The prevalence of gestational diabetes in women of child bearing age belonging to K.P.K

Bushra Gul[1], Saima Mehboob[2], Sumaira Qayuom[3], Muhammad Daud[4]

Abstract: This study was conducted with an aim to determine the prevalence of GDM in pregnant women using standard OGTT as a screening tool presenting to the antenatal care. After approval from the hospital ethical and research committee this cross sectional study was conducted in the department of obstetrics and gynecology, Khyber Teaching Hospital, and it included patients recruited through non probability consecutive sampling, presenting to OPD. A total of 126 patients were included in the study, with 16 to 28 weeks gestation. Screening for GDM was done with a 2 hour 75 g, oral glucose tolerance test. Patients were advised to have unrestricted diet and physical activity and come in the morning with overnight fasting. They were given 75g oral glucose load, in the form of Galaxose-D dissolved in 250ml of tap. A sample of blood was drawn one hour after glucose ingestion and send to the laboratory for blood glucose estimation by glucose oxidase hexokinase method. Blood sugar was estimated at 1 hour, 2 hour and 3 hour intervals and the findings were recorded on a structured Performa. Results were analyzed using SPSS version 13.
Results: the mean age was 30 ± 6.25. Family history was positive in 96(76%) and about 30(24%) patients had negative history of GDM. Most of the patients 63(50%) had BMI score >30 Kg/$m^{2.}$ Mean BMI was 30 ± 4.40 Kg/m^2. Mean Hb level was 10g/dl (S.D ± 4.61). The overall OGTT test result shows that 12(10%) patients OGTT was positive while 114(90%) patients OGTT was negative.

Conclusion: prevalence of gestational diabetes mellitus is low (10%) in high risk pregnant patients in child bearing age.

Key words: *gestational diabetes, oral glucose tolerance test*

Introduction:

There are several working definitions of Gestational Diabetes Mellitus. According to the Fourth International Workshop-Conference on Gestational Diabetes any glucose intolerance of different degrees of severity starting for the first time during pregnancy is recognized as Gestational Diabetes Mellitus[1]. This definition applies irrespective of whether insulin therapy is necessary or that the condition persists after the delivery and includes the fact that previously undocumented glucose intolerance may have been present before conception[2].

1. Medical Office, Health Department KPK
2. Assistant Professor Medicine, Kuwait Teaching Hospital, Peshawar
3. District Specialist Gynecology, DHQ Hospital, Lond Khwarh, Mardan
4. Assistant Professor Gastroenterology, Jinnah Medical College, Peshawar

Address for Correspondence:
Dr. Muhammad Daud
Assistant Professor Gastroenterology, Jinnah Medical College, Peshawar
drdaud82@gmail.com

Worldwide, the prevalence of GDM depends on the population being studied and the screening method used. In the USA, GDM is reported to complicate approximately 4% of all pregnancies, but the prevalence may range from 1 to 14% depending on the sub-population studied[3]. International population based studies report prevalence of GDM up to 15.5%, where Native North Americans, Bahraini women and Asian women are regarded as high-risk populations for development of GDM.[4]
The screening tool for GDM used worldwide is the Oral glucose tolerance test (OGTT) defined by O'Sullivan and Mahan in 1964[5]. The criteria were set at approximately two standard deviations exceeding the mean for the cut-off values indicating a diagnosis of GDM. In 2009, the American Diabetes Association (ADA) stated that screening a low-risk group of pregnant women is probably not cost-effective, but recommends several ways to determine the diagnosis of GDM. First, a screening method measuring fasting or casual plasma glucose level is used. A fasting plasma glucose level more than 7.0 mmol/l or a random plasma glucose > 11.1 mmol/l is considered the cut off limit for the diagnosis of diabetes.[6] Furthermore, the OGTT may be performed in a one or two-step approach. The one-step approach is performed without prior

plasma glucose screening and is suggested to be cost-effective in high-risk populations. Using the two step approach, an initial screening method utilizing 50 g glucose load (glucose challenge test, GCT) and measuring the plasma glucose level after one hour is performed to identify the subset of women needing a diagnostic OGTT.

