UNIVERSAL VS SELECTIVE SCREENING OF GESTATIONAL DIABETES MELLITUS BY ORAL GLUCOSE TOLERANCE TEST AT 24-28 WEEKS PREGNANCY

Humaira Tariq, Asifa Siraj*, Tariq Sarfraz, Asma Ansari***, Ayesha Arif******

Combined Military Hospital, Murree Pakistan, *Pak Emirates Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, **Army Medical College/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, ***Combined Military Hospital, Kharian/National University of Medical Sciences (NUMS) Pakistan, ****Combined Military Hospital/National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To compare universal screening of pregnant ladies for Gestational Diabetes Mellitus (GDM) with selective high risk screening by one step Oral Glucose Tolerance Test (OGTT) at 24-28 weeks pregnancy.
Study Design: Comparative cross-sectional study.
Place and Duration of Study: The study was conducted in the Gynecology and Pathology Departments of Pak Emirates Military Hospital, Rawalpindi, from Jul 2017 to Dec 2017.
Material and Methods: One hundred participants were selected between 24-28 weeks of pregnancy. Fifty were placed in universal screening group with no identifiable risk factors for GDM. Fifty participants had risk factors for developing GDM and were placed in selective screening group. Oral Glucose Tolerance Test (OGTT) was performed by using 75gm glucose in all patients in fasting phase. The results were statistically analyzed to see the frequency of GDM and impaired glucose tolerance in both groups. Common risk factors were also observed.
Results: GDM was found in 42% pregnant ladies who had risk factors for developing GDM and underwent selective screening. 32% had impaired glucose tolerance on OGTT. In the universal screening group, 26% had impaired glucose tolerance, 14% had GDM and 60% had normal results. The *p*-value was 0.002, Family history of diabetes mellitus was the most common factor found in 60% of patients. Obesity was found in 38%. Amongst the risk factors, increasing maternal age and previous obstetric losses, 36% and 22% respectively, were commonly found in patients who underwent selective screening for GDM.
Conclusion: In conclusion, GDM and impaired glucose tolerance was found in a significant number of pregnant ladies who underwent universal screening without risk factors. Universal screening is recommended in all pregnant ladies in our setting as diabetes mellitus is highly prevalent in this region.

Keywords: Gestational diabetes mellitus, Impaired glucose tolerance, Oral glucose tolerance test.

INTRODUCTION

Gestational Diabetes Mellitus is defined as any degree of glucose intolerance with onset or first recognition during pregnancy[1]. The new definition by American Diabetes Association (ADA) is Diabetes diagnosed in second or third trimester of pregnancy that is clearly not overt diabetes[2]. GDM affects 1.1-14.3% of the pregnant population depending on the ethnic and clinical characteristics of women and diagnostic tests applied[3]. The global prevalence of hyperglycemia in pregnancy is 16.9%[4]. In Sub continent, the prevalence has increased 11 folds. In Pakistan, the prevalence of GDM is reported from 4.2% to 26%[5]. GDM has serious short and long term health effects on mother, fetus and neonate. Intensive treatment of gestational diabetes mellitus helps in achieving optimum maternal and neonatal health. At the same time it provides us the chance to prevent obesity and diabetes in the off spring. The results of Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study showed a strong association between less severe maternal glucose levels than diabetes and increased birth weight and serum cord c peptide levels above 90th percentile[6]. On the basis of this data, the International Association of Diabetes and Pregnancy Study Groups (IADPSG)

Correspondence: Dr Humaira Tariq, Consultant Obstetrician & Gynaecologist, CMH Murree Pakistan
Email: htariq_73@yahoo.com
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suggested one step 75gm OGTT to be performed at 24-28 week for GDM[7]. Their stringent criteria lead to increased diagnosis of GDM with resultant pressure on patients and medical services. But early intervention also prevents later complications.

Due to increased prevalence of diabetes and the related risks in pregnancy, the screening and diagnosis of GDM has attained a great debate. National Institute of Health and Care Excellence (NICE) recommends a selective approach to avoid screening in low risk women. They recommend selective screening for diabetes mellitus for women having previous history of GDM, previous macrosomic baby, BMI >35kg/m^2, ethnic origin or family history of diabetes[8]. Their proponents debate on the cost constraints of universal screening and over diagnosis of GDM. Two step screening using glucose challenge test (GCT) and OGTT is also being followed by American College of Obstetrician & Gynecology (ACOG)[9]. But in a low resource setting, attending a patient twice for diagnosing GDM has not been found feasible. NICE recommends booking OGTT in women with previous history of GDM and a repeat test at 24-28 weeks if the initial one is normal. In the background increased prevalence of diabetes, it is being universally recommended to perform one step OGTT in all pregnant women irrespective of risk factors between 24-28 wks to minimize complication rate and risks in future life of off springs[10].

