



RISK FACTORS OF DIABETIC RETINOPATHY IN PREGNANCY

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ABSTRACT

Introduction: WHO estimated that diabetic retinopathy is responsible for 37 million cases of blindness worldwide. Current pregnancy status increases the risk of development and progression of diabetic retinopathy. Hence, in this study we aim to identify the prevalence of retinopathy in pregnant women and the risks associated with it.

Materials and methods: A retrospective study of 1054 pregnant women with gestational diabetes mellitus and known case of diabetes mellitus was conducted. Data obtained from computerized clinical case notes included demographic details, ophthalmology assessment, insulin dosage, HbA1c level, body mass index, mode of delivery and baby's weight.

Results: The prevalence of diabetic retinopathy among pregnant woman with gestational diabetes mellitus or chronic diabetes is 0.7%. The risk associated with development of diabetic retinopathy could not be properly assessed as the number of patient with diabetic retinopathy was extremely small (7 patients).

Conclusion: Prevalence of diabetic retinopathy in pregnant women with diabetes mellitus and gestational diabetes mellitus is low as most patient does not have a longstanding diabetes mellitus which heavily influence the development of diabetic retinopathy.

INTRODUCTION

Diabetic retinopathy is a leading cause of new onset blindness in industrialized countries and a more frequent cause of blindness in middle income countries. World Health Organization has estimated that diabetic retinopathy is responsible for 4.8% of the 37 million cases of blindness throughout the world (Resnikoff et al, 2002). However, diabetic patient often do not notice changes in their vision in the early stages of diabetic retinopathy. But as it progresses, diabetic retinopathy usually causes vision loss which in many cases cannot be reversed (Best & Chakravarthy et al 1997). In addition, current pregnancy status increases the risk of development and progression of diabetic retinopathy. The progression of retinopathy changes still occurs in 50%-70% of cases even though it does not have any long term effect. However, those changes have a potential to regress after delivery (Mallika et al., 2010). Lövestam-Adrian et al, retrospectively showed that current pregnancy was found to be a major risk factor for the progression of retinopathy by comparing between pregnant diabetic women and non-pregnant diabetic women. In a study by Maayah et al, diabetic retinopathy was found in 58% of pregnant woman while Moloney and Drury also found that current pregnancy in 53 pregnant diabetic women was associated both with an increased prevalence (from 62% to 77%) and severity of retinopathy whereas in the control group of 39 non-pregnant diabetic women the prevalence of retinopathy remained unchanged at 46% throughout the study period.

Other than that, the effect of pregnancy on diabetic retinopathy is based on many factors that can contribute to its development and progression as it is related to microvascular autoregulatory mechanism in retina in which it is impaired in diabetics. Several studies have shown that poor glycemic control prior to pregnancy and with the greatest reduction in glycosylated haemoglobin (HbA1c) in early pregnancy were at increased risk of progression of retinopathy (Best & Chakravarthy). Besides, Chew et al findings indicate that there is a correlation between the duration of diabetes and the level of baseline retinopathy which also influence the retinopathy changes. Hypertensive disorder conditions either pre-existing or during pregnancy is another factor that contributes to the progression of retinopathy. There is deterioration of retinopathy occurred with

preeclampsia in 4 of 8 pregnancies as compared with 5 of 65 among those who did not develop preeclampsia (Lövestam-Adrian et al, 1997). Ajoy et al has established the correlation between progression of diabetic retinopathy and low haemoglobin level which it is a risk factor that can eventually be preventable.

Therefore, this retrospective study aims to determine the risk factors and the prevalence of retinopathy in pregnancy.

OBJECTIVES:

1. To identify the prevalence of diabetic retinopathy in pregnant women with gestational diabetes mellitus or chronic diabetes mellitus in Hospital Sungai Buloh.
2. To identify the risk factor of development and progression of diabetic retinopathy in pregnancy.
3. To assess the association between the risk factors and development and progression of diabetic retinopathy.
4. To identify the relationship between maternal weight and mode of delivery.
5. To identify the relationship between baby's weight and HbA1c level.

METHODOLOGY:

Retrospective study was conducted in which the data collected was obtained from computerized clinical case notes in Hospital Sungai Buloh. All pregnant women with gestational diabetes mellitus or underlying chronic diabetes mellitus that delivered a baby in Hospital Sungai Buloh from year 2011 to May 2016 were included in this study. Data such as demographic details, diabetes mellitus status and control, type of diabetic retinopathy and obstetric details were collected. All of the data was analyzed using SPSS Statistics 22.

