REVIEW ARTICLE

Diagnosing Gestational Diabetes by a Single Step Procedure and Care is a Propitious Step Towards Containing the Epidemic of Diabetes

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Abstract

The prevalence of diabetes is increasing globally, based on the data published in the International Diabetes Federation Atlas (IDF) 9th edition 2019. The data in the Atlas revealed an alarming increase in the prevalence of type 2 diabetes in the world from 463 million in 2019 to 700 million in 2045, a 51% increase. While several reasons are ascribed for this rising trend including aging population, urbanization, genetic predisposition, nutrition and lifestyle transition, etc. One factor that has not received adequate attention is glucose intolerance that occurs during pregnancy, gestational diabetes mellitus (GDM). Gestational diabetes mellitus is defined as carbohydrates intolerance of varying degrees of severity with the onset or first recognition during pregnancy. The diagnosis of GDM has implication beyond the index pregnancy in that women with GDM are at increased risk of future diabetes, predominantly type 2 DM as are their offsprings. Gestational diabetes mellitus may play a crucial role in the increasing prevalence of diabetes and obesity. It is prudent to evaluate the preventive strategies for GDM management in terms of cost-effectiveness and disabilities averted by preventing complication of GDM.

Keywords: Hyperglycemia in pregnancy, Diabetes in pregnancy study group India, Gestational diabetes mellitus.

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Prevelance of Hyperglycemia in Pregnancy

In 2019, the global prevalence of hyperglycemia in pregnancy (HIP) in the age group 20–49 years was estimated to be 20.4 million or 15.8% of live births.[1] They had some form of HIP, of which 83.6% were due to GDM[1] (Fig. 1). One in six live births occurs to women with some form of hyperglycemia (Fig. 1). The highest prevalence of GDM in South East Asian countries is 26.6% (Fig. 2). Hence, all women should be screened for gestational diabetes mellitus (GDM), even if they have no symptoms.[2] But unfortunately, there is no uniformity in the diagnostic procedure (Table 1).

Practical Problems in Diagnosing GDM

There are 10 diagnostic criteria used for estimating GDM,[1] of them, the International Association of Diabetes and Pregnancy Study Groups (IADPSG) guideline is prevalently used. But the concern is IADPSG criteria overdiagnose GDM without clear clinical benefit.[3] All the diagnostic criteria including IADPSG require women to be in fasting.[4] OGTT is resource-intensive and many health services, especially in low resource settings, are not able to routinely perform an OGTT in pregnant women. In these circumstances, many health services do not test for HIP.[4] Therefore, options which do not involve an OGTT are required. For a pregnant woman, the request to attend fasting for a blood test may not be realistic because of the long travel distance to the clinic in many parts of the world, even in developed countries (e.g., UK).[5] A blood test in the fasting at the antenatal booking is often inconvenient due to increased tendency to nausea. Consequently, non-fasting testing may be the only practical option.[4]

Attending the first prenatal visit in the fasting state is impractical in many settings.[4] The dropout rate is very high when a pregnant woman is asked to come again for the glucose tolerance test. On repeat screening in subsequent visits, 28% of the women were detected to have GDM.[6,7] Hence, a need arose to evaluate a test that could be performed without imposing any restrictions to undertake the test.

A diagnostic test procedure that would not require a woman to be in the fasting state was attempted and performed in the Institute of Obstetrics and Gynecology and Maternity Hospital, Chennai, Tamil Nadu, India after obtaining ethical committee approval.[8] The outcome of this study was, 2-hour plasma glucose ≥ 140 mg/dL (7.8 mmoL/dL) with 75 gm oral glucose administered to a pregnant woman in the fasting or non-fasting state, without regard to the time of the last meal was able to identify woman with GDM.[8–10] National Institute of Clinical Excellence (NICE) guideline also accepts 2 hour PG ≥ 7.8 mmoL/dL as one of the diagnostic criteria for GDM based on the study performed in multi-ethnic population of UK.[11] Diagnosis of GDM with 2-hour PG ≥ 140 mg/dL (7.8 mmoL/dL) and treatment is worthwhile with a decreased macrosomia rate, fewer emergency cesarean sections, serious perinatal morbidity and may also improve the women's health-related quality of life.[12,13]

