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ORIGINAL RESEARCH

Prevalence and risk factors of gestational diabetes mellitus among women attending antenatal clinic in Chengalpattu district: Original Study

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Abstract

Background: It is well known that the prevalence of gestational diabetes mellitus (GDM) varies greatly depending on geographic location, dietary preferences, and socioeconomic status. In order to ascertain the prevalence of GDM and risk factors connected to it in women visiting an antenatal care (ANC) clinic in the Chengalpattu region, this study was conducted.

Methods: Women who were receiving antenatal care (ANC) at a clinic and had an estimated gestational age between 24 and 28 weeks were participated in this study. Women who agreed to participate were informed before undergoing a conventional 2-hour, 75-gram oral glucose tolerance test (OGTT). A proforma was filled out with general information including demographics, socioeconomic status, level of education, parity, family history of diabetes and/or hypertension, and history of GDM. GDM was diagnosed using the 75 g 2-h OGTT criteria set out by the American Diabetes Association (ADA).

Results: In all, 607 women took part in the study, and 43 (7.1%) of them had GDM. Additional 66 (10.87%) women showed a single abnormal value. Age, educational level, socioeconomic status, pre-pregnancy weight and BMI, weight gain, acanthosis nigricans, family history of diabetes or hypertension, and past history of GDM were risk factors that were found to be significantly associated with GDM on bivariate analysis; however, on multivariate analysis, only upper middle class and the presence of acanthosisnigricans were found to be significantly associated with GDM.

Conclusion: A tertiary care hospital found that 7.1% of patients had GDM. Control and risk factor modification require the right interventions.

Keywords: Diabetes Mellitus, Obesity, Pregnancy, Risk factors

Introduction

Pregnant women can develop gestational diabetes mellitus (GDM), a non-communicable condition. The range of global median estimates for GDM is 6 to 13% [3]. There is strong evidence that women with GDM are more likely to develop preeclampsia [4, 5], premature birth [6], an increased risk of caesarean section [4, 5], and type 2 diabetes in the future [2]. A higher incidence of prenatal problems, such as abnormalities [7], shoulder dystocia [5], neonatal hypoglycaemia [8], and perinatal mortality [8, 9], is also linked to GDM. Prior studies have consistently identified obesity and a family history of diabetes as two of the

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main risk factors for GDM [3]. A previous unexplained stillbirth [12, 13], advanced maternal age [10], non-white race [10, 11], and obesity [10, 13] are additional risk factors for GDM. In addition to raising the risk of GDM, maternal obesity also raises the risk of thrombosis [14], gestational hypertension [15], preeclampsia [16–18], premature delivery [19], and caesarean section [16, 18]. Various newborn diseases and complications have been linked to GDM and obesity. Congenital abnormalities such as sacral agencies [20, 21], macrosomia [22], and birth injuries [23, 24] are a few of these. Unipolar major depressive illness is currently implicated in an emerging body of research as one of the key risk factors for and conditions co-occurring with GDM [25], albeit the research is contradictory [26].

Diabetes mellitus (DM) is becoming more common worldwide, particularly in emerging nations like India. Increased urbanisation, declining levels of physical activity, alterations in eating habits, and an increase in obesity prevalence are all factors contributing to the rising prevalence in emerging nations [27–31]. Special attention should be given to this population, especially in poor countries, because women with gestational diabetes mellitus (GDM) and their children are at a greater risk of having diabetes mellitus in the future.

The statistics on the prevalence of GDM, the number of women affected, and the distribution of afflicted women are crucial for future prevention efforts to be planned and resourced logically. Multiple regional studies in various population subgroups are required to quantify prevalence statistics as well as risk variables related to it because studies in various parts of India have found vastly divergent prevalence rates. In order to investigate the prevalence of GDM and related risk factors in women visiting an antenatal clinic in the Chengalpattu area, the current study was conducted.