The initial sample size that was calculated is 273 patients. This is according to the estimated calculation to achieve 95% Confident Interval from estimated pregnant women that delivered in

Hospital Sg Buloh from year 2011 to May 2016. However, the total 273 sample size cannot be achieved as there was an incomplete data and repeated admissions of a single patient.

RESULT

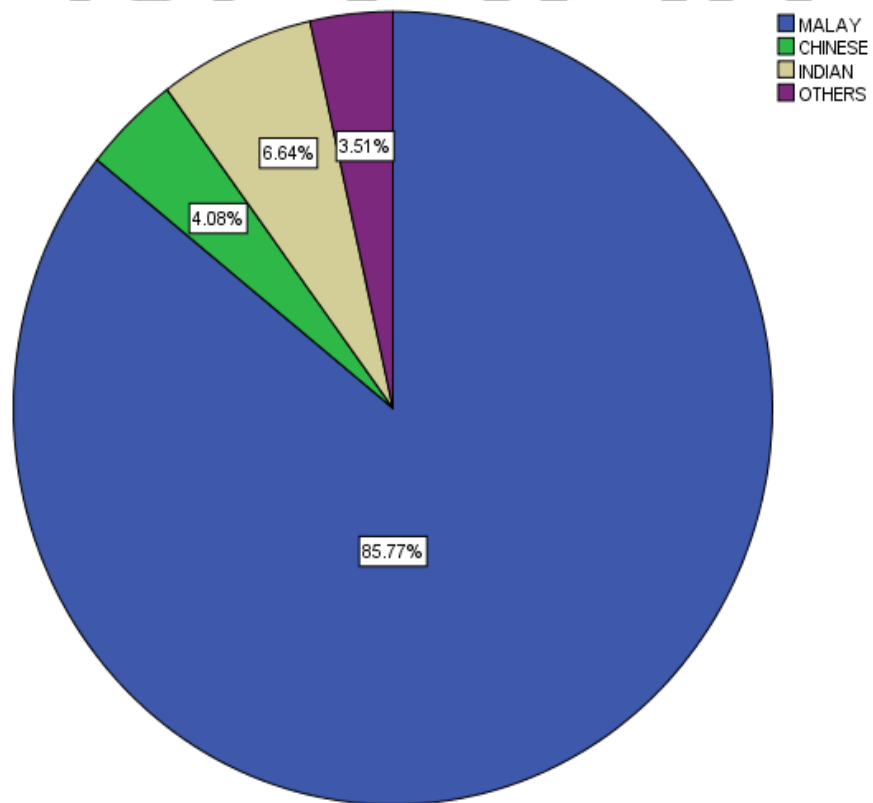
A. Demographic Details

Out of 1,054 pregnant women that were collected from year 2011 until May 2016, 904 (85.8%) Malay make up the majority of race in this study followed by Indian 70 (6.6%), Chinese 43 (4.1%) and others 37 (3.5%). All pregnant women were aged 18 or above and a large number of them were aged between 24 and 38 (84.9%). From 1,054 data collected, only 326 patients had their occupation listed. Among those who were listed, 135 (12.8%) of the patients were housewife, and the others were worked as teacher (2.3%), nurse (1.5%), clerk (2.4%) and others (12.0%). Most of the patients parity were less than 5 about 86.1% and 13.9% patients were grandmultip .

Race	Frequency	Percent	Valid Percent	Cumulative Percent
Malay	904	85.8	85.8	85.8
Chinese	43	4.1	4.1	89.8
Indian	70	6.6	6.6	96.5
Others	37	3.5	3.5	100.0

