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PREVALENCE OF GLUCOSE INTOLERANCE IN POST-PARTUM WOMEN WITH HISTORY OF GESTATIONAL DM

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Abstract-

Background- Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy. This definition helps for diagnosis of unrecognized pre-existing Diabetes also. The definition applies whether insulin or only diet modification is used for treatment.

Aims- prevalence of glucose intolerance in post-partum women with history of gestational DM.

Materials and methods- this is prospective observational study done in Department of obstetrics and Gynaecology, MGM Medical college and MY hospital, Indore from January 2020 to January 2022 in 100 patients. All pregnant women with GDM who are attending antenatal outdoor and admitted for delivery at obstetrics and gynecology, Department studied. A total 100 pregnant women had been selected as study population on the basis of inclusion and exclusion criteria. Informed consent had been taken from every patient for their voluntary participation. Necessary information had been collected as per Performa which had include Basic information, chief complain, obstetric history, menstrual history, past medical and surgical history, dietary habit, family history, gestational age at which GDM detected, treatment received during antenatal period for GDM.

Results- mean age (Mean ± S.D.) of patients being 25.4400±3.6991 years. Proportion of patients was significantly higher in age group 26-30 years. The prevalence of GDM was found to be higher in women belonging to upper middle class (49.0%). It was found that 30(30.0%) patients had BMI <25 kg/m^2, 51(51.0%) patients had BMI 25-30 kg/m^2, 19 (19.0%) patients had BMI 30.0 -35.0 kg/m^2 and no patient had BMI >35.0 kg/m^2. GDM was more prevalent among patients with positive family history of DM. Maximum number of GDM patients were diagnosed between 24 -28 weeks of gestation with a mean (± S.D) of 26.42±3.4994. 34% Patients treated with insulin therapy,30% were on oral hypoglycemic drug and 36 %were controlled with diet modifications. The mean gestation age of delivery (Mean± S.D.) was37.6120±1.5270weeks.In postpartum period, 6 weeks following delivery 14 % cases persistently developed impaired fasting glucose and 15% cases developed impaired glucose tolerance. Following 12 weeks of post-partum period 9% cases had impaired fasting glucose and 6% cases had impaired glucose tolerance. On the basis of PPBS 5% Patients convert to diabetes at 6 weeks and 1% patients at 12 weeks follow up.

Conclusion- In present study, increasing maternal age, increased BMI, upper socioeconomic status, family history of DM was significantly associated with GDM. If blood sugar level was not controlled with diet and exercise, then oral hypoglycaemic (metformin) and insulin therapy (human insulin, insulin analogs) were used.GDM women have high risk of developing diabetes in the future and need to be followed postpartum to reduce the risks for complications of diabetes and to avoid conception

of future pregnancies in the setting of uncontrolled hyperglycaemia. In conclusion, as rates of type 2 diabetes continue to increase, women with GDM should be educated that glucose intolerance may not be temporary, that it can be modified by behaviour changes and that is why postpartum testing is important.

Keywords- gestational diabetes mellites, pregnant women's, glucose tolerance test.

INTRODUCTION-

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy.[1] This definition helps for diagnosis of unrecognized pre-existing Diabetes also. The definition applies whether insulin or only diet modification is used for treatment. Using current criteria, it is estimated that gestational diabetes mellitus (GDM) affects 2 to10 percent of all pregnancies, depending on the population studied.[2]

GDM is the single strongest population predictor of Type 2 DM development and there is at least a seven fold increase in Type 2 DM in women who have had GDM compared to those with Euglycemic pregnancies[3].

Worldwide prevalence of GDM varies between 1.4 – 14 %[4]. The prevalence of Gestational diabetes mellitus in India varies from 3.8 to 21% in different parts of the country, depending on the geographical locations and diagnostic methods used. Gestational diabetes mellitus (GDM) has been found to be more prevalent in urban than in rural areas. Indians belong to higher risk for developing diabetes due to their ethnicity.[4,5]

The incidence of gestational diabetes mellitus (GDM), the most common metabolic disorder during pregnancy, is also increasing worldwide owing to advancing maternal age and increasing obesity rates.[6,7] The prevalence of diabetes are increasing because of change in life style, dietary habits, older age of first conception, polycystic ovarian disease, obesity and more so due to increased awareness and changing methodology in testing for the condition. [(8-14)]

AIMS- aim of our study is 'prevalence of glucose intolerance in post-partum women with history of gestational DM.

