

Bio-Socio-demographic Risk factors of Gestational Diabetes: A Case Control Study

Dr. Kavita Meena^{1*}, Dr. Krishan Kumar Meena², Dr. Kusum Lata Meena³, Dr. Kusum Lata Gaur⁴, Dr Mahesh C Verma⁵, Dr Amita Kashyap⁶

¹Resident Doctor, Department of Community Medicine, SMS Medical College, Jaipur (Rajasthan) India

^{2,4,6}Senior Professor, Department of Community Medicine, SMS Medical College, Jaipur (Rajasthan) India

³Senior Professor, Department of Gynecology & Obstetrics, SMS Medical College, Jaipur (Rajasthan) India

⁵Associate Professor, Department of Community Medicine, SMS Medical College, Jaipur (Rajasthan) India

Abstract—India is second largest country to have people with Diabetes Mellitus (DM) in world. Gestational Diabetes Mellitus (GDM) has bad pregnancy outcomes so this present case control study was conducted on 50 pregnant women (ANCs) with GDM and 50 normal ANCs to assess the bio-socio-demographic risk factors of Gestational Diabetes. It was found that GDM was significantly associated with age, religion, residence and BMI of woman. GDM was found significantly more with increasing age and increasing BMI. ANCs residing in urban areas and belonging to Muslim religion were more pron to have GDM than their counter parts. Family history of diabetes also favors in occurrence of GDM. So clinicians should increase GDM screening at first ANC visit and prompt treatment is recommended to prevent complication. Early identification of woman at risk of GDM may prevent maternal and perinatal morbidity.

Keyword- Gestational Diabetes Mellitus, Risk factors, Impaired Glucose Tolerance, Bio-socio-demographic factors.

I. INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with the onset or first diagnosed during gestation with or without remission after the end of pregnancy.¹

Diabetes complicates 1-20% of all pregnancies worldwide.² Indian women have high prevalence of diabetes and their relative risk of developing GDM is 11.3 times compared with white women.³ Indian woman had higher prevalence of gestational diabetes at 22 to 25% as opposed to the worldwide prevalence figure of 15%.⁴ In addition to these GDM cases are expected to rise to 101.2 million by 2030. The prevalence of GDM in India varies from 3.8 to 21% in different parts of the country depending on the geographical locations and diagnostic methods used. GDM has been found to be more prevalent in urban areas rather than rural areas.⁵ According a study in Tamil Nadu by Thamizharasi M, et al. that GDM was detected in 17.8 per cent women in urban, 13.8 per cent women in semi-urban and 9.9 per cent women in rural areas.⁶

The prevalence of gestational diabetes has been reported to 6.6% in western Rajasthan.¹ Prevalence of GDM is 9.5% in Western India⁷ and 17.9% in Tamil Nadu.⁸ In India it is difficult to predict any uniform prevalence levels because of wide differences in living conditions, socio-economic levels and dietary habits.⁹

II. METHODOLOGY

A hospital based case control type of observational study was conducted in Mahila Chikitsalaya; Jaipur under department of PSM, SMS (Rajasthan) India in year June 2015.

2.1 Study participants

Every diagnosed GDM ANC attending at Mahila Chitsalay was included in Study Group and for Control Group consecutive normal ANC was included. ANC with some other chronic illness were excluded from both the groups. Finally study was conducted on 50 pregnant women without GDM and 50 pregnant women with GDM. Oral Glucose Tolerance Test (OGTT) with 75 gram glucose (WHO criteria, 2013)¹⁰ was used to diagnose GDM in this study.

Desired information's were collected from hospital ANC card of the women and by interviewing the study subject herself. After considering the inclusion and exclusion criteria and informed consent patients of both groups were selected for the study. At the time of ANC visit detailed history taking, general physical examination, systemic examination and obstetric examination were done and demographic details such as age, weight, height, residence, socioeconomic status, dietary habits and religion etc were recorded.

2.2 Statistical analysis

Continuous variables were summarized as mean and standard deviation while Nominal/ Categorical variables were summarized as proportion (%). Chi-square test was used to find out significance of difference in proportion. Risk assessment was done by calculation of Odds Ratio in Bivariate analysis. All statistical calculations were done by using Med Calc.14.2.1.0 software. $P < 0.05$ was taken as significant. Significance was set at $p < 0.05$.