Most regions also apply the criterion proposed by the European Association for the Study of Diabetes, which has been adjusted to the equivalents of plasma glucose i.e. a 2-hour plasma glucose value ≥ 10.0 mmol/l indicative of GDM. However, there are a few regions using the threshold value of manifest DM i.e. 2-hour plasma glucose level of equal to or more than 12.2 mmol/l as the criteria for GDM diagnosis.[6]

World Health Organization recommends that for OGTT at least two values of blood glucose should be measured; fasting and the 2-hour post prandial glucose. A fasting capillary plasma glucose value of less than 7.0 mmol/l and 2-hour plasma glucose value of more than or equal to 8.9 up to 12.2 mmol/l indicates impaired glucose tolerance (IGT). Two-hour values of capillary plasma glucose ≥ 12.2 mmol/l indicate DM. Pregnant women who fulfill the WHO criteria for DM or IGT are classified as having GDM. However, the cut-off values for GDM diagnosis in the recommendations of the European Association for the Study of Diabetes are not exactly the same as the WHO recommendations as values exceeding 2-hours blood glucose of 9.0 mmol/L indicate the GDM diagnosis. [7]

It is clear that controversies still exist regarding the diagnosis, management and risk of adverse maternal and fetal outcomes of GDM. However, despite the uncertainty of potential benefit and harm, the US Preventive Services Task Force suggests that until better evidence is available, clinicians should inform and discuss screening with their patients on individual basis.[8]

The National Board of Health and Welfare (NBHW) states that the reason for illuminating the issue of GDM is the increased risk of harm to unborn or newborn infants if the diagnosis is undetected or poorly treated during pregnancy. Furthermore, NBWH states that there is weak evidence regarding what is the best treatment of the GDM.[9]

Currently, there is no consensus in Pakistan on how to perform screening, diagnostics and treatment of GDM.[10] Despite procedures used in Pakistan for GDM diagnosis, GDP is still a risk for maternal and fetal health. Therefore the aim of this study is to determine the prevalence of GDM in pregnant women using standard OGTT as a screening tool presenting to the antenatal care in obstetrics department as undiagnosed hyperglycemia is associated with adverse fetal and maternal outcomes.

Material and Methods:

After approval from the hospital ethical and research committee the study was conducted at the department of obstetrics and gynecology Khyber teaching hospital Peshawar and it included patients recruited through non probability consecutive sampling, presenting to OPD. The study was conducted on 126 patients, calculated through WHO sample size calculator keeping the prevalence of 9% for women with gestational diabetes with confidence interval 95% and 5% margin of error. An informed consent was taken in all cases.

As screening is recommended at 16 weeks gestation and again at 24 to 28 week of gestation Women with 16 to 28 weeks gestation were included in the study, whereas those women with preexisting diabetes, who had not reported for prenatal care before 16 weeks of gestation, and those who delivered before 28 weeks of gestation were excluded. All the women were counseled and educated about the risk and adverse maternal and fetal outcomes of gestational diabetes mellitus and the importance of its early detection was emphasized. After detailed history and examination, the gestational age was calculated using the last normal period date and later confirmed through sonographic assessment of fetal age.

As per the NICE guidelines a 2 hour 75 g, oral glucose tolerance test was performed for screening at 16 weeks initially and repeated at 24 to 28 weeks of gestation if initial test was normal. Participants were advised to have normal diet and physical activity prior to the test. After an overnight fast they were given 75g oral glucose load, in the form of Galaxose-D dissolved in 250ml of water. The blood sample was collected one hour after glucose ingestion and the blood sugar was assessed using the glucose oxidase hexokinase method. Blood sugar was estimated at 1 hour, 2 hour and 3 hour intervals and the findings were recorded on a structured Performa. Results were analyzed using SPSS version 13.