Materials and methods- this is prospective observational study done in Department of obstetrics and Gynaecology, MGM Medical college and MY hospital, Indore from January 2020 to January 2022 in 100 patients. All pregnant women with GDM who are attending antenatal outdoor and admitted for delivery at obstetrics and gynecology, Department studied.

Inclusion criteria-

-Women with GDM who delivered after 35 weeks gestational age
-Women with singleton pregnancy
-Pregnant woman who consented for testing

Exclusion criteria-

-Patients with prior history of type 1 or 2 DM.
-Medical conditions requiring long term steroid treatment in pregnancy.
-Preterm birth at less than 35 weeks gestation.
-Age less than 18 years.
-Women with twin or multiple pregnancies

Methodology- A total 100 pregnant women had selected as study population on the basis of inclusion and exclusion criteria. Informed consent had taken from every patient for their voluntary participation. Necessary information had collected as per proforma which had include Basic information, chief complain ,obstetric history, menstrual history, past medical and surgical history, dietary habit, family history, gestational age at which GDM detected ,treatment received during antenatal period for GDM. General physical examination for enrolled subject had done including

measurement of the following.
-Weight (in kg measured by simple weighing scale in the OPD) Height (in cm measured via stadiometer in the OPD)
-Blood pressure: systolic/diastolic in mm Hg (using sphygmomanometer) Calculating the B.M.I. of the patients by formula:
-BMI =Weight in kg/(height in meter)^2
-Socioeconomic status- according kuppuswamy scale

Diagnostic criteria:
Method adopted by hospital for diagnosis of GDM were according to DIPSI recommended criteria. All pregnant women, attending the antenatal clinic after undergoing preliminary clinical examination, were given a 75 g glucose load irrespective of fasting or non-fasting state.
The diagnosis of GDM was based on the 2 hrs75g post glucose value =/>140mg/dl.

CRITERIA INITIATION OF INSULIN THERAPY
As per DIPSI Guideline:
Once diagnosis is made, medical nutritional therapy (MNT) was advised initially for two weeks. If MNT fails to achieve control, we have referred the patient to our endocrinology OPD for better control of blood sugar. i.e., FPG is 95mg/dl and/or 2 hr PPG ≥120mg/dl, insulin was initiated.

Monitoring of blood sugar:
Those patients who were controlled with help of MNT were advised to get FBS and 2 hrs PPBS at least once a month.
Patients on oral hypoglycemic were monitored with help of FBS and 2 hrs PPBS once a month.
Patient on insulin advised self-monitoring of blood sugar level at least 3 times a day.(FBS,2 hr PPBS post lunch,2 hr PPBS post dinner)
Patients those who could not do self-monitoring of blood sugar, were advised to get CBG at least once a week. .(FBS, 2 hr PPBS post lunch,2 hr PPBS post dinner)
After 48 hours of delivery a postprandial plasma sugar level was measured. Women who showed hyperglycemia were referred for further treatment.
In women, who were found to be glycemic after 48hours test were further performed at 6-12 weeks of postpartum period(Fasting blood sugar level and 2hour 75gm OGTT) to see any persistent hyperglycemia and thus to find out their proneness to develop type 2 diabetes mellitus in future.

Statistical Analysis:
For statistical analysis data were entered into a Microsoft excel spread sheet and then analyzed by SPSS 24.0 and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. A chi-squared test ($\chi 2$ test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Without other qualification, 'chi-squared test' often is used as short for Pearson's chi-squared test. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate.

Explicit expressions that can be used to carry out various *t*-tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a *t*- distribution under the null hypothesis is given. Also, the appropriate degrees of freedom are given in each case. Each of these statistics can be used to carry out either a one-tailed test or a two-tailed test.
Once a *t* value is determined, a *p*-value can be found using a table of values from Student's t-distribution. If the calculated *p*-value is below the threshold chosen for statistical significance (usually the 0.10, the 0.05, or 0.01 level), then the null hypothesis is rejected in favour of the alternative

hypothesis. p-value≤ 0.05 was considered for statistically significant.

Observations and results-

This study done in 100 patients. 15(15.0%) patients had age ≤20 years, 20(20.0%) patients had age between 21-25 years, 55(55.0%) patients had age 26-30 years and 10(10.0%) patients had age 31-35 years. The Z- Score is 5.1121. The p-value is <0.001. The result is significant. The mean age (Mean± S.D.) of patients was 25.4400±3.6991years with range 18.00-34.00 years and the median age was 26.00 years. We found that the prevalence of GDM higher in women belonging to upper middle class (49.0%). The Z-Score is 5.1539. The p-value is <0.001. The result is significant. 62% patients had positive family history of DM. p value is 0.0007, which is significant.

