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Outcomes of Gestational Diabetes Mellitus in Pakistani Mothers: An Experience of a Tertiary Care Hospital

Samina Naseem Khattak, Abid Hussain Shah, Ayesha Imran, Muhammad Irfan Khattak, Khurram Mansoor, Asma Naveed Memon

ABSTRACT

Objective: To assess the incidence and outcome of gestational diabetes mellitus (GDM) during pregnancy among sample of Pakistani population.

Study Design and Setting: This was an analytic case-control prospective study carried out at two centers (CMH Kharian and PNS Shifa Hospital Karachi) from 1st Jan till 30th July 2021.

Methodology Previously healthy mothers were divided into three groups according to their risk of elevated glucose levels gestational diabetes mellitus (GDM) during pregnancy. Associations between GDM eminence (exposure variable) and pregnancy-related, fetal, and neonatal outcomes were reviewed (i.e., mode of delivery, preterm baby, pregnancy-induced hypertension, and fetal macrosomia, stillbirth, premature delivery etc. One way ANOVA was employed to compare the significant differences in different dependent variables amongst three groups. P Values of <0.05 were considered substantial.

Results: A total of 120 patients were divided into 3 groups Group 1 (uncontrolled sugar group) who could not achieve adequate sugar control, Group II (adequate sugar control group) and Group III as control group (Non-Diabetic). The mean age in our population was 24 (+ 4.15) years most of study population 70% of mothers were under 25 years of age. The majority (95%) of deliveries in the control group (Euglycemic) were uneventful, but poor fetal outcomes were noted in groups 1 2 (documented to have elevated blood sugars,) especially in the group with Uncontrolled Sugar. GDM was positively associated with preterm birth, stillbirth and macrosomia.

Conclusion: GDM is a prevalent disease in Pakistan and needs and has association with poor pregnancy outcomes. Urgent attention requires at individual and state level to reduce morbidity and mortality.

Keywords: Gestational Diabetes, GDM, Fetal outcomes.

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INTRODUCTION:

Lot of progress have been made regarding healthcare facilities especially during COVID pandemic and attention have been paid to the development of health disabilities across the world. However, it is feared that over occupation by COVID may result in suboptimal health care for Non COVID related illnesses.

Diabetes is a worldwide challenge and a big health concern. Economic and social development in various countries has led to changes in dietary habits which in its turn posed a massive threat in community. The fact is that not only common population is at risk, but pregnant ladies are especially vulnerable to diabetes and its adverse effects for children and mother.[1] It is a well-known fact that pregnancy with diabetes carries an extremely poor prognosis as adverse fetal and maternal outcomes are usually associated with diabetes mellitus. Recently there has been a surge in diabetic cases, especially in underdeveloped countries. It is believed that excessive use of steroids in treating COVID and sedentary lifestyle during lockdown may be responsible for this phenomenon.[2] In contrast to developed countries surprisingly little research has been carried out in developing countries that are more vulnerable to diabetes mellitus as it is quite a common phenomenon in Asian countries.[3] Although accurate data on the burden of gestational Diabetes Mellitus

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(GDM) are not available because of the lack of unanimously accepted and adopted diagnostic standards and screening approaches.[4-7] GDM is estimated to affect around 1 in 10 pregnant women worldwide Most of the data regarding diagnosis and association of diabetes with other comorbidities has been taken from European countries. Likely, this data may not apply to our communities because of diverse cultural, social, and geopolitical differences.[3,8,9]

In underdeveloped countries like Pakistan GDM has been an immense problem since long time.[10] Recently due to over commitment for COVID and relative in sensitivity of the local communities, it is important that latest trends of GDM and its implications are documented .It is likely that the changed lifestyles and excessive use of medication such as high dose steroids for covid in the recent past has resulted in aggravation of the incidence of GDM .This study can help in getting deep insight into this under recognized problem. This valuable information can be used in further research projects and may help in health care planning in future. Hence; this can add vital information for understanding, planning, and management of this complex regional and global health care issue. This can be compared to the world literature and help to ascertain whether the findings of the international literature are true in this part of world. Therefore: the aim of the study was to assess the incidence and poor outcome of gestational diabetes mellitus (GDM) during pregnancy among sample of Pakistani population.