Keeping in mind the increased back ground prevalence of diabetes mellitus in our region, it is generally being recommended to perform universal screening for gestational diabetes mellitus in all pregnant ladies. History of diabetes mellitus in first degree relatives, increased body mass index and increasing maternal age are also strong risk factors in our pregnant ladies for developing gestational diabetes mellitus.

This study was conducted to compare the frequency of GDM and impaired glucose tolerance in universal versus selective screening groups and to assess the feasibility of performing universal screening for GDM by OGTT in our low resource setting.

PATIENTS AND METHODS

A comparative cross-sectional study was conducted from July 2017 to December 2017. The study was conducted at Obstetrics & Gynecology and Pathology Departments, Pak Emirates Military Hospital, Rawalpindi. Pregnant ladies between 24-28 weeks gestation were chosen. 100 participants were selected for the study. Sampling technique used was non probability consecutive sampling. Those with no identifiable risk factors for developing GDM in history and clinical examination were placed in low risk group. Those with factors like GDM in previous pregnancy, history of diabetes in first degree relatives, BMI >30kg/m^2 and previous child with birth weight >4.5kg were placed in high risk group. Ethnicity was considered a common factor as our region is highly prevalent for diabetes mellitus. Other relative risk factors considered were maternal age >35yrs, high order pregnancies, conception with artificial reproductive techniques and glycosuria 2+ on one occasion or 1+ on more than two occasions.

Fifty patients were placed in low risk group and underwent universal screening. Fifty patients were placed in high risk group and underwent selective screening of GDM by one step OGTT between 24-28 weeks gestation.

Patients with known type 1 or 2 diabetes, patients with psychiatric illnesses taking treatment and other chronic illnesses like thyroid disorders were excluded from the study.

After an overnight fast of about 8-10 hours, a fasting venous blood sugar sample was taken. Patient was given 75 grams of glucose dissolved in water. Blood sugar sample was again taken at one and two hour intervals. WHO criteria for diagnosing gestational diabetes mellitus was applied.

Data was collected on a performa designed for the study. The data was analysed by using SPSS version 22. Frequency and percentages were

calculated for qualitative data, while mean and standard deviation (SD) were calculated for quantitative variables.

RESULTS

Out of 100 participants, gestational diabetes was found in 42 pregnant ladies (42%), who had risk factors for developing GDM and underwent selective screening. About 26% pregnant ladies (26%) in this group had normal results and 32 pregnant ladies (32%) had impaired glucose tolerance on OGTT. Results are shown in fig-1.

In the universal screening group who had no risk factors for developing GDM, 26% had impaired glucose tolerance, 14% had GDM and 60% had normal results. Results are shown in fig-2. The *p*-value was calculated by using chi square test. The *p*-value was 0.002, which makes the results statistically significant.

Family history of diabetes mellitus was the most common factor found in 60% of patients who were at high risk for developing GDM. Obesity was found in 38% making it the second common factor. Frequency of risk factors is shown in fig-3.

Amongst the relative risk factors, increasing maternal age and previous pregnancy losses including intrauterine deaths, 36% & 22% respectively, were commonly found in patients who underwent selective screening for GDM. The frequency of relative risk factors is shown in fig-4.

DISCUSSION

Screening for Gestational Diabetes Mellitus has remained under a great debate regarding its timing, method of screening and patient selection[11]. Diabetes Mellitus has spread world over like an epidemic in the last decade. India and South Asian countries are declared as diabetic bombs. Poor glycemic index has been seen in women of child bearing age[12]. High frequency of GDM irrespective of risk factors and in all trimesters has been reported in Pakistan[5,12]. In United States above one third pregnant ladies have hyperglycemia in pregnancy. The rising rate of GDM has been strongly linked to rising maternal age and body mass index[13]. Studies have shown that hyperglycemia and diabetes in pregnancy is associated with high maternal and perinatal adverse effects than normal pregnancy. Untreated gestational diabetes mellitus is known to increase perinatal mortality rate up to fourfold.