Results:

Age distribution among 126 patients was analyzed as most of the patients n=61(48%) was found in age group >30 years, followed by

n=40(32%) patients belonging to the group 25-30 years and n=25(20%) patients were in age group <25 years. Mean age was 30 ± 6.25. Family history among 126 patients was analyzed as n=96(76%) patients had positive history of GDM while n=30(24%) patients had negative history of GDM. BMI Status among 126 patients was analyzed as most of the patients n=63(50%) had BMI score >30 Kg/m^2, followed by n=51(40%) patients had BMI score ranged between 25-30 Kg/m^2 and n=12(10%) patients had BMI score <25 Kg/m^2. Mean BMI was 30 ± 4.40 Kg/m^2. Period of Gestation among 126 patients was analyzed as most of the patients n=48(38%) had 24-28 weeks of gestation, followed by n=42(33%) patients had <24 weeks of gestation and n=36(29%) patients had >28 weeks of gestation. Mean age was 28 weeks with standard deviation ± 2.74. Data is tabulated in Table 1.

Hemoglobin (Hb) level among 126 patients was analyzed as most of the patients n=76(60%) had Hb level 9-10 g/dl, followed by n=38(30%) patients had Hb level ranged between 10-12 g/dl and n=12(10%) patients had Hb level ranged from 8-9 g/dl. Mean Hb level was 10 g/dl with standard deviation ± 4.61. (Table 2.)

Fasting blood sugar status shows that most of the patients n=79(63%) had OGTT <95mg and n=47(37%) patients had OGTT level >95 mg. 50 g Glucose challenge test was done in which most of the patients n=89(71%) had glucose level <130 mg and n=37(29%) patients had glucose level >130 mg. Oral glucose tolerance test was done among 126 patients. After 1 hour n=86(68%) patients had OGTT <180 mg while n=40(32%) patients had OGTT >180 mg. After 2 hour n=88(70%) patients had OGTT <155 mg while n=38(30%) patients had OGTT >155 mg similarly after 3 hour n=82(65%) patients had OGTT <140 mg while n=44(35%) patients had OGTT >140 mg. The overall OGTT test result shows that n=12(10%) patients OGTT was positive while n=114(90%) patients OGTT was negative. (Table 3)

TABLE NO 1: Characteristics of Participants

Characteristic	Categories	Frequency	Percentage
Age Distribution (30± 6.25 years)	< 25 Years	25	20%
	25- 30 Years	40	32%
	> 30 Years	61	48%
Female history of GDM	Positive	96	76%
	Negative	30	24%
BMI (30± 4.40 kg/m^2)	< 25 Kg/m^2	12	10%
	25 - 30 Kg/m^2	51	40%
	> 30 Kg/m^2	63	50%
Period Of Gestation (28±2.74 weeks)	< 24 Weeks	42	33%
	24 - 28 Weeks	48	38%
	> 28 Weeks	36	29%
	Total	**126**	**100%**

TABLE NO 2: HEMOGLOBIN LEVEL DISTRIBUTION

Hemoglobin Levels	Frequency	Percentage

8-9 g/dl	12	10%
9-10 g/dl	76	60%
10-12 g/dl	38	30%
Total	**126**	**100%**

TABLE NO 3: FASTING BLOOD SUGER

	OGTT	**Frequency**	**Percentage**
Fasting	<95 mg %	79	63%
	> 95mg %	47	37%
50 g OGTT	<130 mg %	89	71%
	> 130mg %	37	29%
100 g OGTT (1 hour)	<180 mg %	86	68%
	> 180mg %	40	32%
100 g OGTT (2 hours)	<155 mg %	88	70%
	> 155mg %	38	30%
100 g OGTT (3 hours)	<140 mg %	82	65%
	> 140 mg %	44	35%
RESULT OF OGTT	Positive	12	10%
	Negative	114	90%
	Total	**126**	**100%**

Discussion:

GDM has been a troublesome problem for pregnant females worldwide. Despite the adverse fetal outcomes and risks posed to the maternal health there are many controversies existing regarding the choice of initial screening test and the diagnostic criteria. There is however a general consensus that the incidence of GDM is increasing globally. The incidence of GDM in the current study was 10.2% within the reported range in literature similar to most reported cases, but it was relatively higher than some studies performed on Iranian women.[11]This difference may be related to the screening methods, diagnostic criteria used or the demographic and genetic differences of the study population. Another reason for this difference might be high prevalence of type 2 diabetes in Iranian population[11].