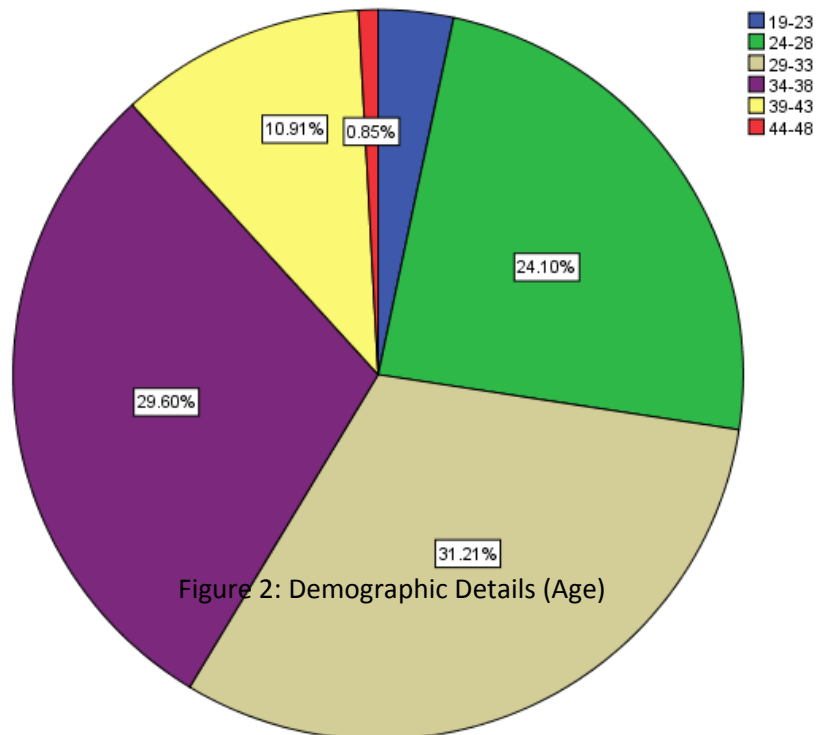
Table 1: Demographic Details (Race)

Age	Frequency	Percent	Valid Percent	Cumulative Percent
19-23	35	3.3	3.3	3.3
24-28	254	24.1	24.1	27.4
29-33	329	31.2	31.2	58.6



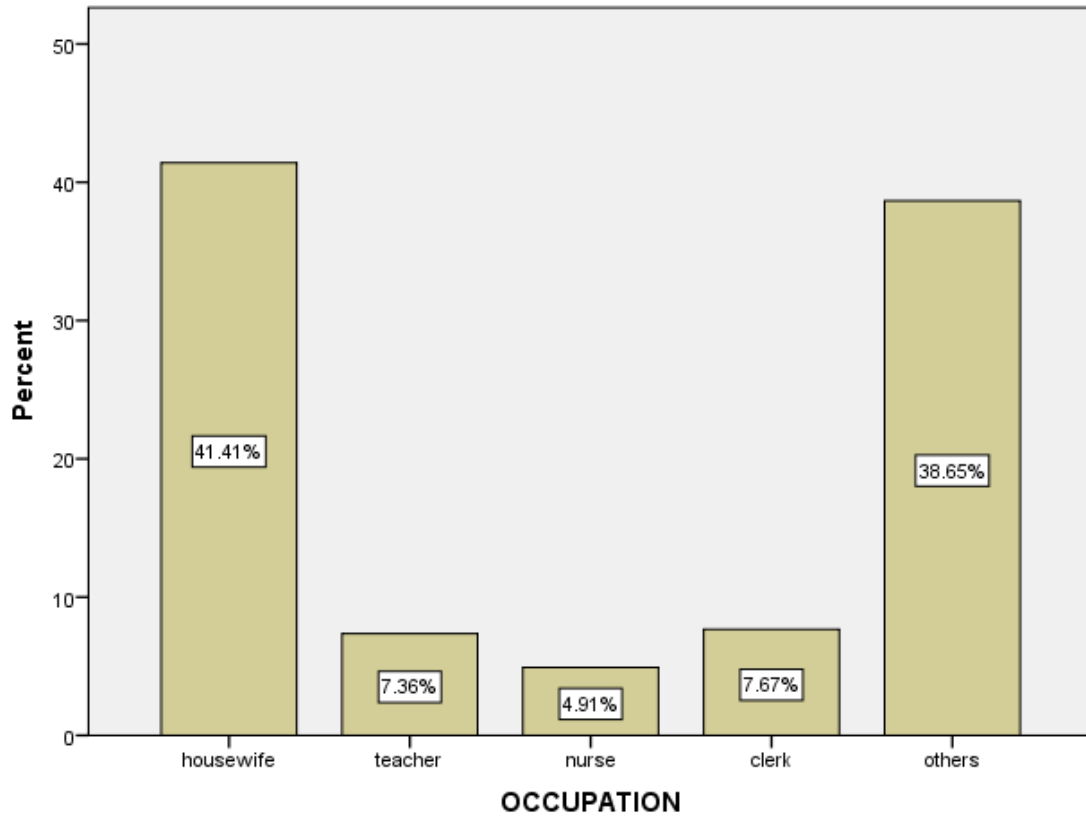
34-38	312	29.6	29.6	88.2
39-43	115	10.9	10.9	99.1
44-48	9	0.9	0.9	100.0