30(30.0%) patients had BMI <25 kg/m^2, 51(51.0%) patients had BMI 25-30 kg/m^2, 19 (19.0%) patients had BMI between 30.0 - 35.0 kg/m^2 and no patient had BMI >35.0 kg/m^2. The Z-Score is 3.025. The p-value is 0.00252. The result is significant. The mean BMI (mean± S.D.) of patients was 25.8080±3.7954kg/m^2 with range 18.00-33.10 kg/m^2 and the median BMI was 26.10 kg/m^2. It was found that GDM was diagnosed in 13 patients at<24 weeks gestation, 57 patients in24- 28 weeks and 30 patients at >28 weeks. The Z-Score is 3.8511. The p-value is 0.00012. The result is significant. The mean Gestational age at which GDM detected (Mean± S.D.) of patients was 26.4200±3.4994 weeks with range 20.00-34.00 weeks and the median Gestational age at which GDM detected was 26.00 weeks. 34 patients had received insulin therapy and the Z-Score is 4.5255. The p-value is <0.0001. The result is significant. 30 patients had received oral hypoglycemic drug and the Z-Score is 3.9598. The p-value is <0.0001. The result is significant.36 patients had controlled with diet only and the Z-Score is 5.6569. The p-value is <0.0001. The result is significant. 15(15.0%) patients had delivered at gestation < 37 weeks, 73(73.0%) patients had delivered between 37-39 weeks and 12(12.0%) patients delivered at >39 weeks. The Z-Score is 8.2621. The p-value is <0.0001. The result is significant.

We found that 80 (80.0%) patients had FBS ≤95 mg/dl at 6 weeks and 90(90%) at 12 weeks follow up. 14 (14.0%) patients had FBS >95-125 mg/dl at 6 weeks and 9 (9.0%) patients at 12 weeks follow-up. 6 (6.0%) patient had FBS >125 mg/dl at 6 weeks follow-up and 1(1.0%) at 12 weeks follow-up. FBS at 6 weeks, the Z-Score is 9.3507. The p-value is <0.0001. The result is significant. FBS at 12 weeks, the Z-Score is 11.4557. The p-value is <0.0001. The result is significant. We found that 80 (80.0%) patients had PPBS<140 mg/dl at 6 weeks and 93 (93.0%) at 12 weeks follow-up. 15 (15.0%) patients had PPBS 140-199 mg/dl at 6 weeks and 6 (6.0%) at 12 weeks follow-up. 5 (5.0%) patient had PPBS >200 mg/dl at 6 weeks and 1 (1.0%) at 12 weeks follow-up. PPBS at 6 weeks, the Z-Score is 9.2039. The p-value is <0.0001. The result is significant. PPBS at 12 weeks, the Z-Score is 12.3043. The p-value is<0.0001. The result is significant. Association of PPBS 48 hrs in gestational age of diagnosis of GDM was not statistically significant. Association of PPBS 6weeks in gestational age of diagnosis of GDM was not statistically significant. Association of PPBS 12weeks in gestational age of diagnosis of GDM was not statistically significant.

Discussion-

- this is prospective observational study done in Department of obstetrics and Gynaecology, MGM Medical college and MY hospital, Indore from January 2020 to January 2022 in 100 patients. All pregnant women with GDM who are attending antenatal outdoor and admitted for delivery at obstetrics and gynecology, Department studied.

Emma Morton Eggleston et al[63] found that 26.0% patients had age 15-29 years, 65.0% patients had age 30-39 years and 9.0% patients had age 40-44 years. C. A. Cabizuca et al [31] found that mean age of all patients 32 ± 5 years.

We found that 15(15.0%) patients had age ≤20 years, 20(20.0%) patients had age 21-25 years, 55(55.0%) patients had age 26-30 years and 10(10.0%) patients had age 31-35 years. The mean age (mean± S.D.) of patients was 25.4400±3.6991years with range 18.00-34.00 years and the median age