Data from previous studies show that the incidence of GDM in Iran is between 4.8-7.4%. We included some pregnant women at low risk for GDM as per the ADA recommendation. The rationale for this approach is the fact that if low risk pregnant women for GDM are not included at least one woman with GDM is missed and suffers the complications of GDM. This approach provides evidence for an acceptable performance of the selective screening inclusive of low risk women because it would miss no more than 2.1% of GDM in this particular subset.

Our study shows that most of the patients 80% were more than 25 years of age. Similar results were found in the study conducted in Iran in which GDM was 86% in the patients older than 27 years. This emphasizes the fact that GDM is more prevalent in women greater than 25 years of age. A positive Family history of diabetes has a strong correlation with prevalence of GDM. Our study showed that 76% of women with GDM had at least one first degree relative with diabetes mellitus compared to 43% women included in the normo-glycemic group. This result is compatible with some studies performed

elsewhere e.g. a study by Hadaegh et al[12] and Jawad et al showed almost comparable results[13]. GDM is strongly associated with adverse previous pregnancy outcomes. In a study by Naylor et.al[13] was found that in about 14.5% of women with impaired glucose tolerance all had an adverse obstetric outcome. In our study the incidence of GDM was more in women who had previous abortions, still births or presented with a history of macrosomia or those who had a previous history of GDM. A high Pre pregnancy BMI was considered to be a strong future predictor of development of GDM in subsequent pregnancies.

Other studies have emphasized the fact that GDM tends to occur more frequently in women with BMI higher than 25. This is consistent with results of our study in which 90% cases with GDM had BMI greater than 25. Our study also showed that the parity was higher in women with GDM as compared to the normo-glycemic group, this finding is also consistent with the study of Hadaegh etal.[12]. This effect can be explained by the fact that increasing parity is associated with other risk factors for Diabetes e.g. increasing age, body weight and visceral adiposity.

Some studies have indicated that the incidence of GDM in pregnant women with polycystic ovarian syndrome is higher. The same fact was observed in our study where the risk of GDM was 1.54 in women with PCOS. However, we defined PCO according to history of irregular menstruation and/or hirsutism before pregnancy and it was not an accurate diagnostic tool for PCOS. We did not have ultrasound finding about PCO before pregnancy. In our study we did not find any association between height and GDM Unlike the other studies which reported that GDM tends to occur more commonly in women who are of shorter height. The results of our study show that universal screening is a valid and useful tool to identify women with GDM in our setup where a large subset of people are medium or high risk for gestational diabetes.

In our study 71% cases had POG <24 to 28 weeks, 60% cases had Hb level 9-10 mg/dl, 63% cases had fasting blood sugar according to OGTT was <95mg. The same results were shown in study Hadaegh et al. in which 80% cases had POG <25 to 30 weeks, 65% cases had Hb level 9-10 mg/dl and 63% cases had fasting blood sugar according to OGTT was <95mg.

In our study 68% patients had OGTT <180 mg and 32% patients had OGTT >180 mg after I hour while after 2 hour 70% patients had OGTT <155 mg and 30% patients had OGTT >155 mg whereas after 3 hour 65% patients had OGTT <140 mg and 35% patients had OGTT >140 mg. Similar results were found in study of Hadaegh et al[12]. in which 70% patients had OGTT <180 mg and 30% patients had OGTT >180 mg after I hour while after 2 hour 68% patients had OGTT <155 mg and 32% patients had OGTT >155 mg, whereas after 3 hour 60% patients had OGTT <140 mg and 40% patients had OGTT >140 mg. Our study shows that 10% patients had positive GMT while 90% patients had negative GMT as per oral gulcose tolerance test.

Conclusion: prevalence of gestational diabetes mellitus is low (10%) in high risk pregnant patients in child bearing age, however about 70 percent of these patients had a hemoglobin < 10g/dl and as such the prevalence of anemia is very high.