Materials and Methods

During the month of August 2021 to August 2022, this study was conducted in the Chengalpattu District's antenatal care clinic. The study included all pregnant patients at ANC clinics who had an estimated gestational age between 24 and 28 weeks during the study period. All women received information about the study's purpose and were invited to participate if they gave their consent. The institutional ethics committee gave its approval to the study protocol. Women with known diabetes or those who had any other chronic ailment were not allowed to participate in the trial. General information was provided on a proforma that asked about demographics, socioeconomic situation (as determined by the Kuppuswamy classification) [32], education level, parity, family history of diabetes and/or hypertension in first-degree relatives, and previous GDM history. The ladies were instructed to follow their regular diet for three days before coming to the ANC clinic to undergo an oral glucose tolerance test after observing an overnight fast (at least 8 hours but no longer than 14 hours) (OGTT). All subjects had an OGTT after having their fasting capillary glucose levels estimated. This test involved ingesting 75g of anhydrous glucose powder dissolved in 250–300 ml of water within five minutes. The clock started when the drink was first poured. Plasma glucose levels were measured using a validated glucometer (Ultra 2; Johnson and Johnson, New Brunswick, NJ) at fasting, 1 and 2 hours after a glucose load. The glucose oxidase technique was used to assess venous plasma glucose in every tenth case [33]. According to the reported pre-pregnancy weight of BMI was calculated.

To compare two proportions, the chi-square test was applied. Using multiple logistic regression analyses and bivariate logistic regression analyses, odds ratios were obtained for various risk factors. The statistical software SPSS version 17.0 was used to conduct all analyses (SPSS Inc. Chicago IL).

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Results

Throughout the course of the study, 607 women in all were enrolled, and Table I lists their baseline characteristics. Based on ADA criteria, 43 (7.1%) women had GDM, which was diagnosed. Of these, 26 women had two abnormal OGTT readings, and 17 women had all three abnormal. 66 (10.87%) of the women had one abnormal result while 55 of the women had fasting plasma glucose as their most prevalent abnormal value.

Most of the participants (463, or 76.3%) were under the age of 26, and the majority (353, or 58.2%) fell between the ages of 21 and 25. Participants' average ages were 23.62 ±3.42 years (range 18-38). In comparison to women aged 16–20 and 21–25 yr (4.54 and 4.53%, respectively), the prevalence rate was higher in women aged 26–30 and >30 yr (11.57 and 34.8%, respectively). This observation was found to be statistically significant (P<0.001).

GDM rate increased as participants' educational levels rose, with women (19/133) with doctorate degrees having the highest rate (14.3%). Women from the upper and upper middle classes were found to have a greater prevalence of GDM (5/20, 25% and 20/119, 16.8%, respectively), and this difference was statistically significant (P 0.001) when compared to women from the lower middle class (10/219, 4.6%) and upper lower class (8/230, 3.4%). When compared to other socioeconomic levels, upper class women's mean age and BMI were much higher (Table 2).

Characteristics	N(%)
Age	
16-20	110 (18.1)
21-25	353 (58.2)
26-30	121 (19.9)
>30	23 (3.8)
BMI (kg/m^2)	
< 18.5	232 (38.2)
18.5- 24.9	325 (53.6)
≥ 25	50 (8.2)
Parity	
0	254 (41.8)
1	245 (40.4)
2	73 (12.0)
>3	35 (5.8)
Class	
Upper class	20 (3.3)
Upper middle	119 (19.6)
Lower middle	229 (37.7)
Upper lower	238 (39.2)
Lower	1 (0.2)

Table 1: Baseline characteristics of the study population

Socio-economic class (n)	Mean age ± SD* (yr)	Mean BMI ± SD** (kg/m^2)
Upper class (20)	26.90 ± 4.712	22.374 ± 2.700
Upper middle (119)	24.63 ± 3.668	20.932 ± 3.734
Lower middle (229)	23.24 ± 3.158	20.057 ± 3.180
Upper lower (238)	23.21 ± 3.155	19.275 ± 2.834
Lower (1)	20.00 ± 0.000	16.866 ± 0.000

Table 2: Comparison of mean age and BMI of participants based on socio-economic status

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Discussion

In India, a research conducted in 1982 [34] indicated that the prevalence of GDM was 2%, while a further study conducted in 1991 [35] found that the prevalence was 7.62%. According to reports, 6.7% of rural women in the Jammu district have GDM [36]. In a random study conducted in different Indian cities in 2002-2003, GDM prevalence was found to be 16.2% in Chennai, 15% in Thiruvananthapuram, 21% in Alwaye, 12% in Bangalore, 18.8% in Erode, and 17.5% in Ludhiana [29]. A 16.55 percent overall prevalence of GDM was noted. In a separate study carried out in Tamil Nadu (2005–2007), a total of 4151, 3960, and 3945 pregnant women were tested in urban, semi-urban, and rural areas, respectively, and GDM was found in 17.8, 13.8 and 9.9% of women, respectively [31]. In research conducted at a tertiary care hospital in Maharashtra, it was determined that 7.7% of women had GDM, and 13.9% of them had one or more OGTT results that were abnormal [37]. Different prevalence rates of GDM could be brought on by the use of various diagnostic standards for GDM.

