ORIGINAL ARTICLE

Prevalence and Effects of Gestational Diabetes Mellitus on Pregnancy and Foetal Outcomes among Women Attending Health Clinic in Perak.

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Abstract

Background: Gestational Diabetes Mellitus (GDM) is known to affect the livelihood of the mothers and the baby before, during and after the pregnancy. The incidence seems to be on the rise worldwide and has increased the disease burden of the population.
Objectives: The aim of the cross-sectional study was to determine the association between various factors during antenatal, intrapartum, and postpartum with the prevalence of GDM among mothers at one of Kinta District's health clinics. The impact of gestational diabetes mellitus (GDM) on the newborns was documented.
Methodology: This study was done among mothers who registered at the health clinic from January 2016 to December 2017. Systematic random sampling was used to select 300 antenatal records from the health clinic's repository. Socio-demographic, behavioural characteristics, reproductive and medical history were extracted from these records. The data were analysed using SPSS to identify various factors associated with GDM.
Results: The prevalence of GDM in this study was 22.6% and more often developed in the second semester of the pregnancy. There was a significant association between a prevalence of GDM with weight during a pregnancy booking, maternal obesity, history of either GDM, abortion (2 times or more), urinary tract infections, LSCS or medical problems in a family (p<0.05). During delivery, uterus bigger than date seem to be very significant association with GDM. Wound breakdown was the only post-partum factor that has a significant association with GDM. Severe jaundice occurred more frequently in neonates in mothers with GDM (58.3%) than in mothers without GDM.
Conclusion: The prevalence of GDM was high among women attending health clinic in Perak. It affects the health of mothers, foetuses, and neonates. Measures are needed to control GDM to reduce its impact on health of the mothers and survival of the infants.

Keywords: Gestational Diabetes (GDM), cross-sectional study, prevalence, antenatal risk factors, intrapartum factors, postpartum factors.

Introduction

The prevalence of diabetes is increasing globally and in Malaysia. The National Health Morbidity Surveys (NHMS) showed a dramatic increase in the prevalence of diabetes among Malaysian adults aged 30 years and above. The prevalence rate was 8.3% in 1996, 14.9% in 2006 and 21.6% in 2020. The prevalence of gestational diabetes (GDM) has also increased among Malaysian women. The National Obstetric Registry, 2015 reported that the incidence of diabetes in pregnancy was 7.7% and 7.4% was gestational diabetes (GDM). In Perak, the incidence of GDM was 9.3%.[1]

It is a well-known fact that GDM is associated with maternal and foetal morbidity and mortality.[2] Neonatal adverse events include macrosomia, neonatal hypoglycaemia, respiratory disorders, jaundice, miscarriage, stillbirth, and neonatal death. The mothers with GDM will usually recover following childbirth, however, they remained at high risk of developing diabetes types 2 after 10 years of life.[3] Early identification of GDM among pregnant women and intensive treatment will reduce the complications during an antenatal and perinatal period. It is well known that being of Asian heritage, advanced maternal age, family history of diabetes, previous GDM, having a macrosomic baby and being overweight or obese are the risk factors for developing GDM. The correct diagnosis of this condition in the stage of pregnancy is essential because early intervention with dietary control, pharmacological intervention and close monitoring of the pregnancy will improve the outcome of the pregnancy.[4] Screening the pregnant mothers at any setting using the local known risk factors may be able to reduce the future consequences of GDM.

This study aimed to measure the prevalence of GDM and its association with the antenatal risk factors, intrapartum factors, and its complication to neonates.

Methodology

The study was conducted at one of the health clinics in Ipoh, Perak, using the cross-sectional study design. The population coverage for the clinic was around 100,000 people and the estimated number of reproductive women was 35,000. About 1200 women attended the antenatal clinic and delivered the baby here annually. The sample size was estimated based on the estimated prevalence of 25%, the precision of 5% and 95% confidence interval, giving the minimum sample size of 246. Taking into a consideration of non-response (about 20%), a total of 300 records were selected randomly using a systematic random sampling method among mothers who delivered from 1st January 2016 until 31st December 2017 in the health clinic. Only mothers who reside in the operational area, made a booking for the delivery, attended the antenatal follow up and delivered a baby in this clinic were selected as a sample. The study duration was between 1st April and 15th June 2019.

