ardilouze JL. Gestational diabetes mellitus: simplifying the international association of diabetes and pregnancy diagnostic algorithm using fasting plasma glucose: comment on Agarwal, Dhatt, and Shah. Diabetes Care. 2010;33:145.
11. Nayak PK, Mitra S, Sahoo JP, Daniel M, Mathew A, Padma A. Feto-maternal outcomes in women with and without gestational diabetes mellitus according to the international association of diabetes and pregnancy study groups (IADPSG) diagnostic criteria. Diabetes Metab Syndr 2013;7:206-9.
12. CL Meek, HB Lewis, C Patient, HR Murphy, D Simmons; Diagnosis of gestational diabetes mellitus: falling through the net. Diabetologia (2015) http://dx.doi.org/10.1007/s00125-015-3647-z.