43 (7.1%) of the women in our study had gestational diabetes mellitus. There was no known diabetes case among any of them. On the 2-h OGTT, 66 more ladies (10.87%) got one abnormal value. 55 (83.33%) of the 66 women in this group had abnormal fasting plasma glucose levels. In comparison to normal women, those with GDM had mean fasting plasma glucose values of 103.85 14.93 mg/dl as opposed to 86.22 6.70 mg/dl. According to the ADA criteria, the prevalence of GDM in our study was comparable to the 7.7% reported by Swami et al [37] in Maharashtra. In a nearly 5000-woman observational trial, the Brazilian Gestational Diabetes Study assessed the diagnostic criteria of the American Diabetes Association (ADA) and the World Health Organization (WHO) against pregnancy outcomes [28]. The incidence of GDM was 2.4% when using the 2-h 75 g OGTT criterion recommended by the ADA, and it was 7.2% when utilising the WHO criteria. Although the WHO criteria detected more cases of GDM, this study came to the conclusion that both the ADA and WHO criteria are legitimate options for the diagnosis of GDM and the prediction of unfavourable pregnancy outcomes [28]. According to several studies [29-31,38-42], GDM is linked to getting older, having more children, having a higher pre-pregnancy BMI and weight, having a history of diabetes in first-degree relatives, and having previously experienced the condition. Age, higher socioeconomic status, pre-pregnancy weight and BMI, weight gain during pregnancy, acanthosisnigricans, a family history of diabetes or hypertension, and prior history of GDM were all found to be risk factors for GDM in the current study.

In a few studies [29, 30], it was discovered that increased parity was linked to a higher prevalence of GDM. This link was not found to be statistically significant in our investigation. While Jang et al. [43] discovered a higher ratio of women with GDM in the group with parity >2 compared to primipara, the results were not statistically significant after adjusting for age, pre-pregnancy BMI, height, family history of diabetes mellitus, and weight increase during pregnancy.

Conclusion

To sum up, the current study provides a 7.1% prevalence of GDM from a tertiary care hospital and emphasises the significance of conducting prevalence studies in various Indian regions to determine the precise incidence of GDM nationwide. These studies show that GDM is highly prevalent in pregnant women who also have depression and a higher mid-pregnancy BMI. In this demographic, GDM is common, particularly in pregnant women who are overweight or obese and who are depressed. Our findings can be applied to the creation and execution of programmes helping high-risk women during prenatal care.