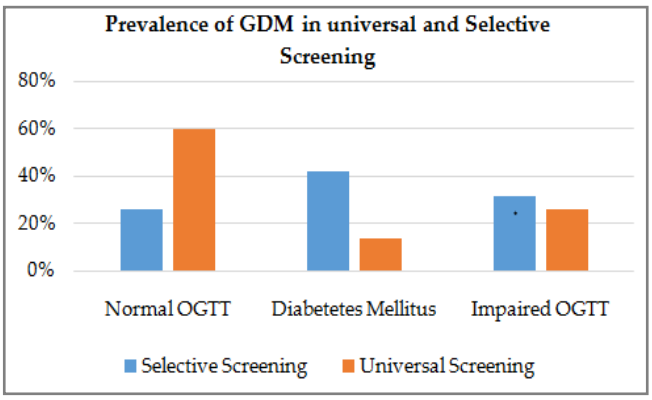

Figure-1: Prevalence of GDM in universal and selective screening.

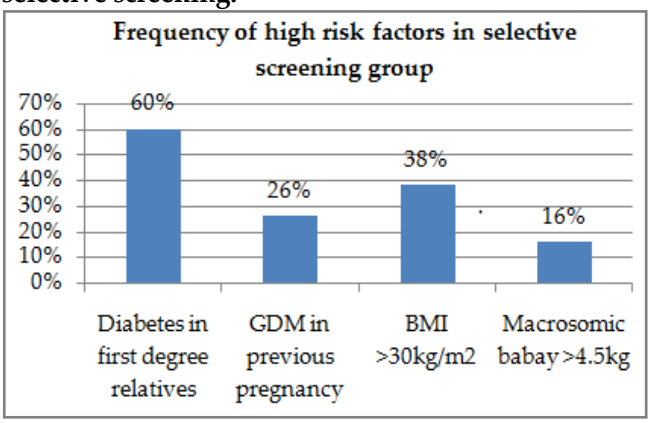

Figure-2: Frequency of high risk factors in selective screening group.

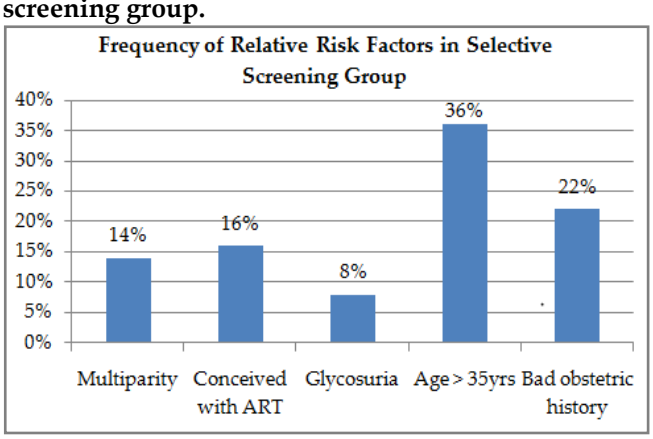

Figure-3: Frequency of relative risk factors in selective screening group.

The stringent criteria for diagnosing GDM lead to increased diagnosis and medical interventions. On the other hand, early detection and treatment lead to optimum neonatal outcome with reduced risk of complications[14]. Off springs of diabetic mothers have future risks of developing glucose intolerance, Type II Diabetes and obesity. Early detection in pregnant ladies lead to better control with diet and life style changes which in case of late diagnosis would require oral medication and insulin.

NICE and Scottish Intercollegiate Guidelines Network (SIGN) recommends a more selective approach to screening protocols[15]. Miaihi and colleagues suggested a selective approach to avoid screening in low risk women. Selective screening in their setting missed 1/6th GDM. These cases were milder with normal fasting blood sugar levels less likely to cause peri natal complications[16]. In a debate over benefits versus cost effectiveness, selective screening of gestational diabetes was recommended by many authors[17].

However in another study, Cosson and colleagues concluded that universal rather than selective screening may improve outcomes, and prevent delay in diagnosis and care[18]. A Belgian study concluded that prevalence of GDM in low risk population increased from 3.3-5.7% using universal screening strategy with OGTT[19]. Mayo and Melamed concluded in their study that IADPSG criteria resulted in increased diagnosis of GDM but this also appears to identify more women at risk of having pregnancy complications related to GDM. They suggested the need for larger studies in this regard[20]. A recent study on clinical implications of NICE 2015 compared with IADPSG criteria found similar GDM associated peri natal complications in the two groups[21]. An analysis of screening and diagnostic tests for GDM was done by Rani and Jasmine. They concluded that in Southeast Asian countries universal screening should be done preferably by one step OGTT at 24-28 weeks which is more patient friendly, cost effective, accurate in diagnosis and closer to international consensus[22]. A Sri lankan study results showed prevalence of GDM to be 5.5% in their hospital and traditional risk factors did not predict GDM so universal screening for all pregnant women was strongly recommended[23].

