Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com/journal/sjams/home

OPEN ACCESS

Obstetrics & gynecology

Association of Risk Factors and Maternal Outcomes in Gestational Diabetes Mellitus

Preksha Jain[1*], Savita Somalwar[2], Pritesh Jain[3], Divya Dewani[4]

[1]Assistant Professor, Department of Obstetrics & gynecology, Umaid Hospital, Dr SN Medical College, Jodhpur, Rajasthan 342008 India
[2]Assistant Professor, Department of Obstetrics & gynecology Lata Mangeshkar Hospital, NKP Salve Institute of Medical Sciences, Nagpur 440001 India
[3]Senior Resident, All India Institute of Medical Sciences, Jodhpur 342001 India
[4]Senior Resident, Department of Obstetrics & gynecology Lata Mangeshkar Hospital, NKP Salve Institute of Medical Sciences, Nagpur 440001 India

***Corresponding author:** Preksha Jain
| **Received:** 15.01.2019 | **Accepted:** 26.01.2019 | **Published:** 30.01.2019
DOI: 10.36347/sjams.2019.v07i01.063

Abstract | **Original Research Article**

Diabetes epidemic has been largely impacted by Gestational diabetes mellitus (GDM). Our aim is to determine the association of risk factors and maternal outcome in women with gestational diabetes mellitus diagnosed using Diabetes in Pregnancy Study Group of India (DIPSI) method. A prospective time bound study conducted in rural Maharashtra (India). Out of 487 antenatal women, 52 women were diagnosed with gestational diabetes mellitus. All women were followed up till delivery, evaluated for maternal outcome and managed accordingly. Appropriate statistical tests for various variables were applied by using statistical analysis program of Epiinfo-7 software. Occurrence of GDM in Gravida 3 and above were significantly higher than in primigravida. Amidst, risk factors of GDM, women with age above 25 years, family history of diabetes, previous abortions, and previous macrosomic babies were significantly associated with GDM. Among maternal outcomes, abortions (3.8%), PIH (28.8%), polyhydramnios (9.6%), candidiasis (13.5%), UTI (9.6%) were found to be statistically significant. Cesarean rates (60%) and Postpartum Hemorrhage (19.2%) were significantly higher among GDM women. GDM is associated with higher maternal morbidity hence early diagnosis and treatment is recommended. Identification of risk factors may curtail subsequent complications in present pregnancies.

Keywords: Diabetes in pregnancy, Gestational Diabetes Mellitus, Preconception care, Pregnancy outcomes, Risk factors.

INTRODUCTION

Gestational Diabetes Mellitus (GDM) is defined as carbohydrate intolerance with onset or recognition during pregnancy [1] which is associated with adverse maternal and fetal outcome. GDM represents developing diabetes; this is confirmed by increase in its prevalence along with diabetes [2]. Prevalence of GDM in India varied from 3.8 to 21% in different parts, depending on the geographical locations and diagnostic methods [3]. Worldwide, its prevalence differs according to race, ethnicity, age, body composition, screening and diagnostic criteria [4].Women diagnosed to have GDM are also at increased risk of future diabetes predominantly Type 2 diabetes mellitus (DM) as are their children. Early diagnosis, achieving euglycemia and ensuring adequate nutrition may prevent in all probability, the vicious cycle of transmitting glucose intolerance from one generation to another [5].

MATERIALS AND METHODS

Present study was carried out at a tertiary care hospital attached to medical college in the Department of Obstetrics and Gynecology, between November 2016 and October 2018 after approval of the Institutional Ethics Committee. Total 487 antenatal women were screened for GDM. Inclusion criteria included singleton pregnancies and those willing for regular antenatal check-up. While, women who were known cases of diabetes or with multiple pregnancies or with history of pancreatitis and those not willing for any intervention were excluded. Detailed history and examination was done. After taking informed consent, patients were made to drink 75gm glucose dissolved in 200ml of water consumed over a period of 5 minutes, irrespective of whether she is in the fasting or non-fasting state and without regard to the time of the last meal. A venous blood sample was collected at 2 hours for estimating plasma glucose by Glucose Oxidase Peroxidase (GOD-POD) method at central laboratory. Women with 2hr

post glucose blood sugars (PGBS) ≥140 mg/dl were classified as GDM and with<140 mg/dl were classified as Non-GDM according to DIPSI criteria. Apart from routine investigations, additional parameters monitored in patients with GDM were HbA1c, examination of fundus every month, serum creatinine levels, blood pressure and estimation of micro albuminuria for evidence of PIH. The patients with PGBS between 140 to 199 mg/dl were advised Medical Nutrition Therapy (MNT) under supervision of dietician and continued for 2 weeks. If MNT failed, i.e. FPG ~90 mg/dL and 2hr post-meal glucose ~120 mg/dL, patients were admitted, insulin was initiated and physician opinion was taken. Those with initial PGBS ≥ 200 mg/dl were started on insulin along with MNT and were admitted for sugar monitoring. Appropriate maternal, fetal monitoring and management was done for GDM women. All antenatal, intrapartum, postpartum and neonatal complications were noted and managed accordingly.