METHODOLOGY:

This was an analytic case-control prospective study carried out at two centers (CMH Kharian and PNS Shifa Hospital Karachi) from 1st Jan till 30th July 2021. Both these hospitals are tertiary care hospitals. Ethical approval for this study was attained from the PNS SHIFA Ethics Committee for Students Research Projects at PNS Shifa hospital Karachi. The study was conducted in accordance to standards and guidelines of the Declaration of Helsinki of medical research regarding human subjects.

All those patients who reported in the outpatient department for antenatal care were screened for risk factors of Gestational Diabetes (BMI >30kg/m, previous macrocosmic baby 4.5kg or more, previous gestational diabetes, family history of diabetes in first degree relatives, Glycosuria of 2+ or above on one occasion) women with any of these risk factors were tested for gestational diabetes using 75-gram 2-hour OGTT at booking appointment. In addition, women with fasting plasma glucose levels of 5.6 mmol/l or 2-hour postprandial plasma glucose level of 7.8 mmol/le or more were diagnosed as having GDM. They were divided into three different groups. Group 1 (GDM Uncontrolled Sugar group) consisted of patients who were diagnosed as GDM but failed to achieve their targets glycaemia goals because of non-compliance or any other reasons. The second group consisted of GDM patients who were compliant and achieved target glycaemic levels. They were labelled Controlled Sugar group. The third group was the control group, and these patients did not suffer from any comorbidity. All patients who were previously known as diabetic, hypertensive, renal or heart patients were excluded. Similarly, those patients using any medications chronically for reasons other than nutritional supplements were excluded from the study. Sample was calculated using Raosoft sample size calculator. With 95% confidence interval ,and 50% response distribution the sample size was 100 .A recently published study by Musarrat Riaz was also consulted in sample calculation.[11]

Details of the patients were noted and entered on a designated electronic proforma. All the patients were followed up till delivery. Data was analyzed using SPSS v 28. Descriptive statics were obtained for age, parity, blood pressure and adverse fetal outcome. They were expressed as means and percentages. Fetal adverse outcomes were noted as percentages of preterm deliveries, stillbirth, macrosomia, and shoulder dystocia. Associations between GDM eminence (exposure variable) and pregnancy-related, fetal, and neonatal outcomes were reviewed (i.e., mode of delivery, preterm baby, pregnancy-induced hypertension, and fetal macrosomia, stillbirth, premature delivery etc. One way ANOVA was employed to compare the significant differences in different dependent variables amongst three groups. P Values of <0.05 were considered substantial.

RESULTS:

The mean age of study sample was 24 years S.D (+4.15). Mean age was 25 years S.D (+5.23) in uncontrolled sugar group and 26 S.D (+2.72) years in the Controlled GDM group. Significantly, lower mean age was noted in the non-diabetic group at 21 years S.D (+4.15).

Positive family history was strongly suggestive of GDM.A total of 16 (43%) in group 1, 16 (43%) in group II and 5 (14%) in the group III volunteered family history of diabetes mellites. Thereby >80% of the GDM population had a suggestive family history of DM.

Mean systolic Bp was 118 mmHg S.D (+ 9.63) in GDM group as compared to the mean systolic Bp 112mmHg ($p<0.05$). Most (95%) of deliveries in control group were un-eventful. Regarding **fetal outcomes** n=5 still births were noted in the study group and all of them occurred in the GDM group 1. So poor glycaemic control was significantly associated with still births .GDM was decisively associated with other poor fetal outcomes such as shoulder dystocia n=2 (5%), macrosomia n =4 (10%) in GDM Uncontrolled sugar group. Fetal outcome was good in non-diabetic group .A total of n=38 (95%) , normal births were recorded in control group. Merely only n= 19 (48%) of Uncontrolled GDM group had normal births. One way ANOVA test was used to know the significance of difference of poor outcomes results between three study groups. Unfavourable fetal

outcomes were significantly more common in the Uncontrolled GDM group-table-2P value<0.05. In the Controlled sugar GDM group p-value became insignificant. So, good glycaemic control improved fetal outcomes in the second study group but remained above the control group.