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References

1. Ferrara A. Increasing prevalence of gestational diabetes mellitus: a public health perspective. Diabetes Care. 2007;30(Suppl 2):S141–6.
2. Zhu Y, Zhang C. Prevalence of gestational diabetes and risk of progression to type 2 diabetes: a global perspective. CurrDiab Rep. 2016;16(1):7.
3. DeSisto CL, Kim SY, Sharma AJ. Prevalence estimates of gestational diabetes mellitus in the United States, Pregnancy Risk Assessment Monitoring System (PRAMS), 2007-2010. Prev Chronic Dis. 2014;11:E104.
4. Waters TP, Dyer AR, ScholtensDM, Dooley SL, Herer E, Lowe LP, Oats JJ, Persson B, Sacks DA, Metzger BE, et al. Maternal and neonatal morbidity for women who would be added to the diagnosis of GDM using IADPSG criteria: a secondary analysis of the hyperglycemia and adverse pregnancy outcome study. Diabetes Care. 2016;39:2204–10.
5. Fadl HE, OstlundIK, Magnuson AF, Hanson US. Maternal and neonatal outcomes and time trends of gestational diabetes mellitus in Sweden from 1991 to 2003. Diabet Med. 2010;27(4):436–41.
6. Hedderson M. Gestational diabetes mellitus and lesser degrees of pregnancy hyperglycemia: association with increased risk of spontaneous preterm birth. Obstet Gynecol. 2003;102(4):850–6.
7. Sheffield J, Butler-Koster E, Casey B, McIntire D, Leveno K. Maternal diabetes mellitus and infant malformations. Obstet Gynecol. 2002;100(5 Pt 1):925–30.
8. BarthaJL, Martinez-Del-Fresno P, Comino-Delgado R. Gestational diabetes mellitus diagnosed during early pregnancy. Am J Obstet Gynecol. 2000; 182(2):346–50.
9. Wood S, Jick H, Sauve R. The risk of stillbirth in pregnancies before and after the onset of diabetes. Diabet Med. 2003;20(9):703–7.
10. Solomon C, Willett W, Carey V, Rich-Edwards J, Hunter D, Colditz G, Stampfer M, Speizer F, Spiegelman D, Manson J. A prospective study of pregravid determinants of gestational diabetes mellitus. JAMA. 1997;278(13): 1078–83.
11. Hunsberger M, Rosenberg KD, Donatelle RJ. Racial/ethnic disparities in gestational diabetes mellitus: findings from a population-based survey. Womens Health Issues. 2010;20(5):323–8.
12. McMahon M, Ananth C, Liston R. Gestational diabetes mellitus. Risk factors, obstetric complications and infant outcomes. J Reprod Med. 1998;43(4):372–8.
13. Mwanri AW, Kinabo J, Ramaiya K, FeskensEJ. Gestational diabetes mellitus in sub-Saharan Africa: systematic review and metaregression on prevalence and risk factors. Tropical Med Int Health. 2015;20(8):983–1002.
14. Larsen TB, Sorensen HT, Gislum M, Johnsen SP. Maternal smoking, obesity, and risk of venous thromboembolism during pregnancy and the puerperium: a population-based nested case-control study. Thromb Res. 2007;120(4):505–9.
15. Gaillard R, SteegersEA, Hofman A, Jaddoe VW. Associations of maternal obesity with blood pressure and the risks of gestational hypertensive disorders. The generation R study. J Hypertens. 2011;29(5):937–44.
16. Rahman MM, Abe SK, Kanda M, Narita S, Rahman MS, Bilano V, Ota E, Gilmour S, Shibuya K. Maternal body mass index and risk of birth and maternal health outcomes in low- and middle-income countries: a systematic review and meta-analysis. Obes Rev. 2015;16(9):758–70.
17. Young OM, Twedt R, Catov JM. Pre-pregnancy maternal obesity and the risk of preterm preeclampsia in the American primigravida. Obesity (Silver Spring). 2016;24(6):1226–9.
18. Vinturache A, Moledina N, McDonald S, Slater D, Tough S. Pre-pregnancy Body Mass Index (BMI) and delivery outcomes in a Canadian population. BMC Pregnancy Childbirth. 2014;14:422.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