was 26.00 years. Proportion of patients was significantly higher in age group 26-30 years. The Z-Score is 5.1121. The p-value is <0.001. These findings were similar to hospital based study in Pakistan showed that about 50% of the GDM women were in the range of 25-30 years of age group.[16,17] Similar study from Bangladesh showed that 57.5%% cases of GDM were in age group ranging from 21-29 years.[15] Seshiahet al[16] found that the mean age of these pregnant women was 23 ± 4 years.
Rajesh Rajput et al [32] found that the prevalence of GDM was found to be higher in women belonging to upper and upper middle class (5/20, 25% and 20/119, 16.8%, respectively) and it was statistically significant (P<0.001) as compared to women belonging to lower middle class 10/219 (4.6%) and upper lower class 8/230 (3.4%). In my study, the prevalence of GDM was found to be higher in women belonging to upper middle class (49.0%). The Z-Score is 5.1539. The p-value is <0.001. similar study done by Rajesh Rajput et al [32] that the prevalence of GDM was found to be higher in women belonging to upper and upper middle class (5/20, 25% and 20/119, 16.8%, respectively) and it was statistically significant (P<0.001) as compared to women belonging to lower middle class 10/219 (4.6%) and upper lower class 8/230 (3.4%).[18,20] However, unlike my study, a study conducted by **Cheung et al**.[19] reported that lower socioeconomic status is associated with GDM. Similarly, **Keshavarzet al**[21] found an association between GDM with low socio-economic level in pregnant Iranian women.
We found that 30(30.0%) patients had BMI <25 kg/m^2, 51(51.0%) patients had BMI 25-30 kg/m^2, 19 (19.0%) patients had BMI 30.0 and 35.0 kg/m^2 and no patient had BMI >35.0 kg/m^2. In present study, the mean BMI (Mean± S.D.) of patients was 25.8080±3.7954kg/m^2 with range 18.00-33.10 kg/m^2 and the median BMI was 26.10 kg/m^2. High BMI at the time of diagnosis is also positively correlated with postpartum risk of type 2 diabetes.[8,9] A study from Denmark reported that BMI of ⩾25 kg/m^{2}was one of the main predictors of postpartum glucose abnormalities [13], similar to my study. Postpartum glucose abnormalities were of similar frequency in all the pre pregnancy BMI categories: 33.4% with BMI < 25 kg/m^2, 36.2% in those BMI 25-3025 kg/m^2, and 35.2% in the BMI>30kg/m^2.[33] Nadine Farah et al [34] found that 46(2.4%) patients had BMI <18.5 kg/m^2, 1010 (52.2%) patients had BMI ≥18.5 and <25.0 kg/m^2, 521 (26.9%) patients had BMI ≥25.0 and <30.0, <25.0 kg/m^2, 193 (10.0%) patients had BMI ≥30.0 and <35.0 kg/m^2 and 65 (7.4) patients had BMI ≥35.0 kg/m^2. We found that 62 (62.0%) patients had positive family history of DM. C. A. Cabizuca et al [31] found that family history of type 2 diabetes had 74 (48.7%). LetíciaSchwerzWeinert[35] et al showed that family history of DM had 62 (59%), similar to my study.
In present study diagnosis of GDM at which period of Gestation, 13 patients had <24 weeks, 57 patients had 24-28 weeks and 30 patients had >28 weeks. The mean Gestational age at which GDM detected (mean± S.D.) of patients was 26.4200±3.4994 weeks with range 20.00-34.00 weeks and the median Gestational age at which GDM detected was 26.00 weeks. Berkowitz and colleagues detected 29% of total 99 women with GDM detected prior to 24 weeks and 71% detected after 24 weeks. [23] similarly to my study. Soheilykhah et al[24] found that 37 subjects (i.e.33.6%) were within less than 24 weeks of gestation, 42 (i.e.38.1%) were between 24- 28 weeks and 31 (i.e.28.2%) were more than 28 weeks of gestation. [24]
Samar Banerjee et al[22] found that out of176, GDM group amongst which 44 (i.e.25%) were detected before 24 weeks, 32 (i.e.18.2%) between 24 - 28weeks, 72 (i.e.40.9%) between 29 -34 weeks and 28 (i.e.15.9%) beyond 34 weeks. C. A. Cabizuca et al [31] found that 64 (42.1%) patients had received insulin therapy, 10 (6.6%) patients had received oral hypoglycemic drug and 78 (51.3%) patients had controlled with diet only. We showed that 34 patients had received insulin therapy, 30 patients had received oral hypoglycemic drug and 36 patients had controlled with diet only.