All cards which fulfil eligibility criteria were collected. The data was extracted from these antenatal cards, cleaned, and analysed. The data were analysed for descriptive statistics using the Statistical package for Social Sciences (SPSS) for Windows, Version 25. Chi-square test was used to determine the association between various factors with the prevalence of GDM.

Ethical Consideration

This research has been approved by the RCMP Research Ethical Committee and the National Medical Research and Ethical Committee (MREC) of Ministry of Health, Malaysia (NMRR- 18-3782-41144). The study has been granted permission from the health clinic director. This study was self-funded, with no conflict of interest in any other parties. The investigator declares there is no conflict of interest.

Results

Socio-demographic characteristics

Among the 300 mothers selected for the study, 175 (58.3%) were aged 19-30 years old and 125 (41.7%) were 31-46 years old (Table 1). Malays constituted 79.4% of the population, Chinese 12.6% and Indians 8.0%. In terms of education, 37.0% of mothers were having a higher education level, 54.7% of secondary school level and 8.3% of primary school level. Mothers with professional job constituted about 22.0% of the population, unskilled jobs, 40.0% and unemployed or housewife 38.0%. Almost all mothers were married (97.7%), and 2.3% were not married. 30.6% of mothers were primigravida, 49.0% were multipara whilst 20.4% were grandmultipara.

Antepartum characteristics

Out of 300 samples selected, 223 (74.3%) made their pregnancy booking during the first trimester, 65 (21.7%) second trimester and 12 (4.0%) third trimester. 279 (93.0%) had term delivery and 21 (7.0%) had preterm delivery, 214 (71.3%) had spontaneous vaginal delivery (SVD) whilst 86 (28.7%) had a lower segment Caesarean section (LSCS),

Among these selected populations, during intrapartum 26(8.7%) had foetal distress, 9(3.0%) had premature rupture of membranes,7(2.3%) had severe pre-eclampsia, 6(2.0%) had anaemia, 6(2.0%) had uterus bigger than date (symphysial fundal height more than period of amenorrhea (POA), 5(1.7%) had polyhydramnios, 5(1.7%) had premature of contraction, 3(1.0%) had prolonged labour and 1(0.3%) had reduced foetal movement. 232 (77.3%) did not have any problems during intrapartum. After delivery (post-partum), 22 (7.4%) of mothers were found to have hypertension, 8 (2.7%) had wound breakdown, one case each (0.3%) for anaemia, deep vein thrombosis (DVT) and puerperal sepsis.

Obstetric history of samples

The study showed that 223 (74.4%) of mothers made the booking in less than 12 weeks POA. The weight during pregnancy booking, 248 (82.7%) weighted 45.1–79.9 kg (normal) whilst 20 (6.7%) weighted less than 45 kg (underweight) and 32 (10.6%) had weight of more than 80 kg. In term of BMI, 165 (55.0%) were normal (18.9–23.9 kg/m2), 100 (33.4%) were overweight (24.0 -29.9 kg/m2) and 35 (11.6%) were obese (more 30 kg/m2). 30 (10.0%) of mothers experienced excessive weight gain of more than 2 kg/week. Four (1.3%) of mothers had a previous macrosomia baby. It was shown that 91 (30.3%) of samples had previous history of GDM, 47 (15.6%) had previous history of abortion (two times or more), 8 (2.6%) experienced perinatal death, 18 (6.0%) had previous history of infertility of more than 2 years, 48 (16.0%) had poor spacing (birth of less than 2 years), 74 (24.6%) had the previous LSCS and 10 (3.3%) of mothers had history of family with medical problems such as heart problem, diabetes or hypertension.