III. RESULTS

In present study a total of 50 gestational diabetes mellitus cases and 50 euglycemic controls were included. Observations of this present study were as follows:-

3.1 Age of ANCs

Mean age of GDM study group was (Mean $\pm$ SD) 28.4 ± 4.03 years, while mean age of controls was 23.34 ± 3.13 . In study group majority of ANCs were in 26-30 years of age followed by 31-35, 21-25, ≤ 20 and > 35 years whereas in control group majority of ANCs were in 21-25 years of age followed by ≤ 20 , 25-30, 31-35, and > 35 years. This variation in age wise distribution in both the group was with significant difference ($p < 0.001$). So age was found to be associate with GDM. When risk of GDM was assessed with Odds ratio it was found that as the age increases the risk of GDM also increases. Maximum risk of GDM was found in 31-35 years i.e. 35 times (OR=35 with CL 4.195 - 291.986) more with reference to age ≤ 20 followed by 25-30 years which was 12 times (12.857(2.310 – 74.087) where it was found significant ($p < 0.05$). (Table 1)

3.2 Religion of ANCs

In study group Muslims were significantly more than control group where Hindus were significantly more ($p = 0.020$). So religion was found to be associate with GDM. When risk of GDM was assessed with odds ratio it was found 2.7 times (OR=2.739 with CL 1.204 - 6.230) more in Muslims than Hindus. (Table 1)

3.3 Residence of ANCs

In study group majority of ANCs were of urban area followed by rural and urban slum areas whereas in control group majority of ANCs were of rural areas followed by urban and urban slums. This variation

in residence wise distribution in both the group was found significant ($p=0.039$). So residence was found to be associate with GDM. When risk of GDM was assessed with Odd's ratio it was found that urban ANC's were 5.97 times at more risk than rural which was found significant ($p<0.05$) and urban slums were at 4.23 times more risk than rural but it was not significant ($p>0.05$). (Table 1)

3.4 Family type of ANC's

In both the group majority of ANC's belonged to joint families followed nuclear families and three generation families. So family type of ANC's was not found to be associate with GDM ($p=0.145$). (Table 1).

Table1
Comparison of bio-socio-demographic variables of study and control group

Socio-demographic variables		Study Group (N=50)		Control Group (N=50)		Odds Ratio (95%CL)	P Value
		No	(%)	No	(%)		
Age Group (years)	≤20	2	4	10	20	R*	0.001
	21-25	14	28	31	62	2.258(0.436 – 11.689)	
	26-30	18	36	7	14	12.857(2.310 – 74.087)	
	31-35	14	28	2	4	35.000(4.195 - 291.986)	
	>35	2	4	0	0	NA**	
Religion	Hindu	23	46	35	70	2.739 (1.204 - 6.230)	0.020
	Muslim	27	54	15	30		
Residence	Urban	36	72	17	34	5.968(2.432-14.645)	0.039
	Rural	11	22	31	62	R*	
	Urban Slum	3	6	2	4	4.227(0.622- 28.745)	
Family Type	Nuclear	20	40	11	22	2.403 (0.992 -5.819)	0.145
	Joint	28	56	37	74	R*	
	3 Generation	2	4	2	4	1.321(0.175 -9.967)	
Education	Illiterate	6	12	5	10	1.800(0.210-15.408)	0.950
	Just Literate	7	14	3	6	3.500(0.372-32.973)	
	Primary	10	20	13	26	1.154(0.161 -8.274)	
	Middle	9	18	13	26	1.038(0.143 -7.528)	
	Secondary	2	4	3	6	R*	
	Senior Secondary	2	4	4	8	0.750(0.064-8.834)	
	Graduation	11	22	8	16	2.062(0.277-15.357)	
	Post-Graduation	3	6	3	6	1.500(0.136 -16.543)	
Occupation	House Wife	41	82	46	92	2.524 (0.723 - 8.818)	0.234
	Working	9	18	4	8		
Socio-economic status	I	9	18	10	20	R*	0.691
	II	18	36	17	34	1.176 (0.385-3.599)	
	III	11	22	14	28	0.462 (0.152 to 1.403)	
	IV	12	24	8	16	1.071 (0.320 to 3.585)	
	V	0	0	1	2	NC**	
Body Mass Index (Kg/M ²)	20	2	4	11	22	0.364 (0.071-1.870)	<0.001
	20-25	14	28	28	56	R*	
	26-30	23	46	9	18	5.111(1.875 - 13.931)	
	>30	11	22	2	4	11 (2.139 - 56.569)	
Blood groups	A	17	34	16	32	1.240(0.342-4.480)	0.953
	B	20	40	16	32	1.458(0.408-5.210)	
	AB	6	12	7	14	R*	
	O	7	14	11	22	0.742(0.175-3.148)	

