

Ten Year Retrospective Studies on Pregnant Women with Diabetes Mellitus Progressing to Types-2-Diabetes Mellitus in Gombe South Senatorial District of Gombe State.

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Abstract- Women with Gestational Diabetes Mellitus (GDM) are known to have higher rates of cesarean deliveries and pregnancy-induced hypertension. Evidence suggests that a large percentage of these women are at a higher risk of developing type 2 diabetes mellitus (T2DM) in the future. This study was carried out on a ten years retrospective study on pregnant women with diabetes mellitus progressing to types-2- diabetes mellitus in Gombe South Senatorial District of Gombe State. A descriptive cross sectional Hospital based research design was developed for the study to assess a ten years retrospective study on pregnant women. Ten years hospital records from 2011 to 2019 were used in this study. Samples was randomly selected from four General Hospital where record of all pregnant women of different religion, culture and other characteristics was reached without being biased. Seven (7) research questions were answered using percentages, frequencies and Pearson Product moment Correlation, via SPSS version 23. The result obtained showed that majority of the pregnant women are house wives, 1626 (38.9%); majority of them, 3862(92.4%) are married; a larger number are O⁺, 1649(39.5%); followed closely by A⁺, 1255(30.0%); 3954(94.6%) are rhesus positive, while 108(2.6%) are rhesus negative. Majority of the pregnant women either have low B.P or normal B.P. Hence, hypertension is not prevalent; the pregnant women were majorly obese and severely obese (62.1% and 33.5%, respectively); almost all the pregnant women (98.1%) have a neutral pH level recorded for their urine samples. There was a negative but not significant relationship between their gestational age and blood pressure ($r = -0.02$, $p > 0.05$); there was a negative but not significant relationship between patients age and BMI ($r = -0.01$, $p > 0.05$); there was a significant negative relationship between patients' age and blood pressure ($r = -0.04$, $p < 0.05$). Pregnant women in the study area should be educated on the dangers and possibility of GDM progressing to Type II diabetes if not prevented or properly treated. Health workers and state and local government should ensure the pregnant women are properly attended to so as to prevent diabetes, and as such reduce maternal mortality or both maternal and neonatal mortality.

Index Terms- Retrospective, Pregnant, Diabetes Mellitus, Types-2-Diabetes, Patients, Gestational diabetes mellitus

I. INTRODUCTION

The prevalence rate of GDM is unknown in many countries, but it is in general said to reflect the prevalence of pre-diabetes in young reproductive women as well as background prevalence of type 2 diabetes in the given population (Hunt et al., 2007), and it is estimated that among some high risk groups the prevalence rate may be as high as 30%. Gestational diabetes mellitus (GDM), which is defined as diabetes diagnosed in the second and third trimesters of pregnancy, has emerged as a global public health concern (Hunt et al., 2007). It has been associated with short-term and long-term adverse health outcomes for both mothers and their newborns. Women with GDM are known to have decreased quality of life and increased risks of caesarean section, gestational hypertension, preeclampsia, and type-2- diabetes (Farrar et al., 2016).

In 2008-2009, the International Association of Diabetes and Pregnancy Study Groups (IADPSG), an international consensus group with representatives from multiple obstetrical and diabetes organizations, including the American Diabetes Association (ADA), recommended that high-risk women found to have diabetes at their initial prenatal visit, using standard criteria, receive a diagnosis of overt, and not gestational diabetes (American Diabetes Association Diabetes Care, 2013). The prevalence of GDM has been reported to vary widely from 3.8 to 21% in different parts of India depending on the geographical location and on the diagnostic criteria used (Seshiah *et al.*, 2009). Although, there is high rates of morbidity, most women remain asymptomatic for the duration of their pregnancy and GDM goes unnoticed until a routine screening of blood sugar is carried out. Hence, it is recommended that all pregnant women undergo screening for GDM at 24-28 weeks of gestation (Saxena *et al.*, 2011).