Prevalence of GDM

Out of 300 mothers, 68 were found to have GDM, hence the prevalence of GDM was 22.7%. 4 (1.3%) were detected in the first trimester of their pregnancy, 53 (17.7%) in the second trimester and 19 (6.3%) in the third trimester. Some of the signs and symptoms shown by the mother with GDM include urinary tract infection (UTI), Candida vaginitis, glycosuria, skin allergy, increased blood pressure, pedal oedema, urine albumin, and facial puffiness.

Relationship between GDM and sociodemographic factors.

There was a significant association between age of pregnant mothers and prevalence of GDM (p<0.05) (Table 2). Mothers aged above 30 years old have higher prevalence of GDM (29.6%) as compared to mothers without GDM (17.7%). Other socio-demographic factors have no association with the occurrence of GDM.

Relationship between GDM and antenatal risk factors.

There was a significant association between a prevalence of GDM with weight during a pregnancy booking, maternal obesity, past history of either GDM, abortion (2 times or more), UTI, LSCS or medical problems in a family (p<0.05) as shown in Table 4. Mothers weight more than 80 kg at pregnancy booking were more likely to have GDM (62.5%) as compared to mothers' weight less than 80 kg (37.5%). Mothers who were obese during antenatal has a higher prevalence of GDM (62.5%) as compared to non-obese mother (42.9%). In this study, it was found that mothers without past history of GDM has a significantly higher prevalence of GDM (68.1%) as compared to mothers with a past history of GDM (31.9%). Mothers with a history of UTI during antenatal period was significantly associated with GDM (72.1%) as compared to mothers without UTI (27.9%). Prevalence of GDM was higher among mothers without past history of LSCS (59.4%) as compared to mothers with a history of LSCS. Mothers with family history of medical problems such as diabetes, hypertension, heart disease was likely to have GDM (90%) as compared to mothers without family history of medical problems (10%). Other risk factors were not significant (p>0.05).

Relationship between GDM and risk factors during intrapartum.

There was no association between the existence of anaemia, foetal distress, polyhydramnios, prolonged labour, severe preeclampsia, premature contraction, reduced foetal movement, premature rupture of membrane during pregnancy and term of pregnancy with GDM (Table 3). However, uterus bigger than date seem to be very significant association with GDM. 66.7% of uterus bigger than date cases occurred in mother with GDM as compared to 33.3% among non-GDM mothers. There was a significant association between mode of delivery and GDM where more LSCS done among mothers without GDM as compared to mothers with GDM.

Relationship between GDM among mothers and postpartum factors.

Wound breakdown was the only post-partum factor that have a significant association with GDM (p<0.05) as shown in Table 4. Wound breakdown occurred more among mothers with GDM (62.5%) as compared to non-GDM mothers (37.5%). The existence of anaemia, deep vein thrombosis, hypertension and puerperal sepsis after delivery has no significant relationship with GDM in mothers.

Relationship between GDM among mothers and postpartum factors for neonates.

Based on Table 5, severity of jaundice in newborn seems to be a significant factor associated with GDM in mothers (P<0.05). Severe jaundice occurred more often in mothers with GDM (58.3%) as compared to mothers without GDM. Weight of baby has no significant relationship with the status of GDM in mothers.

Discussion

The prevalence of GDM in this study was 22.7%, of which 78% of cases developed during the second trimester of pregnancy. The prevalence was higher compared to a national average of 18% [3] but was lower compared to other study in primary care settings (27.9%).[5] Most of GDM studies in Malaysia were conducted in tertiary settings and the prevalence ranges from 11.4% to 38.6%.[6] Compared to other ASEAN countries, the prevalence was lower compared to Singapore (23.5%) and Thailand (24.7%) but higher than Vietnam (21.3%).[7] The highest prevalence in the world was reported in the Middle East and North Africa and the lowest in Europe. [3] The socioeconomic status and nutritional transition are the possible reason for the difference in the prevalence.[7]

