

A study of modifiable risk factors of GDM in Delhi

Sakshi Singh^{1,*}, Tapas K. Ray², Sandeep Kumar³

¹Tutor, ²Professor, ³Senior Resident, ^{1,2}Dept. of Community Medicine, ³Dept. of Surgery, ¹Dr. Babasaheb Ambedkar Medical College & Hospital, Rohini, New Delhi, ^{2,3}Lady Hardinge Medical College, New Delhi, India

***Corresponding Author:**

Email: sakshi.195singh@gmail.com

Abstract

Introduction: Gestational diabetes mellitus (GDM) has been observed to be associated with increased perinatal morbidity and mortality. GDM is becoming a public health concern globally as well as in India with fast increasing trend. It affects approximately 14% of all pregnancies. Most of the literature available has focused on traditional risk factors while this article has thrown light on modifiable ones.

Objective: To study the modifiable risk factors for developing GDM in pregnant women based on physical examination and personal history.

Materials and Methods: A hospital based case control study was conducted in Lady Hardinge Medical College and associated hospital with a sample size of 104 (52 cases & 52 controls). Pregnant women with gestational diabetes mellitus as diagnosed by abnormal oral Glucose Tolerance Test (OGTT) were taken as cases and Pregnant women who have completed 24 weeks of gestation and who tested negative on Glucose Challenge test (GCT) were selected as controls. The data was compiled and analysed in SPSS version 12.

Results: Pre pregnancy BMI >23kg/m² (OR=12.96), Skinfold thickness >13mm (OR=5.30). OCPs use for more than 5 years (OR=4.71), Physical activity sedentary vs moderate (OR=1.40), consumption of food item with high GI (OR=2.86).

Conclusions: The information found in the study regarding the risk factors may contribute heavily to the policy makers to develop strategies to combat the problem of GDM in the community.

Introduction

India has become the diabetic capital of the world. According to WHO projections India will have maximum number of patients with diabetes (57.2 million) by the year 2025.⁽¹⁾ Gestational diabetes mellitus (GDM), which is defined as the onset or recognition of glucose intolerance during pregnancy,⁽²⁾ is also becoming a public health concern globally as well as in India with fast increasing trend. It affects approximately 14% of all pregnancies.⁽³⁾

Non modifiable risk factors such as past history of GDM, family history of DM, increasing maternal age have already been identified,⁽⁴⁾ however the impact of other modifiable risk factors like diet, lifestyle etc has not yet been adequately analyzed.

The simple preventive measures like health education, screening test, life style modification etc can bring about considerable reduction in morbidity burden due to gestational diabetes. It is therefore of paramount importance to study the risk factors of GDM, especially the modifiable ones, in details.⁽⁵⁻⁷⁾

Substantial evidence has related risk factors like diet to the development of glucose intolerance. Diet has been reported to be both protective and risk-enhancing between particular dietary factors and type 2 diabetes in adult men and nonpregnant women.⁽⁴⁾ Further evaluation needs to be done in that direction. This paper has tried to study the association of modifiable risk factors like obesity, OCPs (oral contraceptive pills) use, with that of GDM.

Materials and Methods

The study was conducted in Antenatal clinic, Department of Obstetrics and Gynaecology in Lady Hardinge Medical College & Smt Sucheta Kripalani Hospital (SSKH).

A complete general physical examination was carried out including height, weight, temperature, heart rate (HR), blood pressure, pedal oedema, thyromegaly, pallor, icterus, skin fold thickness with harpender skin caliper on left arm triceps. Obstetrical examination & abdominal examination was done in details. All the pelvic grips were done. Abdominal girth was taken. Laboratory investigations relevant to the study were recorded e.g. haemoglobin, random blood glucose, glucose challenge test, glucose tolerance test, glyatedhaemoglobin(HbA1c)* (*glycatedhaemoglobin was available for cases only as controls were not subjected to the test).

With two sided confidence level of 95%, Power-80%, Ratio of cases to controls 1, Prevalence of family history of diabetes in developing GDM in normal population 12% (out of all major risk factors it has the minimum prevalence according to existing literature in India)⁽⁴⁾ and assumed OR of Family history for developing GDM 4, the sample size was calculated to be 52 cases and same number of controls were taken using Epi_Info software.

