<u>ORIGINAL RESEARCH</u>

Correlation of Body Mass Index, Lifestyle and Polycystic Ovary Syndrome with Gestational Diabetes

Dr. Bharti Maheshwari[1], Dr. Preeti Sharma[2], Dr. Divya Mor[3], Dr. Shreya Jain[4]

[1]Professor & Head, [2]Associate Professor, [3]Junior Resident-2, [4]Junior Resident-3, Department of Obstetrics & Gynecology, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, Uttar Pradesh, India

Corresponding Author
Dr. Shreya Jain
Junior Resident-3, Department of Obstetrics & Gynecology, Muzaffarnagar Medical College & Hospital, Muzaffarnagar, Uttar Pradesh, India
Email: jsroses.jain@gmail.com

ABSTRACT
Background: GDM is defined as impaired glucose tolerance first diagnosed during pregnancy. The prevalence of GDM is increasing due to increased obesity and is estimated globally to be 14%, varying between 1% and 28% depending on ethnicity, screening methods and diagnostic criteria. Polycystic ovarian syndrome (PCOS) is the most common endocrine disorder that affects women of reproductive age with a prevalence of 12–21%, and it has a profound impact on the psychological, reproductive and metabolic health of women. the present study aims to find the correlation between BMI, lifestyle and PCOS with gestational diabetes. **Aim & Objectives:** To study the correlation of BMI, lifestyle and Polycystic Ovary Syndrome with Gestational Diabetes. **Material and Methods:** A hospital basedobservational study was conducted among 200 antenatal females in Muzaffarnagar Medical College & Hospital, Muzaffarnagar, Uttar Pradesh. Study was conducted for 12 months.Data was analysed statistically and chi square test was applied. **Results:** 42% of the women were aged 25-30, and 34% were aged 20-25. The majority (62%) were primigravida. 39.5% had a normal BMI, 34% were overweight, 15% were obese, and 11.5% were underweight. 11% were smokers. Additionally, 20.5% of the participants had a family history of gestational diabetes mellitus (GDM). Lastly, 28% of the participants had polycystic ovary syndrome (PCOS), and 72% did not. 37% had GDM. There was highly statistically significant association between BMI, smoking habits and PCOS with GDM. **Conclusion:** The present study identified significant correlations between higher BMI, smoking habits, and the presence of PCOS with the incidence of Gestational Diabetes Mellitus (GDM) among the participants, highlighting the need for targeted interventions to manage these risk factors and reduce the risk of GDM in these populations.
Keywords: BMI, PCOS, GDM.

INTRODUCTION

GDM is defined as impaired glucose tolerance first diagnosed during pregnancy. [1] The prevalence of GDM is increasing due to increased obesity and is estimated globally to be 14%, varying between 1% and 28% depending on ethnicity, screening methods and diagnostic criteria. [2,3] GDM is associated with adverse pregnancy outcomes for both the mother and the infant, such as preeclampsia, preterm birth, shoulder dystocia, macrosomia, large for gestational age (LGA) infant and neonatal hypoglycaemia. [1,2,4]
Polycystic ovarian syndrome (PCOS) is the most common endocrine disorder that affects women of reproductive age with a prevalence of 12–21%, [5] and it has a profound impact on the psychological, reproductive and metabolic health of women. [6]In the non-pregnant state, most women with PCOS are characterized by the presence of both hyperandrogenemia and increased insulin resistance. [7] Insulin resistance has been found to be present in 44–70% of women with PCOS, depending on the method used.[8] A meta-analysis of clamp studies demonstrated an overall 27% reduction of insulin sensitivity in PCOS women compared to controls. Importantly, the insulin sensitivity was reduced also in lean women with PCOS compared to lean controls. [9] The risk for developing GDMistherefore expected to be increased in women with PCOS. A recent meta-analysis of 40 studies including 17,800 PCOS pregnancies found a relative risk of 2.78 for GDM compared to non-PCOS pregnancies. This increased risk was particularly among non-obese women.