19. Cnattingius S, Villamor E, Johansson S, Bonamy AE, Persson M, Wikström A, Granath F. Maternal obesity and risk of preterm delivery. JAMA. 2013;309(22):2362–70.
20. Moore L, Singer M, Bradlee M, Rothman K, Milunsky A. A prospective study of the risk of congenital defects associated with maternal obesity and diabetes mellitus. Epidemiolog. 2000;11(6):689–94.
21. Martínez-Frías M, Frías J, Bermejo E, Rodríguez-Pinilla E, Prieto L, Frías J. Pregestational maternal body mass index predicts an increased risk of congenital malformations in infants of mothers with gestational diabetes. Diabet Med. 2005;22(6):775–81.
22. Ehrenberg HM, Mercer BM, Catalano PM. The influence of obesity and diabetes on the prevalence of macrosomia. Am J Obstet Gynecol. 2004;191(3):964–8.
23. Shoar Z, Zivot A, Nasiri S, Mandhani N, Kelly B. Maternal obesity, maternal gestational diabetes mellitus, and maternal and neonatal outcomes. J Obes Weight Loss Therapy. 2016;06(01):1-12.
24. WendlandEM, Torloni MR, Falavigna M, Trujillo J, Dode MA, Campos MA, Duncan BB, Schmidt MI. Gestational diabetes and pregnancy outcomes–a systematic review of the World Health Organization (WHO) and the International Association of Diabetes in Pregnancy Study Groups (IADPSG) diagnostic criteria. BMC Pregnancy Childbirth. 2012;12:23.
25. Byrn M, Penckofer S. The relationship between gestational diabetes and antenatal depression. J ObstetGynecol Neonatal Nurs. 2015;44(2):246–55.
26. Katon JG, Russo J, Gavin AR, Melville JL, KatonWJ. Diabetes and depression in pregnancy: is there an association? J Women's Health (Larchmt). 2011;20(7):983–9.
27. American Diabetes Association. Gestational Diabetes Mellitus (Position Statement). Diabetes Care 2004; 27 (Suppl 2): S88-90.
28. Schmidt MI, Ducan BB, ReicheltAJ, Branchtein L, Matos MC, Costa e Forti A, et al. For the Brazilian Gestational Diabetes Study Group. Gestational diabetes mellitus diagnosed with a 2-h 75 gm oral glucose tolerance test and adverse pregnancy outcomes. Diabetes Care 2001; 24 : 1151-5.
29. Seshiah V, Balaji V, Balaji MS, Sanjeevi CB, Green A. Gestational diabetes mellitus in India. J Assoc Physicians India 2004; 52 : 707-11.
30. Zargar AH, Sheikh MI, Bashir MI, Masoodi SR, Laway BA, Wani AI, et al. Prevalence of gestational diabetes mellitus in Kashmiri women from the Indian Subcontinent. Diabetes Res ClinPract 2004; 66 : 139-45.
31. Seshiah V, Balaji V, Balaji MS, Paneerselvam A, Arthi T, Thamizharasi M, et al. Prevalence of gestational diabetes mellitus in South India (Tamil Nadu) - a community based study. J Assoc Physicians India 2008; 56 : 329-33.
32. Mishra D, Singh HP. Kuppuswamy's socio-economic status scale - A revision. Indian J Pediatr 2003; 70 : 273-4.
33. Meites S, Banrey KS. Modified glucose oxidase method for determination of glucose in whole blood. ClinChem 1973; 19 : 308-11.
34. Agarwal S, Gupta AN. Gestational Diabetes. J Assoc Physicians India 1982; 30 : 203-5.
35. Narendra J, Munichoodappa C, Gurudas A, Ramprasad AV, Madhav T, Vijayalakshmi, et al. Prevalence of glucose intolerance during pregnancy. Int J Diab Dev Countries 1991; 11 : 2-4.
36. Verma AK, Singh B, Mengi V. Gestational diabetes in rural women of Jammu. Indian J Comm Med 2008; 33 : 54-5.
37. Swami SR, Mehetre R, Shivane V, BandgarTR, Menon PS, Shah NS. Prevalence of carbohydrate intolerance of varying degrees in pregnant females in western India (Maharashtra) - A hospital-based study. J Indian Med Assoc 2008; 106 : 712-4.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

38. Metzger BE, Buchanan TA, Coustan DR, Levia AD, Dunger DB, Hadden DR, et al. Summary and recommendations of the Fifth International Workshop-Conference on Gestational Diabetes Mellitus. Diabetes Care 2007; 30 : S251-60.
39. Xiong X, Saunders LD, Wang FL, DemanczukNN. Gestational diabetes: prevalence, risk factors, maternal and infant outcomes. Int J GynaecolObstet 2001; 75 : 221-8.
40. Torloni MR, Betran AP, Horta BL, Nakamura MU, Atallah AN, Moron AF, et al. Prepregnancy BMI and the risk of gestational diabetes: a systematic review of the literature with meta-analysis. Obes Rev 2009; 10 : 194-203.
41. Kim C, Liu T, Valdez R, Beckles GL. Does frank diabetes in first degree relatives of a pregnant woman affect the likelihood of her developing gestational diabetes mellitus or nongestational diabetes? Am J ObstetGynecol 2009; 201 : 576, e1-6.
42. McGuire V, Rauh MJ, Mueller BA, Hickock D. The risk of diabetes in a subsequent pregnancy associated with prior history of gestational diabetes or a macrosomic infant. PaediatrPerinatEpidemiol 1996; 10 : 64-72.
43. Jang HC, Min HK, Lee HK, Cho NH, Metzger BE. Short stature in Korean women: a contribution to the multifactorial predisposition to gestational diabetes mellitus. Diabetologia 1998; 41 : 778-83.