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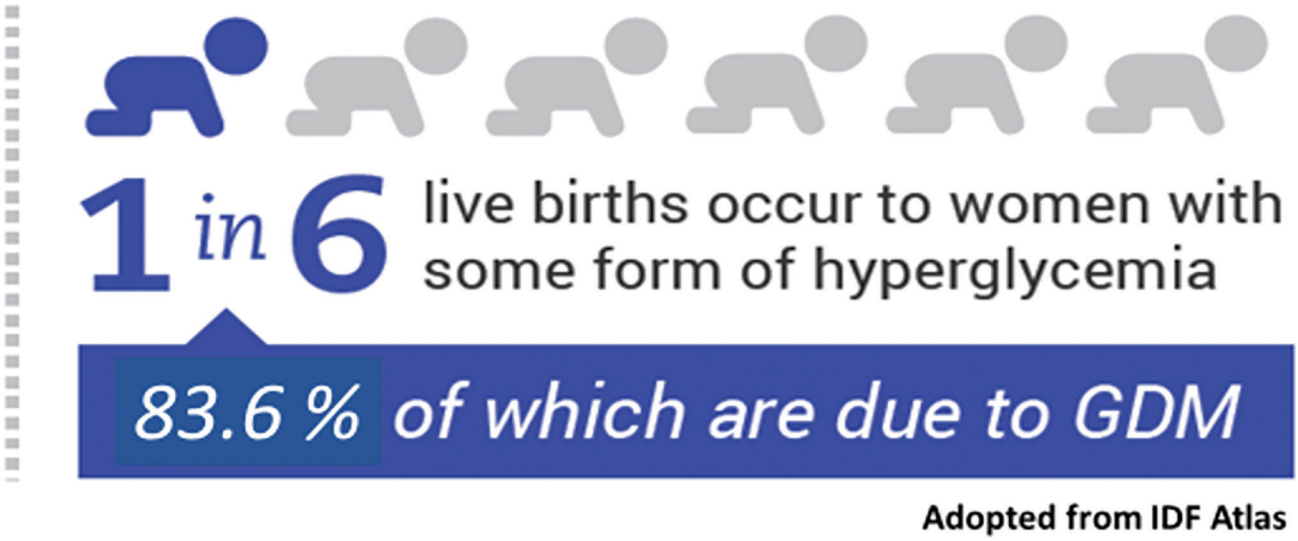

Fig. 1: Live birth percentage in hyperglycemia

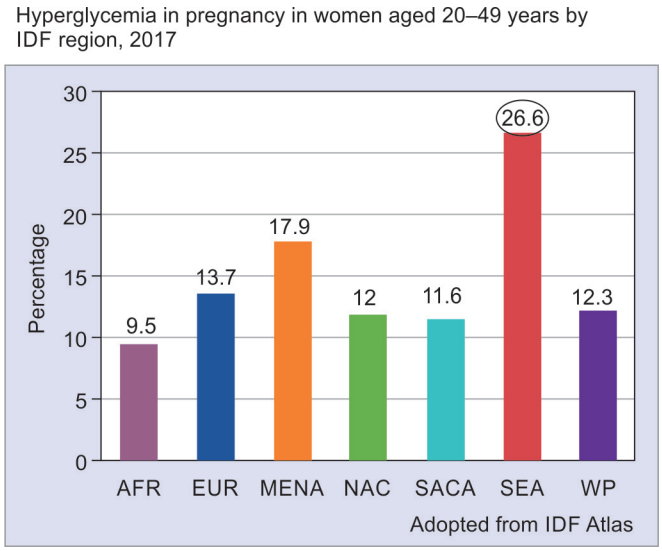

Fig. 2: Hyperglycemia in pregnancy

Advantages of this "single test procedure" are (a) pregnant woman need not be fasting, (b) causes least disturbance in a pregnant woman's routine activities, (c) serves as both screening and diagnostic procedure (Universal testing is possible), (d) extremely useful for diagnosing GDM in the present context of COVID-19 pandemic (e) laboratory glucose measurement is often not available and testing with a portable plasma glucose standardized glucometer is recommended.[4] (f) RCT shows the benefit of treating GDM women identified primarily by post-load values.[4] (g) there is no high-quality evidence that women and their fetuses benefit from treatment if only the fasting value is abnormal,[4] (h) fasting glucose measurement is insufficient for reliably ruling out GDM.[14]

Cost-effectiveness of the Single Test Procedure

This procedure is recommended by the Diabetes in Pregnancy Study Group India (DIPSI). This DIPSI procedure requires one blood sample drawn at 2 hours after 75 gm oral glucose load for estimating plasma glucose. Even if the test is to be repeated in each trimester, the cost in performing the procedure will be 66% less than the cost of performing International Association of Diabetes and Pregnancy Study Group (IADPSG) recommended procedure.[15] A cost-utility analysis found that screening based on IADPSG criteria was not cost-effective.[16] Screening strategy based on the IADPSG criteria may be cost-effective for high resource settings ($61,503/QALY), but probably is too costly for most countries.[17] Cost-effectiveness and availability of resources must also be considered in decisions related to the selection of criteria for local implementation.[18]