819

[10]However, another review demonstrated substantial heterogeneity among studies, suggesting that the results could depend on differences in BMI and study designs.[11] Two Nordic prospective cohort studies and review did not find any increased risk for GDM in PCOSperse, but rather that the risk of GDM depended on factors like ethnicity, BMI, age and the diagnostic criteria for GDM used.[12,13]

By establishing the correlation between BMI, lifestyle factors, and PCOS with the risk of Gestational Diabetes Mellitus (GDM), healthcare providers can better identify women at high risk. This allows for more targeted screening and monitoring during pregnancy. This study underscore the critical role of maintaining a healthy weight and adopting a healthy lifestyle in reducing the risk of GDM. This can lead to the development of preventive strategies and public health initiatives aimed at educating women, especially those with PCOS, on the importance of nutrition and exercise to prevent GDM.

AIM & OBJECTIVES

To study the correlation of Body Mass Index, lifestyle and Polycystic Ovary syndrome with Gestational Diabetes.

MATERIAL AND METHODS

A hospital based observational study was carried out on 200 antenatal women who came tothe Department ofObstetrics &Gynaecology, Muzaffarnagar Medical College & Hospital, Muzaffarnagar. This study was done for 12 months. 200women were selected on the basis of average number of antenatal women bysimple Random Sampling. Antenatal women from 16-20 weeks of gestation with singleton pregnancy and who gave informed written consent were included in the study. All pregnant women with <16and >20 weeks of gestation, hypertension, cardiovascular problems, thrombotic diseases and who did not give consent

were excluded from the study. On the follow up at 24-28 weeks, women were categorized into GDM and non- GDM. GDM cases had to meet the American Diabetes Association criteria to be diagnosed as Gestational diabetes mellitus. [14]Ethical approval was taken from the Institutional Ethics Committee of Muzaffarnagar Medical College, Muzaffarnagar. The P-value 0.05 was considered statistically significant. Discrete data was entered in MS-Excel sheet and data was analysed using the software SPSS 21.0.

RESULTS

The study involved 200 participants, revealing that 42% of the women were aged 25-30, and 34% were aged 20-25. The majority (62%) were primigravida, while 38% were multigravida. In terms of BMI, 39.5% had a normal BMI, 34% were overweight, 15% were obese, and 11.5% were underweight. Regarding smoking habits, 11% smoked, while 89% did not. Additionally, 20.5% of the participants had a family history of gestational diabetes mellitus (GDM), while 79.5% did not. Lastly, 28% of the participants had polycystic ovary syndrome (PCOS), and 72% did not. **(Table 1)**

The study found that higher BMI (overweight and obese categories), smoking habits, and the presence of PCOS were significantly correlated with the incidence of GDM among the 200 participants. Overweight and obese women had GDM in 57.35% and 70% of cases, respectively. Smoking was associated with GDM in 66.67% of smoking participants. Among those with PCOS, 57.14% had GDM. These findings highlight the importance of managing BMI, smoking habits, and PCOS to reduce the risk of GDM, as evidenced by the highly statistically significant p values (p>0.001) indicating a strong correlation.**(Table 2)**

Figure 1 shows the distribution of participants according to presence of GDM. 37% had GDM while 63% didn't have GDM.

Table 1: Socio- demographic details of participants: (N=200)

Variable	Number of women (%)	Percentage (%)
Age group		
20-25	68	34
25-30	84	42
30-35	29	14.5
35-40	19	9.5
Gravida		
Primigravida	124	62
Multigravida	76	38
BMI		
Underweight	23	11.5
Normal	79	39.5
Overweight	68	34
Obese	30	15
Smoking habits		
Yes	22	11
No	178	89
Family history of GDM		

Yes	41	20.5
No	159	79.5
Presence of PCOS		
Yes	56	28
No	144	72

Table 2: Correlation of BMI, lifestyle and PCOS with GDM: (N=200)