A study carried out on Malaysian population showed prevalence of gestational diabetes mellitus around 18.3%. They performed 50gm glucose challenge test universally in all pregnant ladies and found it to be superior to risk based screening. They found universal screening more feasible for Malayan population but also recommended larger studies for this purpose[24]. Fourth International workshop on gestational diabetes mellitus recommended selective approach to screening. However, Robert and Mosses observed that selective screening based on traditional risk factors would miss 35% of GDM cases[25]. A prospective case study was carried out on Indian pregnant population at a tertiary care hospital. Universal screening tests were recommended for all pregnant ladies as they were ethnically more prone to develop gestational diabetes mellitus. They felt the need to screen all pregnant ladies for GDM to avoid short term as well as long term maternal, fetal and neonatal morbidity and mortality[26].

Emmanuel *et al* compared the off springs and mothers of universal and selective screening groups. This observational study suggested that universal rather than selective screening may improve outcomes and might reduce the delay of diagnosis and care[27]. Unfortunately gestational diabetes has no reliable signs and symptoms and can only be diagnosed through laboratory tests. Another Indian study researched upon the feasibility of performing universal screening by single step oral glucose tolerance test. Out of 500 patients, 5.4% were diagnosed to have gestational diabetes mellitus. Amongst these patients 18.5% had no risk factors. They concluded that universal screening is necessary and single step OGTT is more feasible, simple and economical[28]. Mohan and colleagues debated upon the screening of gestational diabetes mellitus in India. They strongly felt the need to screen all pregnant ladies

keeping in view the back ground increased risk of diabetes in this set of population. They agreed that IADPSG criteria diagnosed a large number of GDM cases causing economic constraints but it is also closer to international criteria. They recommended that wherever possible single step fasting OGTT with IADPSG criteria be used for screening of gestational diabetes mellitus to obtain international standardization[29]. Majority studies focus on prevalence of gestational diabetes mellitus with these two screening strategies. Less work is done to show the pregnancy outcomes with universal and selective screening methods. Crowther *et al* demonstrated that treatment of gestational diabetes mellitus diagnosed by routine screening according to WHO criteria leads to reduction of serious perinatal morbidity[30].

Our results were comparable with the results of the studies particularly from Asian and Southeast Asian countries where universal screening is found more effective for early diagnosis of GDM and prompt intervention to reduce maternal and fetal complication rates. Selective screening may miss out a significant number of pregnant ladies in whom glucose intolerance and gestational diabetes mellitus may lead to fetal and neonatal health risks.

CONCLUSION

In the back ground of high risk ethnicity and increased prevalence of diabetes in general population, it is strongly recommended that all pregnant ladies should be screened by one step OGTT at 24-28 weeks gestation regardless of the risk factors. Larger studies are recommended to determine the cost effectiveness and patient benefit in low resource settings in our part of the world.

CONFLICT OF INTEREST

The study has no conflict of interest to be declared by any author.