RESULTS

Table-1: depicts distribution of antenatal women according to gravidity in two groups. Occurrence of GDM in Gravida 3 and above was significantly higher than in primigravida depicted by p value of < 0.0002 (p < 0.05).

Table-1: Distribution of study population according to gravidity

Gravidity	GDM		Non-GDM		TOTAL
	Number	%	Number	%	n=487 (%)
Gravida 1	23	9.6	217	90.4	240 (49.3)
Gravida 2	6	4	142	95.9	148 (30.4)
≥ Gravida 3	23	23.2	76	76.8	99 (20.3)
TOTAL	52		435		487 (100)
Chi Square Test (x^2) = 23.47, p<0.0002					

Table 2 depicts association of various risk factors with GDM. Frequency of GDM was found to be significantly higher for women with age >25 years as evident by p-value of <0.002.

A significant association was established between positive family history of diabetes and GDM, with p-value of <0.05.

Among GDM women 3 (5.8%) out of 52 were treated case of infertility as compared to 9 (2.1%) women in Non-GDM group. p-value was found to be >0.05, indicating no significant association of women with treated infertility and women having GDM.

Among multigravidas, women with previous history of perinatal losses were 3 (10.3%) among GDM group excluding primigravida as compared to 22 (10.1%) among Non-GDM group. This association was found to be statistically not significant with p-value of >0.05.

Among multigravidas, a statistically significant association was established between women with history of abortions and women with GDM with p-value of <0.0001.

A statistically significant association was established between women who had previous history of macrosomic babies and women with GDM with p-value of <0.0000.

Among multigravida, 3 (10.3%) women in GDM group gave positive history of having GDM in previous pregnancy as compared to 7 (3.2%) women among Non-GDM group. This association was found to be statistically not significant with p-value >0.05.

No significant association was found between women with GDM and women with history of PIH in previous pregnancy.

Table-2: Relationship of GDM with various risk factors

Risk factor in all women	GDM N=52		Non-GDM N=435		Total N= 487	P value
	Number	%	Number	%		
Age >25yr	36	69.2	154	35.4	190	<0.002 S
Family h/o DM	14	26.9	8	1.8	22	<0.05 S
Treated Infertility	3	5.8	9	2.1	12	>0.05 NS
Risk factors in Multigravida	GDM N= 29		Non- GDM N=218		Total N= 247	P value
H/o Perinatal losses	3	10.3	22	10.1	25	>0.05 NS
H/o Abortion	14	26.9	35	8.0	105	<0.0001 S
H/o Macrosomia	8	2.8	2	0.9	10	<0.0000 S
H/o GDM	3	10.3	7	3.2	10	>0.05 NS
H/o PIH	3	10.3	9	4.1	12	>0.05 NS

Table 3 represents distribution of two groups according to antepartum complications. Out of GDM women, 2 (3.8%) were aborted as compared to 1 (0.2%) woman in Non-GDM group. p-value was found to be <0.03 which was statistically significant (p-value < 0.05).

The proportion of women with PIH in GDM group was found significantly higher as indicated by p-value of <0.008. Polyhydramnios was found in 5 (9.6%) women in GDM group as compared to 4 (0.9%) women in Non-GDM group. It was found to be significant with p-value of <0.00 (p-value < 0.05).

No significant association was found between incidence of abruption placentae and GDM as p-value was found to be > 0.05. None of women in either group developed shoulder dystocia. Complications were overlapping in both the groups.

