

ORIGINAL RESEARCH

Comparison of Different Diagnostic Criteria for Screening of Gestational Diabetes Mellitus: A Study in Indian Women

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ABSTRACT

Introduction: Gestational Diabetes Mellitus (GDM) is associated with adverse maternal and fetal outcomes. Among south Asian population, Indian women are at high risk of developing carbohydrate intolerance during pregnancy. This study is undertaken to compare the accuracy of the criteria- American Diabetes Association (ADA), World Health Organization (WHO) and International Association of Diabetes and Pregnancy Study Groups (IADPSG) in diagnosing gestational diabetes in Indian women.

Materials and methods: 353 antenatal women attending the outpatient department with any one risk factor for gestational diabetes were included in the study. The results of 75g Glucose Tolerance Test (GTT) done in antenatal women were analyzed using ADA, WHO and IADPSG criteria. All the cases were followed till delivery. Birth weight of babies was recorded. The association of macrosomia with gestational diabetes diagnosed by those criteria was studied.

Results: In our study, the prevalence of GDM is 20.3% by WHO criteria, 20.6% by IADPSG criteria and 4.9% by ADA criteria. The prevalence is 4 times higher in both WHO and IADPSG criteria when compared to ADA criteria. Most of the women (69.8%) with macrosomic babies were diagnosed as GDM by WHO criteria when compared to ADA (23.3%) and IADPSG criteria (58%).

Conclusion: The diagnostic efficacy of WHO criteria is comparable to IADPSG criteria and better than ADA criteria. Hence, WHO criteria based on 2hour 75g GTT can be used for universal screening instead of IADPSG criteria in high risk ethnic group especially in a low resource setting. Further studies are needed to evaluate this finding.

Keywords: ADA criteria, Gestational diabetes, IADPSG criteria, macrosomia, prevalence of GDM, WHO criteria.

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INTRODUCTION

Gestational Diabetes Mellitus (GDM) is defined as carbohydrate intolerance of variable severity with onset or recognition during pregnancy, irrespective of treatment with diet or insulin. Gestational diabetes is associated with adverse maternal and fetal outcomes. GDM can be considered as a predisposing factor for type 2 diabetes. Thus, any attempt to diagnose GDM earlier seems critical.¹

It has been proved that keeping the plasma glucose in optimum range during pregnancy decreases the risk of adverse outcomes due to gestational diabetes. Hence, universal screening in pregnant women to detect gestational diabetes is essential. Among south Asian population, Indian women are at high risk of developing carbohydrate intolerance during pregnancy. Prevalence of GDM in India is 16.55%.²

There are different diagnostic criteria based on 75 g oral Glucose Tolerance Test (GTT) to diagnose Gestational diabetes. This study is undertaken to compare the accuracy of the criteria - American Diabetes Association (ADA), World Health Organization (WHO) and International Association of Diabetes and Pregnancy Study Groups (IADPSG) in diagnosing Gestational diabetes in Indian women.

MATERIALS AND METHODS

This prospective cohort study was carried out in the department of Obstetrics and Gynecology, Shri Sathya Sai Medical College & Research Institute, Tamilnadu from February 2014 to June 2015. Antenatal women attending the outpatient department with any one of the following risk factors were included in the study - Age ≥ 25 years, positive family history of diabetes, history of gestational diabetes in previous pregnancy and bad obstetric history. Antenatal women with any one of the following factors were excluded from the study - Type 1 or Type 2 diabetes mellitus, fasting plasma glucose ≥ 126 mg/dl and 2 hour plasma glucose ≥ 200 mg/dl.

353 Antenatal women attending the outpatient department with inclusion criteria were screened for GDM by 75g GTT after getting informed written consent. Complete history was obtained from the patients and then they were subjected to clinical examination. The patients were instructed to come after overnight fasting. Venous blood sample was collected and plasma glucose was estimated. 75g oral glucose load was given. Venous blood samples were collected after 1 hour and 2 hours of oral glucose load. The plasma glucose was estimated by glucose oxidation and per oxidation method.

The results of 75g GTT were interpreted using ADA, WHO and IADPSG criteria. Three women were excluded from the study. Two of them had fasting plasma glucose ≥ 126 mg/dl. One woman had 2 hour plasma glucose ≥ 200 mg/dl. 350 women were followed up with regular antenatal visits till delivery.