Variable	GDM cases	Non- GDM
BMI		
Underweight	02	21
Normal	12	67
Overweight	39	29
Obese	21	09
p value<0.001		
Smoking habits		
Yes	16	08
No	58	120
p value=0.001		
Presence of PCOS		
Yes	32	24
No	42	102
p value<0.001		
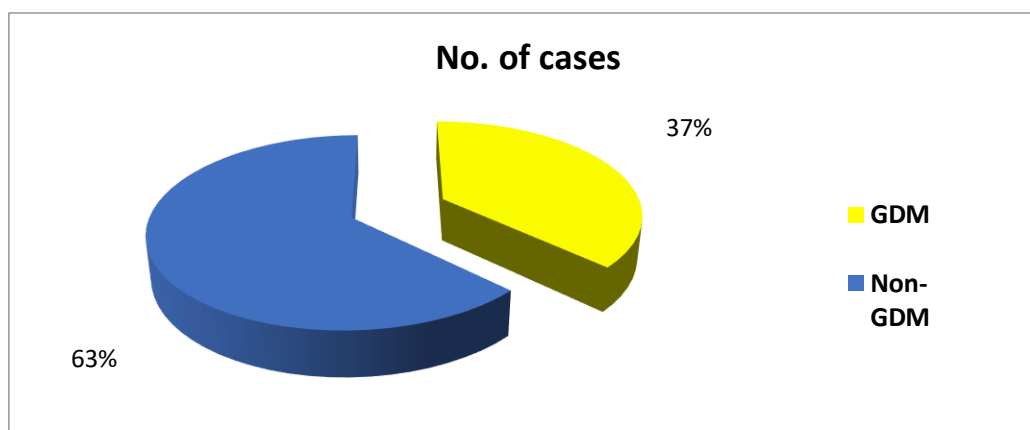
Figure 1: Pie chart showing distribution of participants according to GDM and Non- GDM cases

DISCUSSION

The findings of present study align with previous research highlighting the significant correlations between higher BMI, smoking habits, and the presence of PCOS with the incidence of Gestational Diabetes Mellitus. Our study found that higher BMI (overweight and obese categories), smoking habits, and the presence of PCOS were significantly correlated with the incidence of GDM among the 200 participants. Overweight and obese women had GDM in 57.35% and 70% of cases, respectively. Smoking was associated with GDM in 66.67% of smoking participants. Among those with PCOS, 57.14% had GDM. 37% had GDM.For instance, a community-based retrospective study done by**Zhang S et al (2022)**of 41,845 pregnant women found that early pregnancy BMI was a significant risk factor for GDM. Overweight and obese women had GDM in 57.35% and 70% of cases, respectively. Smoking was associated with GDM in 66.67% of smoking participants.[15]Similarly, another study **Fougner SL et al (2021)**involving 791 pregnant women with PCOS showed a high prevalence of GDM among them, emphasizing the role of PCOS in GDM development.The prevalence of GDM in women with PCOS was 28.3% using WHO 1999 criteria, 41.2% using WHO 2013 criteria, and 27.2% using Norwegian 2017 criteria. The study also found that GDM was associated with increased maternal age and BMI[16]In a study done by **Zheng W et al (2019),**GDM prevalence was 26.5% in normal-weight women with PCOS compared to 16.2% in normal-weight women without PCOS. [17]These findings were similar to the findings of present study.

CONCLUSION

The present study identified significant correlations between higher BMI, smoking habits, and the presence of PCOS with the incidence of Gestational Diabetes Mellitus (GDM) among the participants. Overweight and obese women, smokers, and those with PCOS had a higher prevalence of GDM,

821

highlighting the need for targeted interventions to manage these risk factors and reduce the risk of GDM in these populations.