No noticeable signs and symptoms for many GDM cases, the early symptom complaints by mothers are increased thirst and more-frequent urination.[8] However, in this study, some of signs and symptoms shown by the mother with GDM

include urinary tract infection (UTI), Candida vaginitis, glycosuria, skin allergy, increased blood pressure, pedal oedema, urine albumin, and facial puffiness. Mothers aged above 30 years old have higher prevalence of GDM (29.6%) as compared to mothers without GDM (17.7%). This finding is quite similar with many other studies.[5,9]

Well-documented risk factors for GDM include advanced maternal age, family history of diabetes, previous GDM, having a macrosomic baby, non-Caucasian ethnicity, being overweight or obese and cigarette smoking.[10] Except for cigarette smoking, the occurrence of GDM in this study was significantly related to weight during a pregnancy, maternal obesity, history of GDM and medical problems in the family including diabetes mellitus (p<0.05). The history of urinary tract problems during pregnancy, foetal wastage and LSCS were associated with GDM in this study. Mothers weight more than 80 kg at pregnancy booking was more likely to have GDM (62.5%) as compared to mothers' weight less than 80 kg (37.5%). Mothers who were obese during antenatal has a higher prevalence of GDM (62.5%) as compared to non-obese mother (42.9%) in this study. A study in Taiwan has shown that overweight/obesity was associated with clustering of metabolic risk factors of GDM, including high fasting plasma glucose, high HbA1c, insulin resistance, high plasma triglyceride and elevated blood pressure (p<0.05). It seemed that the number of metabolic risk factors was associated with the incidence of GDM (p <0.05).[2,11]

In this study, it was found that mothers without a history of GDM has a significantly higher prevalence of GDM (68.1%) as compared to mothers with a history of GDM (31.9%). This is opposite to the finding from other studies that the incidence of GDM is higher among mothers who has a previous GDM.[12] There is a possibility that mothers with the previous history of GDM has taken a preventive action before getting pregnant. Another controversial finding was that the prevalence of GDM was higher among mothers without a history of LSCS as compared to mothers with a history of LSCS. However, the study found a consistent association between the prevalence of GDM and the family history of medical problems such as diabetes, hypertension, heart disease.[10,13] Mothers with the family history of medical problems were more likely to have GDM (90%) as compared to mothers without a family history of medical problems (10%).

During partum, uterus bigger than date seem to be a very significant association with GDM. 66.7% of uterus bigger than date cases occurred in mother with GDM as compared to 33.3% among non-GDM mothers. Uterus bigger than date has been associated with macrosomia or hydramnios, however, in this study there was no relationship found between these factors and prevalence of GDM.[14] It was found that mothers with GDM have significantly less LSCS were compared to mothers without GDM. The finding was different from the established evidence in many other studies.[10] One possible reason is that many mothers, especially young one (primiparous) in Malaysia have a tendency for LSCS due to failed induction and foetal distress.[15]

Postpartum complications associated with GDM include hypertensive disorders and postnatal depression in mothers, stillbirths, hypoglycaemia, and hyperbilirubinemia (jaundice) in neonates.[16] In this study, no significant association exists between GDM and postpartum complications in mothers except the wound breakdown. Wound breakdown from episiotomy or LSCS occurred more often among mothers with GDM (62.5%) as compared to non-GDM mothers (37.5%). In neonates, severe jaundice occurred more often in mothers with GDM (58.3%) as compared to mothers without GDM. The findings concurred with other studies elsewhere.[17]

The study has its limitation due to a cross-sectional in nature and data acquisition by antenatal records. The records were subjected to the completeness and accuracy of reporting by patients as well as staff of the setting. The results may be of limited use in the setting like these only.

The uncertainties in the study probably due to sample size and sampling bias that may occur during the process.

Conclusion

This study showed that the prevalence of GDM (22.7%) was higher among women attending health clinics in Perak as compared to the national average. The preventive action should include dietary modification, health education, and treatment of the hyperglycaemia among mothers attending the antenatal clinic and diabetes screening among prospecting mothers. There is an urgent need to identify the potential victim of GDM through early screening in any setting and period of gestation. Emphasis should be given to mothers with the history of urinary tract infections during pregnancy, history of foetal wastage, history of having LSCS and having family history of medical problems such as diabetes, hypertension, heart disease, etc. Since the development of GDM could result in negative outcomes for the mother and newborn infant such as wound breakdown in mother and severe neonatal jaundice in infant, postnatal care should anticipate these possible outcomes.