R*= reference

NC**= Not calculated

3.5 Education of ANC's

In study group majority of ANC's were educated at graduation level followed by primary level, middle level etc. whereas in control group majority of ANC's were educated at middle and primary level

followed by graduation etc. This variation in education wise distribution in both the group was not found significant ($p=0.950$). So education of ANCs was not found to be associate with GDM. (Table 1)

3.6 Occupation of ANCs

In both the group majority of ANCs were housewives. So occupation of ANCs could not found to be associate with GDM ($p=0.234$). (Table 1)

3.7 Socio-economic Status of ANCs

In study group majority of ANCs belonged to SES class II followed SES class IV, III and Class I whereas in control group majority of ANCs belonged to SES class II followed by SES class III, I and Class IV. This variation in SES status wise distribution in both the group was not found significant ($p=0.691$). So SES status of ANCs was not found to be associate with GDM. (Table 1)

3.8 BMI of ANCs

In study group majority of ANCs had BMI 26-30 followed by 20-25, >30 and <20 whereas in control group majority of ANCs had BMI 20-25 followed by <20, 26-30 and >30 BMI. This variation in BMI wise distribution in both the group was found significant ($p<0.001$). So BMI was found to be associate with GDM. When risk of GDM was assessed with Odds ratio it was found that as the BMI increases the risk of GDM also increases. Maximum risk of GDM was found in ANCs having BMI >30 i.e. 11 times (OR= 11 with CL 2.139-56.569) more with reference i.e. BMI 20-25 followed by 5.11 times in BMI 26-30 more with reference i.e. BMI 20-25. (Table 1)

3.9 Blood group of ANCs

In both the group majority of ANCs belonged to blood group 'A' & 'B' and on applying Chi-square test blood group type of ANCs was not found to be associate with GDM ($p=0.953$). (Table 1)

3.10 Personal habits of ANCs

In both the group ANCs with habit of smoking were 4% and with habit of tobacco chewing were ranging 2-4%. On analysis neither the smoking nor the tobacco chewing was found to be associate with GDM. (Table 2)

3.11 Diet of ANCs

Although non-vegetarian ANCs were more in study group than control group (62% v/s 42%) but this difference was not found significant ($p=0.072$). So non-vegetarian diet was not found to be associate with GDM. (Table 2)

Table 2
Comparison of Personal Habits and Diet history of study and control group

Personal variables		Study Group (N=50)		Control Group (N=50)		P Value
		No	(%)	No	(%)	
Personal Habits	Smoking	2	4	2	4	0.610
	Tobacco Chewing	1	2	2	4	0.999
Diet	Vegetarian	19	38	29	58	0.072
	Non-vegetarian	31	62	21	42	

3.12 Personal h/o infertility treatment of ANCs

Positive h/o infertility treatment was in 14% and 16% in study group and control group of ANCs respectively, which was found not significant ($p=0.523$). So h/o infertility treatment of ANCs was not found to be associate with GDM. (Table 3)

Table 3
Comparison of Personal and Family history of study and control group

Personal and Family history Variables		Study Group (N=50)		Control Group (N=50)		Odds Ratio (95%CL)	P Value
		No	(%)	No	(%)		
History of Infertility treatment	Yes	7	14	4	8	1.872(0.512- 6.848)	0.523
	No	43	86	46	92		
Family History Diabetes	Yes	21	42	7	14	4.448(1.675-11.811)	0.004
	No	29	58	43	86		

3.13 Personal h/o infertility treatment of ANCs

Positive family h/o diabetes was in 42% and 14 % in study group and control group of ANCs respectively, which was found significant ($p=0.004$). ANCs having positive family h/o diabetes had GDM 4.4 times more than their counter parts. (Table 3)

IV. DISCUSSION

Present study was aimed to determine the bio-socio-demographic factors that increase risk of GDM. Mean age of GDM study group was (Mean $\pm$ SD) 28.4 $\pm$ 4.03 years, while mean age of controls was 23.34 $\pm$ 3.13 years. Present study found Risk of developing GDM was found more in 26-30 year age group (OR=12.85; 2.31-74.087) and 31-35 year age group (OR=35.00; 4.195-291.98) as compared to $\leq$ 20 years age group. These observation were well comparable with finding of other authors like K Sreekanthan et al.¹¹ Parul Aggarwal et al.¹² Rajesh Rajput et al.¹³ Priyanka Kalra et.al¹ Geeti P Arora¹⁴ Preeti Wahi et.al.¹⁵ etc, who also found that risk of GDM more in woman with high maternal age.