We found that 15(15.0%) patients had delivery period of gestation < 37 weeks, 73(73.0%) patients had delivery period of gestation 37-39 weeks and 12(12.0%) patients had delivery period of gestation >39 weeks. The mean delivery period of gestation age (Mean± S.D.) of patients was 37.6120±1.5270 weeks with range 34.20-42.10 weeks and the median delivery period of gestation age was 37.40 weeks. Similar study done by Turki Gasim found that incidence of preterm delivery was 11.4% in GDM group. Mean age of delivery was 38 weeks. [27]

A Study by Rajab and Mehdi, showed that Pre-term (< 37 weeks) delivery was significantly more common in GDM group compared to control group. [25] Berkowitz *et al*.[26], showed that GDM group had significantly higher rates of pre-term delivery (19.6% vs. 7.6%). Medha Kanani et al [36] found that 8 (57.14%) patients had FBS ≤ 95 mg/dl at 6 weeks follow- up, 6 (42.86%) patients had FBS ≤ 95 mg/dl at 12 weeks follow-up after dietary therapy. They found that 6 (50.0%) patients had FBS ≤ 95 mg/dl at 6 weeks follow-up, 6 (54.55%) patients had FBS ≤95 mg/dl at 12 weeks follow-up after insulin therapy. Medha Kanani et al [36] found that 3(21.43%) patients had PPBS ≤120 mg/dl at 6 weeks follow-up and 1 (7.14%) patient had PPBS ≤120 mg/dl at 12 weeks follow-up after dietary therapy. They also found that 4(33.33%) patients had PPBS ≤120 mg/dl at 6 weeks follow-up and 1 (9.09%) patient had PPBS ≤120 mg/dl at 12 weeks follow-up after insulin therapy.
Letícia Schwerz Weinert et al [39] found that among the 108 women that were revaluated, 82 (76%) had normal postpartum glucose tolerance, while 26 (24%) remained with dysglycemia: 22 (20%) had IFG or IGT and 4 (4 %) had diabetes. Bhavadharini B et al [37] found that 203/212(95.8%) women completed their postpartum OGTT. Of these 203 women, 161(79.3%) came back for postpartum follow-up testing between 6 and 12 weeks, while the remaining 42(20.7%) women came back between 12 weeks and a year after the delivery. Of the 161 women (79.3%) who came back for the test between 6 and 12 weeks, 2(1.2%) developed DM, 5(3.1%), isolated IFG, 13(8.1%), isolated IGT and 5(3.1%) combined IFG/IGT while 136(84.5%) reverted to normal glucose tolerance (NGT). Of the 42 women who came back within a year, 5(11.9%) developed DM, 10(23.8%), isolated IFG and 1(2.4%) combined IFG/IGT, while 26(61.9%) reverted to NGT. Hence dysglycemia was detected in 25(15.5%) women between 6 and 12 weeks and in 16 women (38.1%) between 12 weeks and 1 year. Thus dysglycemia occurred in a total of 41/203 women (20.2%) within 1 year of delivery.[38] Bhavadharini B et al [32] found that 136(84.5%) patients had normal glucose tolerance, 23(14.3%) patients had dysglycemia and 2 (1.2)% patients had developed DM.
We found that 80 (80.0%) patients had FBS ≤95 mg/dl at 6 weeks and 90(90%)at 12 weeks follow up. 14 (14.0%) patients had FBS >95-125 mg/dl at 6 weeks and 9 (9.0%) patients at 12 weeks follow-up. 6 (6.0%) patient had FBS >125 mg/dl at 6 weeks follow-up and 1(1.0%) at 12 weeks follow-up.
We found that 80 (80.0%) patients had PPBS<140 mg/dl at 6 weeks and 93 (93.0%) at 12 weeks follow-up. 15 (15.0%) patients had PPBS 140-199 mg/dl at 6 weeks and 6 (6.0%) at 12 weeks follow-up. 5 (5.0%) patient had PPBS >200 mg/dl at 6 weeks and 1 (1.0%) at 12 weeks follow-up. We showed that association of PPBS 48 hrs in gestational age of diagnosis of GDM was not statistically significant. Association of PPBS 6 weeks in gestational age of diagnosis of GDM was not statistically significant. Association of PPBS 12 weeks in gestational age of diagnosis of GDM was not statistically significant.

Conclusion-

Screening for postpartum diabetes in patients with GDM is a contest worldwide as well as in India and increased maternal and fetal morbidity, mortality and long term moments. In India , screening is essential in all pregnant women as the Indian women have increased risk of developing glucose intolerance during pregnancy.In present study, increasing maternal age, increased BMI, upper socioeconomic status, family history of DM were significantly associated with GDM. If blood sugar level was not controlled with diet and exercise, then oral hypoglycaemic (metformin) and insulin therapy (human insulin, insulin analogs) were used.GDM women have high risk of developing diabetes in the future and need to be followed postpartum to reduce the risks for complications of diabetes and to avoid conception of future pregnancies in the setting of uncontrolled hyperglycaemia. In conclusion, as rates of type 2 diabetes continue to increase, women with GDM should be educated that glucose intolerance may not be temporary, that it can be modified by behaviour changes and that is why postpartum testing is important.

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