Table-3: Antepartum and intrapartum complications among study population

Complications	GDM N=52		Non-GDM N=435		Total N=487	P value
	Number	%	Number	%		
Abortions	2	3.8	1	0.2	3	0.03
PIH	15	28.8	63	14.5	78	0.008
Polyhydramnios	5	9.6	4	0.9	9	0.000
Abruptio Placentae	1	1.9	6	1.4	7	>0.05
Intrauterine Deaths	2	3.8	4	0.9	6	>0.05
Preterm births	6	11.5	28	6.4	34	0.17
Vaginal candidiasis	7	13.5	13	3	20	0.0003
Urinary Tract Infections	5	9.6	17	3.9	22	0.06
Shoulder dystocia	0	0	0	0	0	NA

Table 4 shows distribution of the two groups according to mode of delivery. Total 3 women aborted spontaneously which were excluded from the table. Among aborted, 2 belonged to GDM group and 1belonged to Non-GDM group. Thus, total number of women who crossed the period of viability was 484 (50 in GDM and 434 in Non-GDM). Difference in rate of delivery by cesarean section in both the groups was statistically significant (p-value = 0.0001). There was no statistically significant difference found in instrumental delivery rate in both groups.

Table-4: Distribution of study population according to mode of delivery

Mode of delivery	GDM N=50*		NON-GDM N=434		Total
	Number	%	Number	%	
Vaginal A) spontaneous B) instrumental	 17 3	 34 6	 304 8	 70 1.9	 321 11
Cesarean	30	60	122	28.1	152
Total	50[a]	100	434[a]	100	484[a]

Table-5: Postpartum complications in study population

Postpartum complications	GDM N=52 Number (%)	Non-GDM N=435 Number (%)	TOTAL N=487 Number (%)	P value
Puerperal sepsis	0	0	0	NA
Postpartum hemorrhage	10 (19.2)	23 (5.3)	33 (6.8)	0.0001 S
Wound infection	2 (3.8)	0	2 (0.4)	NA

Table 5 shows postpartum complications in both groups. None of the groups developed puerperal sepsis.

Table 6 shows distribution of study population according to indications for cesarean section. Most common indications for cesarean section in GDM women were fetal distress (30%), Cephalopelvic disproportion (20%) and Severe PIH with unfavorable cervix (16.7%).

Table-6: Distribution of study population according to indications for cesarean section

Serial no.	Indications	GDM N=30	Non-GDM N=122	Total N=152
1.	Cephalopelvic disproportion	6 (20)	3 (2.4)	9
2.	Scar tenderness	2 (6.7)	10 (8.2)	12
3.	Malpresentation	0	13 (10.7)	13
4.	Abruptio Placentae	1 (3.3)	4 (3.2)	5
5.	Severe PIH with unfavorable cervix	5 (16.7)	7 (5.7)	12
6.	Prolonged labour	4 (13.3)	19 (15.6)	23
7.	Fetal Distress	9 (30)	43 (35.2)	52
8.	Bad Obstetric History	1 (3.3)	1 (0.8)	2
9.	PROM with failed induction	1 (3.3)	10 (8.2)	11
10.	Severe Oligo and IUGR	1 (3.3)	9 (7.3)	10
11.	Placenta Previa	0	3 (2.4)	3

DISCUSSION

As expected prevalence of GDM is increasing substantially and so are its complications. DIPSI method is a promising single step procedure to diagnose GDM at an early stage and prevent its subsequent complications. In our study, total 52 (10.7%) women were diagnosed as GDM out of 487 women.

In present study, 9.6% of primigravida, 4% of second gravida, 23.2% of third gravida and above had GDM. Thus, GDM was significantly higher in women who were Gravida 3 or above.

Similar results were obtained in a study by V Seshiah *et al*. [6], the prevalence proportion of GDM increased with gravidity, from 16.3% in the primigravidas to 25.8% in gravidas> 4. In a study by M Waseem Raja [7], 2.8% of primigravida, 10.8% of gravida 2 and 14% gravida ≥ 3 had GDM. Another study by Kalyani KR *et al*. [8], majority of the patients with GDM were gravida 2 and above (19 out of 25, 76%) and majority of subjects in the non GDM group were primigravida showing a significant association between GDM and parity in their study.

In present study, age more than 25 years as a risk factor was found to be significantly associated with occurrence of GDM, as 69.2% GDM women compared to 35.4% Non-GDM women were above 25 years of age.

Similar results were demonstrated in study by K Sreekanthan *et al*. [9] where 75% of women with GDM were above 25 years of age. Also in studies by P Kalra *et al*. [10], 84.4% and by Farooq M *et al*. [11], 88% of GDM women were ≥25 years. This was higher as compared to our study since in their study women with 25 years of age were also included. In study by Kushal N *et al*. [12], 83% were older than 25 years.

In our study, among GDM women 26.9% were found to have positive family history of diabetes mellitus as compared to 1.8% of Non-GDM women. Similar findings were demonstrated by various studies by V Balaji *et al*. [13] and M Mahalakshmi *et al*.[14] in which 18.3% and 70% of GDM women had positive family history of diabetes mellitus, respectively.