Table 1. Socio-demographic characteristics of the samples.

Sociodemographic characteristics	Frequency n =300 (%)
Age of Group	
19 - 30 years old	175(58.3)
31 - 46 years old	125(41.7)
Ethnic of Group	
Malays	238(79.4)
Chinese	38(12.6)
Indians	24(8.0)
Level of Education	
Higher school	111(37.0)
Secondary school	164(54.7)
Primary school	25(8.3)
Occupation	
Unemployed or housewives	114(38.0)
Unskilled worker	120(40.0)
Professional	66(22.0)
Marital status	
Married	293(97.7)
Unmarried	7(2.3)
Parity	
Primigravida	92(30.6)
Multipara	147(49.0)
Grandmultipara	61(20.4)

Table 2. Association between GDM and sociodemographic factors.

Socio-demographic factors	Prevalence n =300	GDM mothers n=68 (%)	Non -GDM mothers n=232 (%)	P value
Age group				
19 - 30 years old	175	31(17.7)	144(82.3)	0.011
31 - 46 years	125	37(29.6)	88(70.4)	
Ethnic group				
Malays	238	51(21.4)	187 (78.6)	0.432
Chinese	38	9 (23.7)	29 (76.3)	
Indians	24	8 (33.3)	16 (66.7)	
Education level				
Higher school	111	29 (26.1)	82 (73.9)	*0.461
Secondary school	164	35 (21.3)	129 (78.7)	
Primary school	25	4 (16.0)	21 (84.0)	
Occupation				
Non skill works	120	29 (24.2)	91 (75.8)	0.532
Unemployed	114	22 (19.3)	92 (80.7)	
Professional staffs	66	17 (25.8)	49 (74.2)	
Status married				
Married	293	67 (22.9)	226 (77.1)	*1.000
Not married	7	1 (14.3)	6 (85.7)	
Parity				
Primigravida	92	15 (16.3)	77 (83.7)	0.214
2 -5 child	147	37 (25.2)	110 (74.8)	
Multipara	61	16 (26.2)	45 (73.8)	

* Fisher Exact test.   P value<0.05 is significant.

Table 3. Relationship between GDM and antenatal risk factors.

Antenatal risk factors	Prevalence n =300	GDM N=68 (%)	Non - diabetes mothers N=232 (%)	P value
POA of booking				
Less than 12 weeks	223	52 (23.3)	171 (76.7)	0.752
More than 12 weeks	77	16 (20.8)	61 (79.2)	
Weight during pregnancy booking				
Less than 45 kg	20	4 (20.0)	16 (80.0)	
45.1 – 79.9 kg	248	44 (17.7)	204 (82.3)	<0.001
More than 80 kg	32	20 (62.5)	12 (37.5)	
Maternal obesity (BMI > 27.0 kg/m^2)				
Normal BMI	165	23(13.9)	142 (86.1)	
Overweight	100	25 (25.0)	75 (75.0)	<0.001
Obese	35	20(57.1)	15 (42.9)	
Weight gain more than 2 kg/week				
Yes	30	6 (20.0)	24 (80.0)	0.821
No	270	62 (23.0)	208 (77.0)	
Previous large baby (macrosomia)				
Yes	4	3 (75.0)	1 (25.0)	0.380
No	296	65 (22.0)	231(78.0)	
History of GDM/ PIH				
Yes	91	29 (31.9)	62 (68.1)	0.016
No	209	39 (18.7)	170 (81.3)	
History of abortion: two times or more				
Yes	47	17 (36.2)	30 (63.8)	0.016
No	253	51 (20.2)	202 (79.8)	
History of perinatal death				
Yes	8	4 (50.0)	4 (50.0)	0.820
No	292	64 (21.9)	228 (78.1)	
Urinary tract problems				
Yes	86	62 (72.1)	24 (27.9)	0.043
No	214	6 (2.8)	208 (97.2)	
History of infertility: more than 2 years				
Yes	18	4 (22.2)	14 (77.8)	1.000
No	282	64 (22.7)	218 (77.3)	
Poor spacing: birth less than 2 years				
Yes	48	9 (18.8)	39 (81.2)	0.575
No	252	59 (23.4)	193 (76.6)	
History of previous LSCS				
Yes	74	30 (40.5)	44 (59.4)	<0.001
No	226	38 (16.8)	188 (83.2)	
History of medical problems in a family				
Yes	10	9 (90.0)	1(10.0)	0.016
No	290	59(20.3)	231(79.7)	