Cost-effectiveness of Gestational Diabetes Screening

Elliot Marseille et al. in their article "The Cost-effectiveness of Gestational Diabetes Screening Including Prevention of Type 2 Diabetes: Application of a New Model in India and Israel"[19] observed that GDM without intervention results in 0.37 years lost to disability per person and GDM with intervention results in 0.25 years lost to disability per person (DALY). The difference in the DALYs between the groups is 0.12, which is the number of years of disability saved (averted) because of prompt intervention (screening) in the antenatal period. Comparing the cost of illness with respect to the years lost to disability in both the groups, it may be observed that GDM patients who undertake intervention spend $44 as a cost for the disability while those patients without any intervention end up spending $89 as a cost for the disability (almost double the cost). The key result of this study is the cost-effectiveness. This was calculated by evaluating the incremental cost spent toward preventing the complications with respect to the number of years of disability saved and the resultant value is $1626. From the above observations and findings, it may be concluded that screening for GDM with a "single test procedure" in the antenatal period is the most cost-effective strategy for preventing perinatal complications and also long-term postpartum risk of T2DM in both the mother and child. Based on the World Health Organization's guideline on cost-effectiveness, it has been established that any program is said

Table 1: Diagnostic criteria used by International/National organization for estimating gestational diabetes

Organization	*Fasting plasma glucose mmoL/dL or mg/dL*	*Glucose challenge*	*1 h plasma glucose mmoL/dL or mg/dL*	*2 h plasma glucose*	*3 h plasma glucose*
WHO, 1991[9]	≥7.0 or 125	75 gm OGTT	Not required	≥7.8 or 140 mg/dL	Not required
WHO, 2013[2]	≥5.1 or 92	–	≥10.0 or 180	≥8.5 or 153 mg/dL	–
ADA[3]/American College Obstetricians and Gynecologist[4] 2018	≥5.3 or 95	100 gm OGTT	≥10.0 or 180	≥8.6 or 155 mg/dL	≥7.8 or 140 mmoL/L
ADIPS[5] 2014	≥5.1 or 92	–	≥10.0 or 180	≥8.5 or 153 mg/dL	–
EASD,[6] 1991	≥7.0 or 125	–	–	≥10.0 or 180	–
FIGO,[7] 2015	≥5.1 or 92	–	≥10.0 or 180	≥8.5 or 153 mg/dL	–
Diabetes Canada Clinical Practice Guidelines,[8] 2018	≥5.3 or 95	75 gm OGTT	≥10.6	≥8.9 or 160 mg/dL	Not required
IADPSG[9]	≥5.1 or 92	75 gm OGTT	≥10.0 or 180	≥8.5 or 153 mg/dL	Not required
DIPSI,[10] 2014	–	75 gm OGTT, non-fasting	–	≥7.8 or 140 mg/dL	Not required
NICE[11]	≥5.6 or 100	–	–	≥7.8 or 140 mg/dL	Not required

[1]WHO 1999 Guidelines, World Health Organization; [2]WHO 2013 Guidelines; [3]ADA, American Diabetes Association; [4]ACOG, American College of Obstetricians and Gynecologist; [5]ADIPS, Australasian Diabetes in Pregnancy Society; [6]EASD, European Association for the Study of Diabetes; [7]FIGO, International Federation of Gynecology and Obstetrics; [8]Diabetes Canada Clinical Practice Guidelines; [9]IADPSG, International Federation of Gynecology and Obstetrics; [10]DIPSI, Diabetes in Pregnancy Study Group in India; [11]NICE, National Institute of Clinical Excellence

Source: Adapted from IDF Atlas

Fig. 3: A group of pregnant women in antenatal clinic

to be "highly" cost-effective if the cost is lesser than per capita GDP of that country. The guidelines and diagnostic criteria which are simple and feasible on the ground is important.[20] Thus, "a single test procedure" is feasible, sustainable, cost-effective, evidence-based[21] and high impact affordable test procedure for any society[20] (Fig. 3). This procedure is recommended by the Ministry of Health and Family Welfare Government of India,[22] WHO,[4] FIGO[23] and IDF.[24] At present, this procedure has become international, because it is being followed in Srilanka,[25] Pakistan,[26] Bangladesh[27] and may be in other countries also.

It is advisable to screen for the glucose tolerance in the first trimester itself. This is essential as all the vital organs develop during this period of gestation. The early gestation exposure to excess maternal fuels may impact the placental transport in a time-dependent manner. This results in different growth pattern emphasizing that "earlier intervention" may be important.[28] Metabolic perturbations are underway before the usual diagnosis (24th to 28th week) and that earlier screening and intervention may be warranted.[29] A study documented that GDM manifests in all trimesters of pregnancy[30] and the present recommendation is that there is a need for testing glucose tolerance in the early weeks of pregnancy.[31]

Prevention of Diabetes

Preventive measures against type 2 DM should start during INTRA UTERINE PERIOD and continue throughout the life from early childhood.[32] Gestational diabetes mellitus offers an important opportunity for the development, testing and implementation of clinical strategies for diabetes prevention, and other non-communicable diseases.[33] What is needed is the timely action taken now in screening all pregnant women for glucose intolerance,

achieving euglycemia FPG 4.4 to 5 mmoL/L 2 hour postprandial 6.1–6.7 mmoL/L[34] in them and ensuring adequate maternal nutrition may prevent in all probability, small for gestational age and large for gestational age offsprings who are prone to develop diabetes. Hence, it can be concluded that the only way to alleviate epidemic of diabetes is to

"Focus on the Fetus For the Future."

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