5.8% GDM women conceived after infertility treatment as compared to 2.1% Non-GDM, this was found to be statistically insignificant in our study. Only one study by Garshasbi *et al*. [15], evaluated infertility as a risk factor for GDM which was found in 12.6% cases of GDM.

In our study, among multigravida 10.3% GDM women had history of perinatal mortality as compared to 10.1% Non-GDM women which was not found to be significant. A study by P Kalra *et al*. [10], showed that 15.15% of GDM mothers had history of previous fetal or early neonatal deaths. In study by Saxena P *et al*. [16], 16.7% GDM women had history of previous IUD.

History of abortions and occurrence of GDM was 26.9% which was significantly associated, in our study. In a study by F Akhlaghi *et al*. [17] 25.9% had positive history of abortions.

In present study, history of macrosomia was significantly associated with GDM. Among multigravida, 2.8% GDM women had positive history. In study by Garshasbi *et al*. [15], 23.5% GDM women had history of previous macrosomic baby. F Akhlaghi *et al*. [9] found that 37% of GDM women had prior Large for Gestational age babies. This difference might be because many women in our study didn't remember birth weight of previous baby.

Among multigravida, women with history of GDM in previous pregnancies were 10.3% in GDM group and 3.2% in Non-GDM group in our study. No statistically significant association was established. This might be because maximum women belonged to rural area with lack of knowledge and awareness and poor antenatal care in previous pregnancy. Similar results were reported by Saxena P *et al*. [16] in which it was 11.9% and in study by P Kalra *et al*. [10] it was 18.18%.

In multigravida, among GDM women 10.3% had history of PIH in previous pregnancy and 4.1% in Non-GDM in our study. This association was found to be statistically insignificant. None studies mentioned history of PIH in their observation. Among GDM women, 3.8% had aborted as compared to2% in a study by Farooq M *et al.* [11].

Also, 28.8% developed PIH as compared to studies by P Kalra *et al.* [7] and K Johns *et al.* [18]in which there were 27%and 24.6% GDM women respectively who developed PIH.

In our study 9.6% had polyhydramnios compared to10% and 18% in studies by Saxena P *et al.* [16] and Farooq M *et al.* [11] respectively? Incidence of abruption was found to be 1.9% as compared to 12% in study by P Kalra *et al.* [7]. In present study, 3.8% had IUD, no other study evaluated this entity. In our study, 11.5% GDM women delivered preterm babies compared to 14% in study by Farooq M *et al.* [11].

Candidiasis was present in 13.5% GDM women in current study as compared to 24.2% in study by P Kalra *et al.* [7]. 9.6% suffered from UTI compared to 6% in Farooq M *et al.* [11]. None developed shoulder dystocia in our study. Complications which were significantly associated with GDM in present study were Abortions, PIH, Polyhydramnios and Candidiasis. Polyhydramnios incidence was observed to be higher among women who were diagnosed late during pregnancy. Correct management of GDM, well controlled blood sugar levels during ante and intrapartum period and electronic fetal monitoring women might be responsible for lower frequency of IUD and no incidence of shoulder dystocia in our study. Abortions in study population were less as most women were booked after 24 weeks.

In present study, 19.2% GDM women had postpartum hemorrhage as compared to 5.3% of Non-GDM women which was statistically significant. In a study by P Kalra *et al.*[7]PPH was found in 21% GDM women and 13.8% in Non-GDM women.

In present study incidence of cesareans were significantly higher in GDM women (60%) as compared to Non-GDM group (28.1%). Most common indication for cesarean in GDM group was fetal distress (30%), CPD (20%) and severe PIH with unfavorable cervix (16.7%). No significant association of instrumental deliveries in GDM women (6%) was found. Mode of delivery in various studies is shown in Table 7.

Table-7: Comparison of present study with other studies in terms of Mode of Delivery

Studies	Cesarean Section in GDM women	Instrumental Deliveries in GDM women
Kalyani KR *et al.* [8]	56%	12%
Farooq M *et al.* [11]	58%	6%
H Aburomman *et al.* [19]	47.3%	-
P Kalra *et al.* [10]	78.8%	3%
Our study	60%	6%

Our results closely resemble those by Farooq M *et al.* [11]. Hence, a thorough elaborated history may not only identify high risk pregnancies but also prevent its dreadful outcomes in current pregnancy.

CONCLUSION

GDM women may have serious implications on their health if not diagnosed and managed cautiously. A patient-convenient single-step screening method like DIPSI, in Indian scenario may help in identifying such cases before development of complications. This study also serves as a reflection of severity and need of urgent intervention in GDM women for healthy outcome.