For dietary history a validated quantitative food frequency questionnaire was used. The usual pattern of eating during days, weeks and months was asked. This questionnaire has already been evaluated in previous studies in Kerala and Gujarat.⁽⁷⁾

For physical activity measurement, the questionnaire was derived from Global Physical Activity Questionnaire version 2. We took history of mothers 1 year before the present pregnancy. The questionnaire comprised of four sections: type of work, type of transportation used, type of recreational activity and time spent in sitting or reclining position. The women were divided under sedentary, moderate and heavy workers.

Data was adequately coded and analysed using SPSS version 12. Odds ratio was used to compare strength of association between cases and controls.

Result

Pre pregnancy BMI >23kg/m² had significant association with the risk of developing GDM (OR-12.96). Skinfold thickness >13mm showed strong evidence of association with GDM (OR-5.30). OCPs use for more than 5 years had very high risk of developing GDM as compared to women who have consumed it for less than 5 years (OR-4.71). (Table-1, 2, 3)

Table 1: Risk of developing GDM with pre pregnancy BMI

BMI	Cases No. (%)	Controls No. (%)	OR(95 %CI)
≥23	27(51.9)	4(7.7)	12.96(4.08-41.18)
<23	25(48.1)	48(92.3)	1
Total	52(100.0)	52(100.0)	
Mean±SD	23.96±3.46	20.79±1.74	

Table 2: Risk of developing GDM with skin fold thickness (Triceps)

Skin fold thickness(mm)	Cases No. (%)	Controls No. (%)	OR(95% CI)
≥13	29(55.8)	10(19.2)	5.30(2.20-12.77)
<13	23(44.2)	42(80.8)	1
Total	52(100.0)	52(100.0)	
mean±SD	12.90±1.66	11.50±1.24	

Table 3: Risk of developing GDM with oral contraceptive pills

OCP use in years	Cases No. (%)	Controls No. (%)	OR(95% CI)
>5 years	18(34.6)	5(9.6)	4.71(1.54-14.35)
< 5 years	26(50)	34(65.4)	1
NOT USING	8(15.4)	13(25.0)	0.81(0.20-2.23)
TOTAL	52(100.0)	52(100.0)	

No significant association was found between the type of physical activity and risk of GDM as the odds ratio is 1.40 having value 1 in the confidence interval (Table 4).

Table 4. Distribution of study subjects according to pre pregnancy physical activity

Type of activity	Cases	Controls	OR(95% CI)
Sedentary	46(88.5%)	44(84.6%)	1.40(0.45-4.34)
Moderate	6(11.5%)	8(15.4%)	1
Total	52(100.0)	52(100.0)	

The glycemic index is a relative measure of the glycemic effect of the carbohydrates in different foods. Total glycemic load was calculated by first multiplying the carbohydrate content of each food by its glycemic index value, then multiplication of this value by the frequency of consumption, and the summation of the values from all food. Dietary glycemic load thus represents the quality and quantity of carbohydrate intake and the interaction between the two. The odds ratio of developing GDM was 2.86 among the cases who were taking high glycaemic foods more frequently in comparison to those who were taking occasionally (Table 5).

Table 5. Distribution of study subjects according to consumption of food items having high glycemic index

Food items with high GI	Cases No. (%)	Controls	OR(95% CI)
More frequently	16(30.8%)	7(13.5%)	2.86(1.06-7.70)
Less frequently	36(69.2%)	45(86.5%)	1
Total	52(100.0)	52(100.0)	

Discussion

Pre pregnancy Body mass index (BMI)

Present study has observed strong association between pre-pregnancy BMI ($\geq 23\text{kg/m}^2$) with GDM (OR 12.96). This finding was consistent with a study done by Madhavan et al⁽⁹⁾ (2005-06) in Kerala showing increased prevalence of GDM with BMI $\geq 23\text{kg/m}^2$ (OR-7.5, CI 1.61-34.31). There are many other studies which have found significant association between high BMI and GDM.⁽¹⁰⁻¹⁶⁾

Physical activity

In the present study the risk of GDM among sedentary women as compared to moderately active women was insignificant. (OR-1.40, CI 0.45-4.34). However other studies^(11,17) have shown contradictory results. This may be attributed by smaller sample size and inadequate information on physical activity in present study.

Dietary factors

Our study has shown that women consuming diet with high glycaemic load had high risk of GDM (OR-3.13 and OR-2.86 respectively). The results are comparable to study by Zahng et al.⁽¹⁸⁾

OCP use

Our study found a statistically significant association between OCP use and risk of GDM (OR-4.7, CI-1.54-14.35). Hedderon et al⁽¹⁹⁾ also showed that there was high risk of developing GDM in women using high-androgen hormonal contraceptive(OR-1.43, CI 0.92-2.22).