Table 2: Demographic Details (Age)



Occupation	Frequency	Percent	Valid Percent	Cumulative Percent
Housewife	135	12.8	41.4	41.4
Teacher	24	2.3	7.4	48.8
Nurse	16	1.5	4.9	53.7
Clerk	25	2.4	7.7	61.3
Others	126	12.0	38.7	100.0
Not documented	728	69.1		

Table 3: Demographic Details (Occupation)



Parity	Frequency	Percent	Valid Percent	Cumulative Percent
< 5	907	86.1	86.1	86.1
> 5	147	13.9	13.9	100.0

Table 4: Demographic Details (Parity)

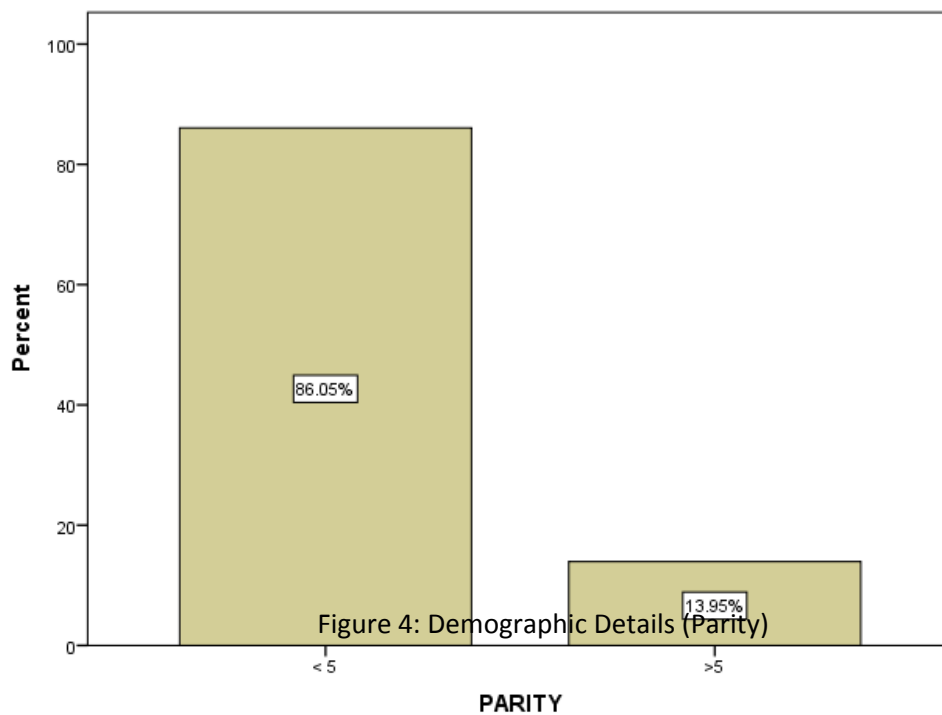


Figure 4: Demographic Details (Parity)

B. Diabetes Mellitus Details

A total of 1,054 pregnant women were included in this study of which 996 (94.5%) women had been diagnosed as Gestational Diabetes Mellitus (GDM) and 715 (67.8%) of them were on diet control (DC) where the other 281 (26.7%) were on insulin treatment. Another 58 (5.5%) pregnant women had known diagnosis of Type II Diabetes Mellitus (T2DM) (Table 5).

Diagnosis	Frequency	Percent	Valid Percent	Cumulative Percent
GDM DC	716	67.9	67.9	67.9
GDM Insulin	280	26.6	26.6	94.5
T2DM	58	5.5	5.5	100.0

Table 5: Diagnosis of the patient

Our study had revealed that 375 (35.6%) had HbA1c level done at third trimester where it normally should be done at first trimester (Table 6). About 411 (39.0%) data collected do not document about the period of gestation during HbA1c level taken throughout the pregnancy.