REFERENCES

1. Sweeting A, Wong J, Murphy HR, Ross GP. A clinical update on gestational diabetes mellitus. Endocr Rev. 2022;43:763-793.
2. Saeedi M, Cao Y, Fadl H, Gustafson H, Simmons D. Increasing prevalence of gestational diabetes mellitus when implementing the IADPSG criteria: a systematic review and meta- analysis. Diabetes Res ClinPract. 2021;172:108642.
3. Wang H, Li N, Chivese T, et al. IDF diabetes atlas: estimation of global and regional gestational diabetes mellitus prevalence for 2021 by International Association of Diabetes in pregnancy study Group's criteria. Diabetes Res ClinPract. 2022;183:109050.
4. Ye W, Luo C, Huang J, Li C, Liu Z, Liu F. Gestational diabetes mellitus and adverse pregnancy outcomes: systematic review and meta- analysis. BMJ. 2022;377:e067946.
5. March WA, Moore VM, Willson KJ, Phillips DI, Norman RJ, Davies MJ. The prevalence of polycystic ovary syndrome in a community sample assessed under contrasting diagnostic criteria. Hum Reprod. 2010;25:544–51.
6. Teede H, Deeks A, Moran L. Polycystic ovary syndrome: a complex condition with psychological, reproductive and metabolic manifestations that impacts on health across the lifespan. BMC Med. 2010;8:41.
7. Glintborg D, Andersen M. MANAGEMENTOFENDOCRINEDISEASE:Morbidit yinpolycysticovary syndrome. Europeanjournal of endocrinology. 2017; 176(2):R53–r65. https://doi.org/10.1530/EJE-16 0373PMID:27601016.
8. MacutD,Bjekic-Macut J, Rahelic D, Doknic M. Insulin and the polycystic ovary syndrome. Diabetes ResClinPract. 2017; 130:163–70. https://doi.org/10.1016/j.diabres.2017.06.011 PMID: 28646699.
9. Cassar S, MissoML,HopkinsWG,ShawCS,TeedeHJ,SteptoNK.In sulinresistanceinpolycystic ovary syndrome: a systematic review and meta-analysis of euglycaemic-hyperinsulinaemic clamp studies. HumReprod.2016;31(11):2619–31.
10. YuHF,ChenHS,RaoDP,GongJ.Associationbetweenpoly cystic ovarysyndromeandtherisk of pregnancy complications: A PRISMA-compliant systematicreview and meta-analysis. Medicine (Balti more). 2016; 95(51):e4863. https://doi.org/10.1097/MD.0000000000004863 PMID: 28002314.
11. Toulis KA, Goulis DG, Kolibianakis EM, Venetis CA, Tarlatzis BC, Papadimas I. Risk of gestational diabetes mellitus in women with polycystic ovary syndrome: a systematic review and a meta-analysis. Fertility and sterility. 2009; 92(2):667–77. https://doi.org/10.1016/j.fertnstert.2008.06.045 PMID: 18710713.
12. Mustaniemi S, Vaarasmaki M, ErikssonJG, GisslerM, Laivuori H, Ijas H, et al. Polycystic ovary syndromeandriskfactors for gestational diabetes. Endocrine connections. 2018; 7(7):859–69. https://doi. org/10.1530/EC-18-0076 PMID: 29858213
13. PalmCVB,GlintborgD,KyhlHB,McIntyreHD,JensenRC ,Jensen TK, et al. Polycystic ovary syndromeandhyperglycaemiain pregnancy. A narrative review and results from a prospective Danish cohort study. Diabetes Res ClinPract. 2018. https://doi.org/10.1016/j.diabres.2018.04.030 PMID: 29689322.
14. Diagnosis and classification of Diabetes Mellitus. American Diabetes 2014;37(1):S81-90.
15. Zhang, S., Liu, H., Li, N. *et al.* Relationship between gestational body mass index change and the risk of gestational diabetes mellitus: a community-based retrospective study of 41,845 pregnant women. *BMC Pregnancy Childbirth* **22**, 336 (2022).
16. Fougner SL, Vanky E, Løvvik TS, Carlsen SM (2021) No impact of gestational diabetes mellitus on pregnancy complications in women with PCOS, regardless of GDM criteria used. PLoS ONE 16(7): e0254895. https://doi.org/10.1371/journal.pone.0254895.
17. Zheng, W., Huang, W., Zhang, L. *et al.* Early pregnancy metabolic factors associated with gestational diabetes mellitus in normal-weight women with polycystic ovary syndrome: a two-phase cohort study. *DiabetolMetabSyndr* **11**, 71 (2019).