Though the sample size is small the information obtained in this study may be used as important tools and inputs for setting effective strategies and policies for prevention of GDM.

References

- King H, Rewers M. Global estimates for prevalence of diabetes and impaired glucose tolerance in adults. WHO Ad Hoc Diabetes Reporting Group. *Diabetes Care* 1993;16:157-177.
- Hanna FW, Peters JR. Screening for gestational diabetes; past, present and future. *Diabet Med* 2002;19:351-8.
- Lobner K, Knopff A, Baumgarten A, Mollenhauer U, Marienfeld S, Garrido-Franco M, et al. Predictors of postpartum diabetes in women with gestational diabetes mellitus. *Diabetes* 2006;55:792-7.
- Bellamy L, Casas JP, Hingorani AD, Williams D. Type 2 diabetes mellitus after gestational diabetes: a systematic review and meta-analysis. *Lancet* 2009;373:1773-9.
- Jovanovic L, Pettitt DJ. Gestational diabetes mellitus. *JAMA* 2001;286:2516-8.
- Madhavan A, Beena Kumari R, Sanal MG. A pilot study on the usefulness of body mass index and waist hip ratio as a predictive tool for gestational diabetes in Asian Indians. 2008 Dec. 24(12):701-7.
- Hebert J, Gupta PC, Bhonsle RB, Sinor PN, Mehta H and Mehta FS. Development and testing of a quantitative food frequency questionnaire for use in Gujarat, India. *Public Health Nutrition*. 1998;2(1), 39-50.
- Krisnaveni GV et al. Gestational diabetes and the incidence of diabetes in the 5 years following the index pregnancy in South Indian women. *Diabetes Res ClinPract*. 2007;78:398-404.
- Madhavan A, BeenaKumari R, Sanal MG. A pilot study on the usefulness of body mass index and waist hip ratio as a predictive tool for gestational diabetes in Asian Indians. 2008 Dec. 24(12):701-7.
- Rajput R, Yadav Y, Nanda S, Rajput M. Prevalence of gestational diabetes mellitus & associated risk factors at a tertiary care hospital in Haryana. *Indian J Med Res* 2013;137:728-733.
- Dempsey JC, Butler CL, Sorensen TK et al. A case control study of maternal recreational physical activity and risk of gestational diabetes mellitus. *Diabetes* 2004;66:203-215.
- Wahi P, Dogra V, Jindal K, Bhagat R, Gupta R, Gupta S et al. Prevalence of Gestational Diabetes Mellitus(GDM) and its Outcomes in Jammu Region. *JAPI* 2011;59:227-230.
- Rehder PM, Pereira BG, Silva JLP. The prognostic value of a normal oral glucose tolerance test in pregnant women who tested positive at screening: a validation study. *Diabetology&Metaboloic Syndrome* 2012;4:10.
- Bener A, Saleh N M, Al-Hamaq A. Prevalence of gestational diabetes and associated maternal and neonatal complications in a fast-developing community: global comparisons. *Int J Women's Health* 2011;3:367-373.
- Dahanayaka N J, Agampodi S B, Ranasinghe O R J C, Jayaweera PMED, Wickramasinghe W A N D, Adhikari A N C W B et al. Inadequacy of the risk factor based approach to detect gestational diabetes mellitus. *Cey Med J* 2012;57:5-9.
- Kalra P, Kachhwaha C P, Singh H V. Prevalence of gestational diabetes mellitus and its outcome in western Rajasthan. *Indian J Endo Metab* 2013;17(4):677-680.
- Oken E, Ning Y, Rifas-Shiman SL, Radesky J S, Rich-Edwards J W, Gillman M W. Associations of Physical Activity and Inactivity Before and During Pregnancy With Glucose Tolerance. *ObstetGynecol* 2006;108(5):1200-1207.
- Zhang C, Liu S, Solomon C, Hu F. Dietary Fiber Intake, Dietary Glycemic Load, and the Risk for Gestational Diabetes Mellitus *Diabetes Care* 2006;29:2223-2230.
- Hedderon M, Ferrara A, Williams M, Holt V, Weiss N. Androgenicity of Progestins in Hormonal Contraceptives and the Risk of Gestational Diabetes Mellitus. *Diabetes Care* 2007;30:1062-1068.