* Fisher Exact test.   P value<0.05 is significant.

Table 4. Relationship between GDM and risk factors during intrapartum

Intrapartum factors		GDM n=68 (22.7%)	Non-GDM N=232(77.3%)	P value
Anemia	yes	1(16.7)	5(83.3)	*0.5895
	no	67(22.8)	227(77.2)	
Fetal Distress	yes	9(34.6)	17(65.4)	0.0639
	no	59(21.5)	215(78.5)	
Polyhydramnios	yes	3 (60.0)	2 (40.0)	0.0705
	no	65(22.0)	230(78.0)	
Prolonged labour	yes	0 (60.0)	3 (40.0)	*0.4611
	no	68(22.9)	229(77.1)	
Severe preeclampsia	yes	2(28.6)	5(71.4)	*0.4968
	no	66(22.5)	227(77.5)	
Premature contraction	yes	2 (40.0)	3 (60.0)	*0.3177
	no	66(22.4)	229(77.6)	
Reduced fetal Movement	yes	0 (0.0)	1 (100.0)	*0.7733
	no	68(22.7)	231(77.3)	
Uterus bigger than date	yes	4 (66.7)	2 (33.3)	*0.0253
	no	64(21.8)	230(78.2)	
Premature rupture of membrane	yes	1 (0.0)	8 (88.9)	*0.3562
	no	67(23.0)	224(77.0)	
Term of pregnancy	term	64 (22.9)	215(77.1)	*0.4615
	preterm	4(19.1)	17(80.9)	
Mode of Delivery	SVD	26(30.0)	60 (70.0)	0.0236
	LSCS	42(19.6)	172 (80.4)	

* Fisher Exact test.   P value<0.05 is significant.

Table 5. Relationship between GDM and postpartum factors in mothers.

Postpartum factors	Prevalence n=300	GDM n=68 (%)	Non - GDM n=232 (%)	P value
Anaemia				
Yes	1	0(0.0)	1(100.0)	*0.7733
No	299	68(22.7)	231(77.3)	
Deep vein thrombosis				
Yes	1	1(100.0)	0(0.0)	*0.2267
No	299	67(22.4)	232(77.6)	
Hypertension				
Yes	12	3(25.0)	9(75.0)	*0.4219
No	288	65(22.6)	223(77.4)	
Puerperal sepsis				
Yes	1	1(100.0)	0(0.0)	
No	299	67(22.4)	232(77.6)	*0.2267
Wound breakdown				
Yes	8	5(62.5)	3(37.5)	*0.0166
No	292	63(21.6)	229(78.4)	

*Fisher Exact Test, P value<0.05 is significant.

Table 6. Relationship between GDM among mothers and postpartum factors for neonates.

Post- partum factors in neonates	Prevalence n=300	GDM n =68 (%)	Non - GDM N=232 (%)	P value
Level of jaundice				
Mild jaundice	288	61 (21.2)	227(78.8)	*0.007
Severe jaundice	12	7(58.3)	5(41.7)	
Weight of baby				
Less than 2.49 kg	40	8 (20.0)	3(80.0)	0.724
2.50 – 3.99 kg	257	59 (23.0)	19(77.0)	
More than 4.0 kg	3	1 (33.3)	2(66.7)	

*Fisher Exact Test, P value<0.05 is significant.

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