Present study also found that GDM was significantly more in Muslims than Hindus. Geeti P Arora¹⁴ also found that GDM is associated with religion.

In this study, urban ANCs were found to have significant risk factor for development of GDM. Geeti P Arora¹⁴ also reported similar observation that urban residence significantly associated with GDM.

In present study BMI was significantly associated with GDM ($P<0.001$). Risk of GDM was more with increase of BMI. Similar finding was reported in many other studies. K Sreekanthan et. al.¹¹ Geeti P Arora¹⁴ Rajesh Rajput et.al.¹³ Preeti Wahi et.al.¹⁵ V Seshiah et al.⁵ etc also reported that risk of GDM was high in woman with high BMI.

In present study, family history of diabetes was significantly associated with GDM. 42% cases have family history of diabetes whereas only 14% of controls have family history (Odds ratio = 4.448). Well comparable observation were made by K Sreekanthan et al.¹¹ Geeti P Arora¹⁴ Preeti Wahi et.al.¹⁵

V. CONCLUSION

This present study concludes that among all studied variables like age, religion, residence, education, occupation, BMI, SES, blood groups, h/o smoking, tobacco chewing, infertility treatment and family h/o

diabetes; greater risk of GDM was found in women with increasing age, increasing BMI, with positive h/o family history of diabetes.

CONFLICT OF INTEREST

None declared till now.

REFERENCES

- [1] Priyanka Kalra, Chetan Prakash Kachhwaha, Hilda Victoria Singh. Prevalence of gestational diabetes mellitus and its outcome in western Rajasthan. *Indian Journal of Endocrinology and Metabolism* / Jul-Aug 2013 / Vol 17 | Issue 4
- [2] Landon MB, Gabbe SG. Diabetes mellitus and pregnancy. *ObstetGynecolClin North Am* 1992;19:633-54.
- [3] Dorhost A, Paterson CM et al. High prevalence of GDM in women from ethnic minority groups. *Diabetic Med* 1992; 9: 820-5.
- [4] Rajesh Chhibber, High prevalence of gestational diabetes among Indian women, *Communications, Public Health Foundation of India, Delhi* March 2015
- [5] Seshiah V, Balaji V, Balaji MS, et al. Pregnancy and diabetes scenario around the world: India *int J GynaecolObstet*, 2009; 104 (suppl 1): S35-8.
- [6] 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.
- [7] Swami SR, Mehrete R, Shivane V, Bandgar TR, 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, 735.
- [8] Bhatt AA, Dhore PB, Purandare VB, Sayyad MG, Mandal MK, Unnikrishnan AG. Gestational diabetes mellitus in rural population of Western India-Results of a community survey. *Indian J Endocrinol Metab* 2015;19:507-10.
- [9] Zargar AH, Sheikh MI, Bashir MI, Masoodi SR, Laway BA, 4. Wani AI, et al. Prevalence of gestational diabetes mellitus in Kashmiri women from the Indian Subcontinent: Gestational diabetes mellitus in India. *J Assoc Physicians India* 2004; 52 : 707-11.
- [10] World Health Organization. Definition, diagnosis and classification of diabetes mellitus and its complications. Report of a WHO consultation. Part 1: Diagnosis and classification of diabetes mellitus. Geneva: WHO; 1999. WHO/NCD/NCS/99
- [11] K Sreekanthan, A Belicita, K Rajendran, Anil Vijayakumar. Prevalence of Gestational Diabetes Mellitus in a Medical College in South India: A Pilot Study. *Indian Journal of Clinical Practice*, Vol. 25, No. 4, September 2014
- [12] Parul Aggarwal, Nutan Agarwal, Nibhriti Das, Krishna Dalal P, Agarwal N, Das N, Dalal K. Association of polymorphisms in angiotensin-converting enzyme gene with gestational diabetes mellitus in Indian Women. *Int J App Basic Med Res* 2016;6:31-7
- [13] Rajesh Rajput, Yogesh Yadav, Smiti Nanda & Meena Rajput. Prevalence of gestational diabetes mellitus & associated risk factors at a tertiary care hospital in Haryana. *Indian J Med Res* 137, April 2013, pp 728-733
- [14] 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;173:257-67
- [15] Preeti Wahi, Vikas Dogra, Ketki Jandial, Rajesh Bhagat, Rajesh Gupta, Sunil Gupta et al. Prevalence of Gestational Diabetes Mellitus (GDM) and its Outcomes in Jammu Region. *JAPI* April 2011 Vol 59.