Period of Gestation during HbA1c Level taken	Frequency	Percent	Valid Percent	Cumulative Percent
1st trimester	40	3.8	3.8	3.8
2nd trimester	228	21.6	21.6	25.4
3rd trimester	375	35.6	35.6	61.0
Not documented	411	39.0	39.0	100.0

Table 6: Period of Gestation during HbA1c Level taken

C. Diabetic Retinopathy

Out of 1,054 patients that were collected from year 2011 to May 2016 that delivered a baby at Hospital Sungai Buloh, only 7 of the patients had diabetic retinopathy and all of them either had chronic Diabetes or had preexisting Diabetes. In this study, most of the gestational diabetes mellitus (GDM) patients was not referred to ophthalmologist for diabetic retinopathy assessment.

	Patient 1	Patient 2	Patient 3	Patient 4
Ophthalmology Assessment	RE- mild NPDR	LE- mild NPDR	LE- mild NPDR	RE- NPDR
Type of Diabetes Mellitus	T2DM (3 years)	T2DM (6 years)	T2DM (7 years)	T2DM (18 years)
Insulin Dosage (unit/day)	70	48	38	38
Booking HbA1c Level (%)	9.4	7.1	9.1	9.5
Body Mass Index	Obesity	Ideal	Overweight	Ideal
Mode of Delivery	SVD	SVD	ELLSCS for 2 previous scars	SVD
Baby's weight (kg)	2.79	2.25	3.88	3.02

Table 7.0: Details regarding Patients with Diabetic Retinopathy

	Patient 5	Patient 6	Patient 7
Ophthalmology Assessment	LE- mild NPDR	RE- PDR LE- severe NPDR - both eyes have vitreous haemorrhage	RE- PDR LE- PDR
Type of Diabetes Mellitus	GDM on Insulin	T2DM (5 years)	T2DM (2 years)
Insulin Dosage (unit/day)	48	42	103
Booking HbA1c Level (%)	10.1	9.8	8.1
Body Mass Index	Obesity I	Obesity II	
Mode of Delivery	EMLSCS for poor progress	EMLSCS due to fresh vitreous hemorrhage	ELLSCS for DM and 1previous scar
Baby's weight (KG)	3.90	3.45	4.06

Table 7.1: Details regarding Patients with Diabetic Retinopathy

***** LE – left eye
RE – right eye
NPDR – non proliferative diabetic retinopathy
PRD – proliferative diabetic retinopathy

EMLSCS – emergency lower segment cesarean section
ELLSCS – elective lower segment cesarean section
SVD – spontaneous vertex delivery

D. Relationship between maternal weight and mode of delivery

Ideally the hypothesis was about maternal Body Mass Index (BMI) and mode of delivery (MOD) but since two third of the collected data regarding the BMI were not documented, maternal weight was taken as a variable in this hypothesis. Maternal weight variable will be classified as weight more than 80kg which indicated as obesity and less than 80 kg. However, almost one fourth of data collected about maternal weight that had not been documented will not be included in the hypothesis which make up the total sample size of 825 data.

The result obtained is shown in table below. It was found that patient who weigh more than 80kg undergone caesarean delivery (50.2%) while 42.1% of patients that weight less than 80kg undergone vaginal delivery of which by chi square test is statistically significant (p= 0.03)

Mode of Delivery	Maternal obesity (> 80 kg)		Total	Chi square (df)	p-value
	Yes	No			
Caesarean	129 (50.2%)	239 (42.1%)	368 (44.6%)	4.718 (1)	0.03
Vaginal delivery	128 (49.8%)	329 (57.9%)	457 (55.4%)		
Total	257 (100.0%)	568 (100.0%)	825 (100.0%)		

Table 8.0: Association between Maternal Weight and Mode of Delivery

Risk Estimate			
	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for mode of delivery (cesarean / non cesarean)	1.387	1.032	1.865

Table 8.1: Risk Estimate for the Association between Maternal Obesity and Method of Delivery

Maternal weight more than 80kg are 1.387 more likely to undergo caesarean delivery compared to those that weight less than 80kg.