REFERENCES

1. Metzger BE, Coustan DR. Summary and recommendations of the fourth international workshop-conference on Gestational Diabetes Mellitus: the organizing committee. Diabetes Care 1993; 21(suppl-2): B161-B167.
2. American Diabetes Association. Classification and diagnosis of Diabetes Mellitus. Diabetes Care 2015; 38(suppl 1): S8-S16.
3. Harris M. National Diabetes Data Group. Diabetes in America 2nd ed, Harris M, Bethesda MD: National Institute of Health; 1995.
4. Gaunguater L, Linnenkamp U, Beagley J, Whiting DR, Cho NH. Global estimates of the prevalence of hyperglycemia in pregnancy. Diabetes Res Clin Pract 2014; 103: 76-85.
5. Riaz M, Nawaz A, Naz S, Fawwad A, Basit A, Sher AS. Frequency of Gestational Diabetes using DIPSI criteria, a study from Pakistan. Clin Epidemiol Global Health 2019; 7(1): 218-21.
6. Metzger BE, Lowe LP, Dyer AR, Trimble ER, Chaovarindr U, Coustan DR, et al. Hyperglycemia and adverse pregnancy outcomes. The HAPO Study Research Group. N Engl J Med 2008; 358(19): 1991–2002.
7. Metzger BE. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes Care 2010; 33(1): 676–82.
8. NICE Guidelines 2015. Diabetes in pregnancy. Management of diabetes and its complications from preconception to postnatal period. Published Feb 25, 2015.
9. American College of Obstetrician and Gynecologists Committee on Practice Guidelines. Gestational Diabetes. Am Fam Physician 2013; 90(6): 416-17.
10. Purandare CN. Universal screening for Gestational Diabetes Mellitus: Mandatory. J Obstet Gynecol India 2012; 62(2): 141-43.
11. Sacks DB, Coustan DR, Cundy T, Donovan L, Hod M. Gestational Diabetes Mellitus: Why the controversy? Clin Chem 2018; 64(3): 1-8.
12. Akhtar J, Qureshi R, Rahim F, Moosvi S et al. Diabetes in pregnancy in Pakistani women: prevalence and complications in indigenuos south asian community. Diabet Med 1996; 13(2): 189-91.
13. Lavery JA, Freidman AM, Keyes KM, Wright JD, Ananth CV. Gestational Diabetes in United States: temporal changes in prevalence rates between 1979-2010. BJOG 2017; 124(5): 804-13.
14. Landon MB1, Spong CY, Thom E, Carpenter MW, Ramin SM, Casey B, et al. A multicenter randomized trial of treatment of mild gestational diabetes. N Engl J Med 2009; 361(14): 1339-48.
15. RCOG-Diagnosis and treatment of gestational diabetes. Scientific Impact Paper no 23; 2011: 1-6.
16. Miaihi G, Kayen G, Girad G, LegardeurH, Mendelbrot L. Selective rather than universal screening for gestational diabetes mellitus? Eur J Obstet Gynecol Reprod Biol 2015; 191(1): 95-100.
17. Berger H, Mathew MD, Sermer MD. Counterpoint: selective screening for gestational diabetes mellitus. Diabetes Care 2009; 32(7): 1352-54.
18. Cosson E, Benchimol M, Carbillon L. Universal rather than selective screening for gestational diabetes mellitus may improve fetal outcomes. Diabetes Metab 2006; 32(2): 140-6
19. Benhalima K, Van Crombrugge P, Hanssens M, Devlieger R, Verhaeghe J, Mathieu C. Gestational Diabetes: overview of the new consensus screening strategy and diagnostic criteria. Acta Clin Belg 2012; 67(4): 255-61.
20. Mayo K, Melamed N, Vandenberghe H, Berger H. The impact of adopting international association of diabetes in pregnancy study group criteria for screening and diagnosis of GDM. Am J Obstet Gynecol 2015; 212(2): 1-9.
21. Bhatia M, Mackillop LH, Bartlett K. Clinical implications of NICE 2015 criteria for gestational diabetes mellitus. J Clin Med 2018; 7(10): p E376.

22. Rani PR, Begum J. Screening and diagnosis of gestational diabetes mellitus, where do we stand. J Clin Diagn Res 2016; 10(4): QE01-04.
23. Sribaddana SH, Deshabandu R, Rajapakse D, Silva K, Fernando DJ. The prevalence of gestational diabetes in Srilankan antenatal clinic. Ceylon Med J 1998; 43(2): 88-91.
24. Idrs N, Hatikah CC, Rushdan MN. Universal versus selective screening for gestational diabetes mellitus in a Malaysian population. Malays Fam Physician 2009; 4(2-3): 83-87
25. Robert G, Moses MD, Cheung NW. Universal screening for GDM. Diabetes Care 2009; 32(7); 1349-51.
26. Hymavathi K, Tadisetti S, Polisetty K, Gottipatti MD. Gestational diabetes mellitus-universal versus selective screening. Int J Reprod Contracept Obstet Gynecol 2016; 5(7): 2155-60.
27. Cosson E, Benchimol M, Carbillon L, Pharisien I. Universal rather than selective screening for gestational diabetes mellitus may improve fetal outcomes. Diabetes & Metabolism 2006; 32(2): 140-6.
28. Kunjam S. Universal vs selective screening & single step GTT as screening for GDM. Intl J Med Res Prof 2018; 4(1): 183-86.
29. Mohan V, Ram U, Usha S. Screening of gestational diabetes in India. Where do we stand? J Postgrad Med 2015; 61(3): 151-54.
30. Crowther C, Hiller J, Moss J, McPhee A, William S, Robinson J. Australian carbohydrate intolerance study in pregnant ladies (ACHOIS). New Eng J Med 2005; 352: 2477-86.

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