DISCUSSION:

This study is the first in Pakistan to substantiate the impact of GDM and its treatment on fetal outcomes and compare it with controls. In this study advanced age, family history of DM/GDM, and previous history of giving stillbirth / miscarriage and suboptimal glycaemic control were associated with increased risk of complicated pregnancy. As far as GDM effects on maternal outcomes, mothers suffering from GDM compared to those without GDM were at elevated risk of C/section delivery, preterm deliveries, pregnancy-related hypertension, and having a macrocosmic Newborn. Mean age was 25 years S.D (+5.23) in GDM Un Controlled sugar group and 26 years S.D (+2.72) in the treated GDM group. Mean age was significantly low in the control group at 21 years S.D (+4.15). This finding signifies the risks associated with increasing age during pregnancy. This fact has been observed in other international literature which states that increased maternal age in pregnancy leads to various complications.[12]

A recently published study in Kuwait by Z Groof, et al addressed the same issue.[8] Their study design was different and included a bigger population size. They noted that the prevalence of GDM was positively associated with advancing maternal age and pre-pregnancy body mass index. They found that GDM was associated with caesarean section delivery (OR=1 76, 95% CI: 1.17, 2.66) and increased birth weight in the fetus (OR=2 36, 95% CI: 1.14, 4.89)5. They also reported poor maternal and fetal outcomes in GDM mothers as was the case in our study. However, their study was limited by the retrospective design and relied on the mother subjective history of being exposed to GDM in the past. This study design lacked objectivity as recall of the previous DM and adverse outcomes cannot be used as reliable criteria to draw credible inferences. Despite having small, control group in the study added an extra dimension to the credibility of data for comparison. All the data was objectively taken and authenticated. The confounder of recall bias was absent in this study.

The mean age of the GDM Uncontrolled Sugar group and Controlled sugar group was around 26 which was significantly higher than the control group 22 years. This finding was in keeping with international studies which state that increased maternal age was associated with poor outcomes for mothers and newborn. Mary Carolan et al linked several factors to increasing prevalence including older maternal age and non-Caucasian ethnicity.[12] They believed increasing maternal age is a risk factor for GDM which is associated with poor pregnancy outcomes. It was mentioned that the highest GDM frequency was seen among Asian women at 11.5%, compared with Australian origin women at 3.7%. They also suggested that there was robust evidence that women born in all regions except North America were more likely to develop GDM in pregnancies at grown-up ages (p<0.001). Study included only Asian ladies only and as mentioned earlier GDM was quite common in the population >25 years of age.[12,13]

Despite the substantial progress in the treatment of diabetes mellitus, still the situation is that both pregestational (PGDM) and gestational diabetes (GDM) poses an additional risk to the embryo, newborn, and course of pregnancy. PGDM usually increase the rate of congenital deformities; especially nervous system, cardiac, and limbs. GDM can interfere with fetal growth, often leads to macrosomia, but in the presence of severe maternal complications, especially nephropathy.It can inhibit fetal growth (IUGR).[3,14] GDM can induce a variety of perinatal problems such as stillbirth and perinatal death, cardiomyopathy, respiratory illness, and perinatal

Table-1: Difference between three groups for adverse Fetal outcomes

Comparison	Sum of Squares	df	Mean Square	F	P-value*
Between Groups	4.550	2	2.275	13.738	<.001
Within Groups	19.375	117	.166		
Total	23.925	119			