Women diagnosed as GDM by any one of these criteria were advised to follow diabetic diet. After one week, the fasting and 2 hour postprandial plasma glucose were measured. They were advised to follow the diabetic diet till delivery. Birth weight of the babies was noted. Macrosomia was defined as per the Indian consensus definition of birth weight 3.5kg or more at term.³

STATISTICAL ANALYSIS

The data collected were analyzed using SPSS software version 20. Odds ratio (OR), 95% Confidence Interval (CI), *P* value were estimated.

RESULTS

The study was carried out from February 2014 to June 2015. This study included 353 antenatal women and after 75g GTT results, three women were excluded. The data of 350 women were analyzed. Age ≥ 25 years (299) 85.4% was the most common indication for screening.

Only 17 women (4.9%) were diagnosed as GDM by ADA criteria whereas 71 women (20.3%) and 72 women (20.6%) were diagnosed as GDM by using WHO and IADPSG criteria respectively. Of the 17 cases diagnosed as GDM by ADA criteria, only 2 (11.8%) cases are missed by WHO criteria. But, of the 71 cases diagnosed as GDM by WHO criteria, 56 (78.9%) cases were missed by ADA criteria (OR=0.027, 95% CI 0.006-0.1212, *P*<0.0001). Of the 72 cases diagnosed as GDM by IADPSG criteria, 23 (31.9%) cases were missed by WHO criteria. Of the 71 cases diagnosed as GDM by WHO criteria, 22 (30.9%) cases were missed by IADPSG criteria. (OR=0.0403, 95% CI 0.0209-0.078, *P*<0.0001)

All women diagnosed as GDM by any one of these criteria were advised to follow diabetic diet. Invariably, in all GDM women, the fasting and 2hour postprandial plasma glucose after one week of diabetic diet were < 90mg/dl and <140 mg/dl respectively.

In the study group, out of 350 cases, 43 women (12.3%) had

Time	Plasma glucose(mg/dl)		
	ADA4	IADPSG5	WHO6
Fasting	93	92	
1 Hour	180	180	
2 Hour	155	153	≥ 140
ADA criteria - If two threshold values are met or exceeded, GDM is diagnosed.			
IADPSG criteria - If one or more threshold values are met or exceeded, GDM is diagnosed.			
WHO criteria- If 2 hour plasma glucose after 75 g glucose load is ≥ 140 mg/dl, GDM is diagnosed.			
Table-1: 75 g oral GTT			

Risk factors	Number of cases
Age ≥ 25 years	299 (85.4%)
Positive family history	46 (13%)
Previous history of gestational diabetes	3(1%)
Recurrent pregnancy loss	2(1%)
Table-2: Indications for screening of gestational diabetes	

Results	Number of cases		
	ADA	WHO	IADPSG
GDM Positive	17(4.9%)	71(20.3%)	72(20.6%)
GDM Negative	333(95.1%)	279(79.7%)	278(79.4%)
Table-3: Comparison of the results of ADA, WHO and IADPSG criteria			

Criteria	Number of GDM women with macrosomic babies
ADA	10(23.3%)
WHO	30(69.8%)
IADPSG	25(58.1%)
Percentage is calculated based on 43 macrosomic babies detected in the study population.	
Table-4: Correlation of GDM with macrosomia	

babies with birth weight ≥ 3.5 kg. Out of these 43 women, 30 women (69.8%) were diagnosed as GDM by WHO criteria; 10 women (23.3%) were diagnosed as GDM by ADA criteria; 25 women (58%) were diagnosed as GDM by IADPSG criteria. The association between macrosomia and GDM diagnosed by ADA, IADPSG and WHO criteria was statistically significant (*P*<0.0001).

42.3% (30/71) of cases diagnosed by WHO criteria, 58.8% (10/17) of cases diagnosed by ADA and 34.7% (25/72) of the cases diagnosed by IADPSG criteria were found to have macrosomic babies. Macrosomia is a known complication of GDM and 69.8% (30/43) of mothers with macrosomic babies are diagnosed as GDM by WHO criteria (OR=0.0668, 95% CI 0.0322-0.1385, *P*<0.0001). WHO criteria can be considered to diagnose more GDM cases accurately when compared to ADA and IADPSG criteria.