Acknowledgement

No conflict of interest relevant to this article was reported.

REFERENCES

1. Expert committee on the diagnosis and classification of Diabetes Mellitus. Report of the expert committee on the diagnosis and classification of Diabetes Mellitus. Diabetes care. 2003; 26(1):S5-S20.
2. Buchanan TA, Kjos SL, Xiang A, Watanbe R. What is gestational diabetes? Diabetes Care. 2007; 30:S105-11.
3. Seshiah V, Balaji V, Balaji MS, Paneerselvam A, Kapur A. Pregnancy and diabetes scenario around the world: India. International Journal of Gynecology & Obstetrics. 2009 Mar 1;104(Supplement).
4. Cunningham F, Leveno K, Bloom S, Hoffman B, editors. Williams's obstetrics 24ed. United States of America: McGraw-Hill Education. 2014:1136p.
5. Seshiah V, Balaji V, Balaji MS. Scope for prevention of diabetes—'Focus intrauterine milieu interieur'. J Assoc Physicians India. 2008; 56: 109-13.
6. Seshiah V, Balaji V, Balaji MS, Sekar A, Sanjeevi CB, Green A. One step procedure for screening and diagnosis of gestational diabetes mellitus. Diabetes. 2005;126:200.

7. Raja MW, Baba TA, Hanga AJ, Bilquees S, Rasheed S, Haq IU, Khan SS, Bashir A. A study to estimate the prevalence of gestational diabetes mellites in an urban block of Kashmir valley (North India). Int J Med Sci Public Health. 2014 Jan;3(2):191-5.
8. Kalyani KR, Jajoo S, Hariharan C, Samal S. Prevalence of gestational diabetes mellitus, its associated risk factors and pregnancy outcomes at a rural setup in Central India. Int J Reprod ContraceptObstet Gynecol. 2014;3:219-24.
9. Sreekanthan K, Belicita A, Rajendran K, Vijayakumar A. Prevalence of Gestational diabetes mellitus in a medical college in South India: A pilot study. Indian Journal of Clinical Practice. 2014 Sep;25(4):342-7.
10. Kalra P, Kachhwaha CP, Singh HV. Prevalence of gestational diabetes mellitus and its outcome in western Rajasthan. Indian journal of endocrinology and metabolism. 2013 Jul;17(4):677.
11. Farooq MU, Ayaz A, Bahoo A, Ahmad I. Maternal and neonatal outcomes in gestational diabetes mellitus. International Journal of Endocrinology and Metabolism. 2007 Sep;2007(3, Summer):109-15.
12. Naha K, Naha S, Pandit V, Seshadri S. A simple score to predict fetal outcomes in gestational diabetes mellitus. Biomedical journal. 2015 Mar 1;38(2).
13. Balaji V, Balaji M, Anjalakshi C, Cynthia A, Arthi T, Seshiah V. Diagnosis of gestational diabetes mellitus in Asian-Indian women. Indian J EndocrinolMetab. 2011;15:187-190.
14. M Mahalakshmi, Balaji B, Maheswari K, Ranjit Mohan Anjana, Sapna S. Shah, A Bridgette, M Choudhury, M Henderson, L Desborough, M Viswanathan, Harish R. Clinical profile, outcomes, and progression to type 2 diabetes among Indian women with gestational diabetes mellitus seen at a diabetes center in south India. Indian J EndocrinolMetab. 2014 May-Jun; 18(3): 400–406.
15. Garshasbi A, Faghihzadeh S, Naghizadeh MM, Ghavam M. Prevalence and risk factors for gestational diabetes mellitus in Tehran. Journal of Family and Reproductive Health. 2008;2(2):75-80.
16. Hamedi FA. Comparison of maternal and fetal/neonatal complications in gestational and pre-gestational diabetes mellitus. Acta Medica Iranica. 2005;43(4):263-7.
17. Saxena P, Tyagi S, Prakash A, Nigam A, Trivedi SS. Pregnancy outcome of women with gestational diabetes in a tertiary level hospital of North India. Indian J Community Med. 2011; 36:120-3.
18. Johns K, Olynik C, Mase R, Kreisman S, Tildesley H. Gestational diabetes mellitus outcome in 394 patients. Journal of Obstetrics and Gynaecology Canada. 2006 Feb 1;28(2):122-7.
19. Hyari M, Abu-Romman H, Ajlouni K. Maternal and Fetal Outcomes in Diabetic Pregnant Women. JRMS. 2013 Sep;20(3):56-61.