***One way ANOVA**

Table 2: Adverse fetal outcomes in GDM group

I) GDM Group	(J) GDM Group	Mean Difference (I-J)	Std. Error	P-Value*
GDM group I (Uncontrolled)	GDM group (Controlled)	.275*	.091	.009
	control	.475*	.091	**<.001**
GDM group II (Controlled)	GDM group (Uncontrolled)	-.275*	.091	.009
	control	.200	.091	.076
Control group III	GDM group (Uncontrolled)	-.475*	.091	**<.001**
	GDM group (Controlled)	-.200	.091	.076

***One way ANOVA**

asphyxia. GDM that develops in the second half of pregnancy induces similar but less severe complications. This severity is directly linked to earlier answers of diabetes, and it reduces with control of blood sugar. Early initiation of GDM might cause some increase in the rate of malformations. all our findings were in confirmation of Asher Ornoy et al.[13] Most of the poor fetal outcomes such as still both, shoulder dystocia and macrosomia occurred in the GDM Uncontrolled Sugar group. Preterm deliveries before 37 weeks (about 8 and a half months) of gestation were noted in all three groups with the predominant percentage in group 1. n=8 (20%) was registered in GDM Uncontrolled Sugar group while n= 6 (15%) and n =1 (2.5%) was found in Controlled Sugar group and control group, respectively. On the other hand, >95% of births in the control group were normal.

Figure: 1 Pie chart showing clustering of suboptimal outcomes in GDM Uncontrolled Sugar group

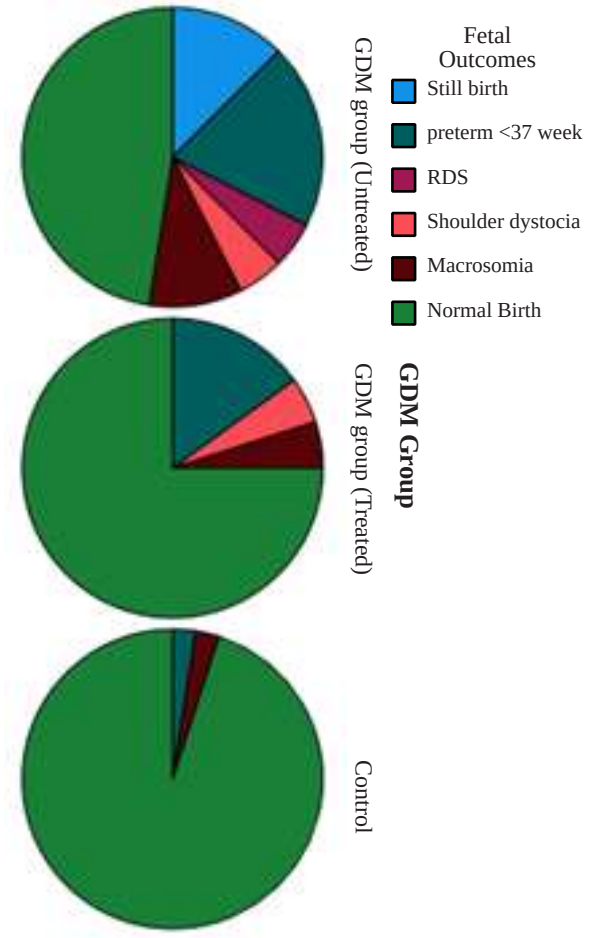
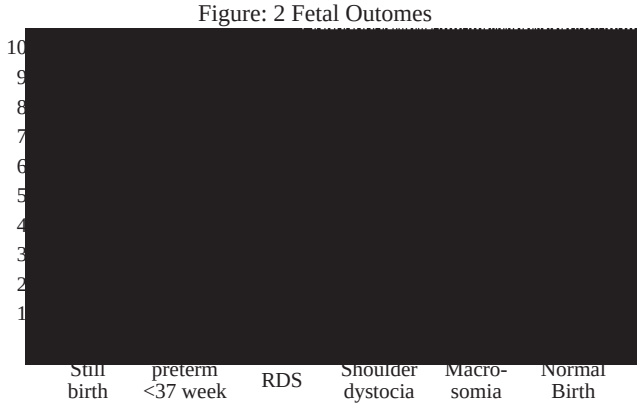


Figure: 2 Fetal Outomes



Another important aspect of our study was that in group 2 where GDM patients who received adequate treatment and attained fair glycaemic control were shown to carry better outcomes than group 1. However, fetal outcome remained poor even in this group in comparison to controls. Ornoy A et al extended their study to long term follow up of various complications in new-born such as attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder etc.[13] This study did not include a long time follow up of such children.