E. Relationship between baby’s weight and HbA1c level

Baby’s Weight	HbA1c Level (> 6.5%)		Total	Chi square (df)	p-value
	Yes	No			
> 4kg	14 (12.1%)	17 (3.2%)	31 (4.7%)	16.774 (1)	0.00
< 4kg	102 (87.9%)	521 (96.8%)	623 (95.3%)		
Total	116 (100.0%)	538 (100.0%)	654 (100.0)		

Table 9.0: Association between Baby’s Weight and HbA1c Level

Baby’s weight more than 4kg which considered as macrosomia for a patients that had high HbA1c level that was more than 6.5% were analyzed. The result obtained is shown in table above. It was found that high HbA1c level is significantly associated with macrosomia.

Risk Estimate			
	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for baby’s weight (> 4kg / < 4kg)	4.206	2.010	8.803

Table 9.1: Risk Estimate for the Association between HbA1c Level and Baby’s Weight

Patients that had high HbA1c level are 4.206 more likely to delivered a baby with weight more than 4kg compared to those that had HbA1c level less than 6.5%.

DISCUSSION

Since only 7 patients out of 1,054 pregnant women was found to have diabetic retinopathy of which 2 of them were treated with high insulin dosage more than 50 units daily while the other 5 patients were given less than 50 units insulin dosage daily as a treatment. Regarding ophthalmology assessment, 2 patients were diagnosed with bilateral diabetic retinopathy and the rest were diagnosed as unilateral diabetic retinopathy either on the left or right eye.

However, some information were not complete and lacking especially regarding the diabetic retinopathy on the baseline assessment before pregnancy. Hence, this study could not assess the progression of retinopathy for the current pregnancy since one of the risk factor for the progression of diabetic retinopathy was pregnancy itself. This is according to the research done by Lövestam-Adrian et al, in their retrospective study comparing between pregnant diabetic women and non-pregnant diabetic women who already had diabetic retinopathy.

Our study had found that 2 patients with diabetic retinopathy had hypertensive disorder which was pregnancy induced hypertension (PIH) and pre-eclampsia (PE). This was one of the contributing factor as there was deterioration of retinopathy occurred with preeclampsia in 4 of 8 pregnancies as compared with 5 of 65 among those who did not develop preeclampsia (Lövestam-Adrian et al, 1997).

Both of the HbA1c level that was above 7.0% and the duration of preexisting diabetes mellitus that ranging from 2 to 18 years were one of the risk factor as indicated in several study. However, all of these risk factors of development and progression of diabetic retinopathy could not be assess since only seven patients being diagnosed with diabetic retinopathy out of 1054 patients delivered at Hospital Sungai Buloh from the year 2011 to May 2016. Hence, it is not significant. However, the prevalence of diabetic retinopathy patients among pregnant mothers with diabetes in Hospital Sungai Buloh from year 2011 to May 2016 is only 0.7%.

The result of another hypothesis in this study showed that there is an association between maternal weight and mode of delivery. A chi-square test of independence was performed to examine the hypothesis. The relation between these variables was significant, $\chi^2 (1, N = 825) = 4.72, p = 0.03$ with risk estimates of 1.387 times higher of getting caesarean delivery in pregnant women with weight more than 80kg when compared to those that weight less than 80kg.

Another chi-square test was performed to examine the relation between baby's weight and HbA1c level. The relation between these variables was also significant, $\chi^2 (1, N = 654) = 16.774, p = 0.00$ with risk estimates of 4.206 times higher of delivering a baby weight more than 4kg in patients that had high HbA1c level compared to those that had HbA1c level less than 6.5%.

CONCLUSION

In conclusion, majority of the pregnant women had Gestational Diabetes Mellitus and only 5.5% had diagnosis of Type II Diabetes Mellitus.

The risk factor of development and progression of diabetic retinopathy in pregnancy could not be assess in our study since it was not significant with only seven patients being diagnosed with diabetic retinopathy out of 1054 patients of which data were collected, delivered at Hospital Sungai Buloh from the year 2011 to May 2016. Based on our study, the prevalence of diabetic retinopathy patients among pregnant mothers with diabetes in Hospital Sungai Buloh from year 2011 to May 2016 is 0.7%.

There is a significant relationship between maternal weight and mode of delivery and pregnant women with weight more than 80kg has 1.387 times higher risk of getting cesarean delivery when compared to those that weight less than 80kg. There is also a significant relationship between baby's weight and HbA1c level as those with higher HbA1c level has an increased risk of 4.206 times

to deliver a baby with weight of more than 4 kg compared to those with HbA1c level of less than 6.5%.

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