REFERENCES

1. Quintanilla Rodriguez BS, Mahdy H. Gestational Diabetes. 2021 Aug 25. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan–. PMID: 31424780.
2. Carrington ER, Shuman CR, Reardon HS. Evaluation of the prediabetic state during pregnancy. Obstet Gynecol. 2000;9(6):664-9
3. Pandey A, Chawla S, Guchhait P. Type-2 diabetes: Current understanding and future perspectives. IUBMB Life. 2015 Jul;67(7):506-13. doi: 10.1002/iub.1396. Epub 2015 Jul 15. PMID: 26177573.
4. Misra A, Khurana L. The metabolic syndrome in South Asians: epidemiology, determinants, and prevention. Metab Syndr Relat Disord. 2009 Dec;7(6):497-514. doi: 10.1089/met.2009.0024. PMID: 19900153.
5. O'Sullivan JB, Mahan CM. Criteria for the Oral Glucose Tolerance Test in Pregnancy. Diabetes. 2003;13:278-5.
6. Meltzer SJ, Snyder J, Penrod JR, Nudi M, Morin L. Gestational diabetes mellitus screening and diagnosis: a prospective randomised controlled trial comparing costs of one-step and two-step methods. BJOG. 2010 Mar;117(4):407-15. doi: 10.1111/j.1471-0528.2009.02475.x. Epub 2010 Jan 26. PMID: 20105163.
7. Jiwani A, Marseille E, Lohse N, Damm P, Hod M, Kahn JG. Gestational diabetes mellitus: results from a survey of country prevalence and practices. J Matern Fetal

Neonatal Med. 2012 Jun;25(6):600-10. doi: 10.3109/14767058.2011.587921. Epub 2011 Jul 15. PMID: 21762003.
8. Ostlund I, Hanson U. Occurrence of gestational diabetes mellitus and the value of different screening indicators for the oral glucose tolerance test. Acta Obstet Gynecol Scand. 2003;82(2):103-8.
9. Balsells M, García-Patterson A, Gich I, Corcoy R. Maternal and fetal outcome in women with type 2 versus type 1 diabetes mellitus: a systematic review and metaanalysis. J Clin Endocrinol Metab. 2009 Nov;94(11):4284-91. doi: 10.1210/jc.2009-1231. Epub 2009 Oct 6. PMID: 19808847.
10. Riaz SH, Khan MS, Jawa A, Hassan M, Akram J. Lack of uniformity in screening, diagnosis and management of gestational diabetes mellitus among health practitioners across major cities of Pakistan. Pak J Med Sci. 2018 Mar-Apr;34(2):300-304. doi: 10.12669/pjms.342.12213. PMID: 29805397; PMCID: PMC5954368.
11. Shahbazian H, Nouhjah S, Shahbazian N, Jahanfar S, Latifi SM, Aleali A, Shahbazian N, Saadati N. Gestational diabetes mellitus in an Iranian pregnant population using IADPSG criteria: Incidence, contributing factors and outcomes. Diabetes Metab Syndr. 2016 Oct-Dec;10(4):242-246. doi: 10.1016/j.dsx.2016.06.019. Epub 2016 Jun 17. PMID: 27350363.
12. Hadaegh F, Tohidi M, Harati H, Kheirandish M, Rahimi S. Prevalence of gestational diabetes mellitus in southern Iran (Bandar Abbas City). Endocr Pract. 2005 Sep-Oct;11(5):313-8. doi: 10.4158/EP.11.5.313. PMID: 16191491.
13. Jawad F, Ejaz K. Gestational diabetes mellitus in South Asia: Epidemiology. J Pak Med Assoc. 2016 Sep;66(9 Suppl 1):S5-7. PMID: 27582153.
14. Sermer M, Naylor CD, Gare DJ, Kenshole AB, Ritchie JW, Farine D, Cohen HR, McArthur K, Holzapfel S, Biringer A, Chen E. Impact of increasing carbohydrate intolerance on maternal-fetal outcomes in 3637 women without gestational diabetes: the Toronto Tri-Hospital Gestational Diabetes Project. American journal of obstetrics and gynecology. 1995 Jul 1;173(1):146-56.