Overall, the findings of this study were in keeping with most of the robust Asian and international literature however the exact magnitude and size of the impact on various variables differed widely.[3,13,15-17]Although there was a lack of quality local literature, no major disparities were noted when compared with our findings.[11,18-21]

This study was limited by a small number of patients and financial constraints. These limitations were the result of a substantial number of study dropouts and poor prenatal follow-up of patients. Individual treatment protocols administered to patients were not studies. The different treatment procedures and protocols for sugar control may have contributed to the different outcomes. Insulin therapy and oral antidiabetic therapy was not observed separately, which could have been a potential confounder. Our sampling method was non-probability random sampling, which may have introduced selection bias. Moreover, PNS Shifa Hospital is the referral hospital for all the naval hospitals in Balochistan, Sind and even Skardu. Of course, only complicated pregnancies are managed in our hospital, which might have led to inflated numbers in the study.

It is recommended that aggressive screening programmes need to be implemented for early diagnosis and treatment of gestational diabetes. More research is needed with larger population size and robust study design to explore this emerging major health issues.

CONCLUSION:

Gestational diabetes is prevalent in Pakistan. Suboptimal sugar control is associated with adverse fetal outcomes. Early recognition and treatment lead to a substantial reduction in various complications like stillbirth, macrosomia, and shoulder dystocia.

Authors Contribution:
Samina Naseem Khattak: Questionnaire designing and improvement, sample collection, statistical analysis, writeup
Abid Hussain Shah: Data analysis, write up
Ayesha Imran: Data analysis, write up
Muhammad Irfan Khattak: Data collection
Khurram Mansoor: Data collection and analysis
Asma Naveed Memon: Data collection and analysis

REFERENCE:

1. Narayan KMV, Boyle JP, Geiss LS, Saaddine JB, Thompson TJ. Impact of Recent Increase in Incidence on Future Diabetes Burden: U.S., 2005–2050. Diabetes Care [Internet]. 2006 Sep 1 [cited 2021 Aug 19];29(9):2114–6. Available from: https://care.diabetesjournals.org/content/29/9/2114
2. Diabetes and COVID-19 - ScienceDirect [Internet]. [cited 2021 Aug 19]. Available from: https://www.sciencedirect.com /science/article/abs/pii/S0040595720300950
3. Wahi P, Dogra V, Jandial K, Bhagat R, Gupta R, Gupta S, et al. Prevalence of gestational diabetes mellitus (GDM) and its outcomes in Jammu region. J Assoc Physicians India. 2011;59(4):227–30.
4. Pennison E and Egerman rS. Perinatal outcomes in gestational diabetes?: a comparison of criteria for diagnosis. Am J Obstet Gynecol 2001;184:1118-1121.
5. Akhter J, Qureshi R, Rahim F, Moosvi S, Rehman A, Jabbar A, et al. Diabetes in pregnancy in Pakistani women: prevalence and complications in an indigenous south Asian community. Diabet Med. 1996;13(2):189–91.
6. Arora GP, Thaman RG, Prasad RB, Almgren P, Brøns C, Groop LC, et al. Prevalence and risk factors of gestational diabetes in Punjab, North India: results from a population screening program. Eur J Endocrinol. 2015;173(2):257–67.
7. Mithal A, Bansal B, Kalra S. Gestational diabetes in India: Science and society. Indian J Endocrinol Metab. 2015;19(6):701-4.
8. Groof Z etal. Prevalence, risk factors, and fetomaternal outcomes of gestational diabetes mellitus in Kuwait: a cross-sectional study. Journal of diabetes research. 2019 Mar 3;2019.
9. Naseer N, Shaw I, Adams G. Effect of lifestyle and Diet on Gestational Diabetes (GDM) in South Asian women: a systematic review. J Diabetes Metab Syndr. 2020;3(1):010
10. Sidahmed MAE, Abubaker NE, Elfadil GA. Journal Homepage:-www. journalijar. com.
11. Riaz M, Basit A. Integrating GDM management in public health: Pakistan perspective. J Pak Med Assoc. 2016;66(9):S101-4
12. Carolan M, Davey M-A, Biro MA, Kealy M. Maternal age, ethnicity and gestational diabetes mellitus. Midwifery [Internet]. 2012 Dec 1 [cited 2021 Aug 20];28(6):778–83. Available from: https://www.sciencedirect.com/science/article /pii/ S0266613811001306
13. Ornoy A, Becker M, Weinstein-Fudim L, Ergaz Z. Diabetes during Pregnancy: A Maternal Disease Complicating the Course of Pregnancy with Long-Term Deleterious Effects on the Offspring. A Clinical Review. Int J Mol Sci [Internet]. 2021 Mar 15 [cited 2021 Aug 20];22(6):2965. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7999044/
14. Phelan S, Jelalian E, Coustan D, Caughey AB, Castorino K, Hagobian T, et al. Protocol for a randomized controlled trial of pre-pregnancy lifestyle intervention to reduce recurrence of gestational diabetes: Gestational Diabetes Prevention/ Prevención de la Diabetes Gestacional. Trials [Internet]. 2021 Apr 7 [cited 2021 Aug 20];22:256. Available from: https:// www.ncbi.nlm.nih.gov /pmc/articles/ PMC8024941/
15. Lee KW, Ching SM, Ramachandran V, Yee A, Hoo FK, Chia YC, et al. Prevalence and risk factors of gestational diabetes mellitus in Asia: a systematic review and meta-analysis. BMC Pregnancy Childbirth [Internet]. 2018 Dec 14 [cited 2021 Aug 20];18:494. Available from: https://www.ncbi.nlm. nih.gov/pmc/articles/PMC6295048/
16. Mirghani Dirar A, Doupis J. Gestational diabetes from A to Z. World J Diabetes [Internet]. 2017 Dec 15 [cited 2021 Aug 20];8(12):489–511. Available from: https://www.ncbi. nlm.nih.gov/pmc/articles/PMC5740094/
17. Delanerolle G, Phiri P, Zeng Y, Marston K, Tempest N, Busuulwa P, et al. A systematic review and meta-analysis of gestational diabetes mellitus and mental health among BAME populations. EClinicalMedicine [Internet]. 2021 Jul 14 [cited 2021 Aug 20];38:101016. Available from: https://www.ncbi. nlm.nih.gov/pmc/articles/PMC8283332/
18. Basit A, Riaz M, Fawwad A. Improving diabetes care in developing countries: The example of Pakistan. Diabetes Res Clin Pract. 2015;107(2):224–32.
19. Janjua NZ, Delzell E, Larson RR, Meleth S, Kabagambe EK, Kristensen S, et al. Maternal nutritional status during pregnancy and surma use determine cord lead levels in Karachi, Pakistan. Environ Res. 2008;108(1):69–79.
20. Riaz M, Nawaz A, Masood SN, Fawwad A, Basit A, Shera AS. Frequency of gestational diabetes mellitus using DIPSI criteria, a study from Pakistan. Clin Epidemiol Glob Health. 2019;7(2):218–21.
21. West J, Lawlor DA, Fairley L, Wright J. Differences in socioeconomic position, lifestyle and health-related pregnancy characteristics between Pakistani and white British women in the born in Bradford prospective cohort study: the influence of the woman's, her partner's and their parents' place of birth. BMJ Open. 2014;4(6):e004805.