DISCUSSION

GDM is associated with adverse maternal and fetal out-

comes. The risk and severity of complications increases with increasing levels of maternal hyperglycemia. Hence it is necessary to diagnose and treat GDM in early stage itself to avoid complications.

There are three criteria based on 75g GTT which are commonly used in India- ADA, WHO and the recent IADPSG criteria which is based on the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study. The HAPO study states that there were continuous graded relationships between higher maternal glucose and increasing frequency of the primary outcomes such as birth weight >90th percentile, primary cesarean section delivery, clinically defined neonatal hypoglycemia and cord C-peptide >90th percentile.⁵ Hence the diagnosis of GDM based on IADPSG criteria predicts adverse maternal and perinatal complications.

In a systematic review done by Elaina M Wendlandt et al, the estimates of relative risk demonstrate that GDM diagnostic criteria based on both the WHO and the IADPSG criteria predict perinatal and maternal adverse outcomes. In that study, for the three outcomes for which meta-analyses were possible for both criteria (large for gestational age, preeclampsia and cesarean delivery), the magnitude of the effects were similar for the WHO and the IADPSG criteria (1.53 vs. 1.73; 1.69 vs. 1.71; 1.37 vs. 1.23, respectively).⁷ This study shows that WHO criteria is equally effective in diagnosing GDM with adverse maternal and perinatal outcomes when compared to IADPSG criteria.

As the GDM diagnostic cut off values are lowered, the milder degrees of hyperglycemia are diagnosed. This will result in increased prevalence of GDM. The IADPSG criteria and WHO criteria identify lesser degrees of hyperglycemia when compared to the ADA criteria.⁸ There is only a slight difference in the cut off values of ADA and IADPSG criteria. Even if one threshold value is met or exceeded, GDM is diagnosed in IADPSG criteria but, at least two threshold values must be met or exceeded to diagnose GDM in ADA criteria. Hence IADPSG criteria picks up more cases of GDM than ADA criteria.

In a study by Reyes-Munoz E et al, the prevalence of GDM based on ADA and IADPSG criteria in urban Mexican women were studied. They concluded that the prevalence of GDM increased almost 3-fold with use of the IADPSG criteria in comparison with that for the ADA criteria.⁹

In a study by Diane Farrar et al, they hypothesized that the association between gestational diabetes and perinatal outcomes, and the criteria for diagnosing gestational diabetes, might differ in South Asian compared with the white British women. The prevalence of gestational diabetes in their study ranged from 4% to 24% in south Asian women using six different criteria.¹⁰

In a study by Ragnhild Helseth et al in Nordic Caucasian women, the prevalence of GDM was 6.1% for the WHO criteria and 7.4% for the simplified IADPSG criteria. Simplified IADPSG criteria moderately increase GDM prevalence compared with the WHO criteria.¹¹

In our study, the prevalence of GDM is 20.3% by WHO criteria, 20.6% by IADPSG criteria and 4.9% by ADA criteria. The prevalence is 4 times higher in both WHO and IADPSG criteria when compared to ADA criteria. The increase in prevalence of GDM by both the criteria (IADPSG and WHO) need to be accepted in order to decrease the adverse maternal and perinatal outcomes.

In the study group, the prevalence of macrosomia is 12.3%. Most of the women (69.8%) with macrosomic babies were diagnosed as GDM by WHO criteria when compared to ADA (23.3%) and IADPSG criteria (58%). Thus, WHO criteria perform better than ADA and IADPSG criteria in diagnosing GDM especially those complicated by macrosomia. The limitation in this study is that except macrosomia, the maternal and perinatal complications of GDM were not studied adequately. Hence the association of GDM with adverse outcomes needs to be evaluated further.

CONCLUSION

Diagnostic efficacy of WHO criteria in detecting GDM, especially those complicated by macrosomia, is comparable to IADPSG criteria. More number of GDM is diagnosed with WHO criteria when compared to ADA criteria. GTT for WHO criteria is easy to perform and it is convenient for the antenatal women when compared to ADA and IADPSG criteria. Hence we suggest that WHO criteria can be used for universal screening in high risk ethnic group especially in a low resource setting. Further studies are needed to evaluate the efficacy of WHO criteria in comparison with IADPSG criteria.

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