Gestational diabetes mellitus is defined as "any degree of glucose intolerance with onset or first recognition during pregnancy that is not clearly overt diabetes" regardless of whether insulin is used for treatment or whether the condition persists after pregnancy (American Diabetes Association, 2013). There is progressive insulin resistance starting in the mid-trimester due to

production of various placental hormones that serve as insulin antagonists (Soma *et al.*, 2016).

GDM is associated with both insulin resistance and impaired insulin secretion and shares the same risk factors with Type 2 diabetes mellitus (T2DM). Prevalence of GDM closely resembles that of T2DM in a population (Ben *et al.*; 2014). There is evidence to show that GDM is a forerunner of type 2 diabetes in predisposed women who are faced with the metabolic challenges of pregnancy (Bentley *et al.*, 2014). GDM seems to be a significant factor associated with increasing epidemic of type 2 diabetes among women and across generations in Africa and Asia, Nigeria inclusive. It is estimated that 10–31% of cases of diabetes in parous women are associated with previous GDM (Bentley *et al.*, 2014).

It is on this basis that this study on ‘Ten Year Retrospective records on Pregnant Women with Diabetes Mellitus Progressing to Types-2-Diabetes Mellitus in Gombe South Senatorial District of Gombe State’ has become important.

The diagnosis of GDM has implications for the pregnancy and also for the future health of the mother and child. Although normal glucose regulation usually returns shortly after delivery, women with prior GDM are at a higher risk of developing type 2 diabetes, metabolic syndrome and cardiovascular diseases later in life (Gunderson *et al.*, 2014). Women with a history of GDM have at least a seven fold increased risk of T2DM later in life compared to women with no GDM.

This large variation in the subsequent development of T2DM may be due to genetic differences among populations, diagnostic criteria employed to diagnose GDM and T2DM, selection criteria and duration of follow-up. The progression to type 2 diabetes increases steeply within the first five years after delivery, and then plateaus after ten years (Kim *et al.*, 2002). In addition to exposure to GDM, several factors such as ethnicity, family history of T2DM, multiparity, advanced maternal age, treatment with insulin, presence of anthropometric risk factors (pre-pregnancy and postpartum Body Mass Index, weight gain during pregnancy) and high blood sugar levels (fasting, 1 hour and 2 hour glucose levels on oral glucose tolerance test (OGTT)) in the index pregnancy have been identified as predictors of later development of T2DM (Bellamy *et al.*, 2009).

There is a growing body of evidence to suggest that lifestyle and pharmacological interventions targeted at women with GDM can prevent or delay the development of T2DM (Bellamy *et al.*, 2009). The effect of dietary and physical exercise interventions, health education and pharmacological interventions on the progression to T2DM have been investigated in randomized controlled trials and observational studies. A recent review of 30 studies aiming to prevent or delay T2DM after GDM suggests that life style and pharmacological interventions may be effective in reducing the risk of T2DM later in life (Peacock *et al.*, 2014). Since one in four women in South-East Asia has hyperglycaemia in pregnancy, preventive strategies targeted at women with GDM would have a significant public health impact on the current epidemic of diabetes and non- communicable diseases in the region (Bellamy *et al.*, 2009). There is however, paucity of data on long term risk of progression to T2DM among South Asian women who have had a pregnancy complicated by GDM in Asia.

II. RISK FACTORS FOR GESTATIONAL DIABETES

The risk factors of GDM include: Obesity with a Body Mass Index (BMI) above 30kg/m², previous large baby weighing 4.5kg or more, previous gestational diabetes, family history of diabetes (first-degree relative with diabetes) and minority ethnic family origin with a high prevalence of diabetes (Knight & Nigam, 2017).

III. CAUSES OF GESTATIONAL DIABETES

GDM may arise as a result of the following:

- i. The hormones produced during pregnancy can make it difficult for a woman’s body to use insulin efficiently, increasing the risk of insulin resistance.
- ii. As pregnancy places a high demand on the body, some women aren’t able to produce enough insulin to overcome this resistance. This, in turn, makes it difficult for the body to use glucose efficiently
- iii. The result is that glucose can remain in the blood at higher levels than normal leading to gestational diabetes.
- iv. Gestational diabetes usually develops in the second and third trimester of pregnancy (after 28 weeks’ gestation) and then usually disappears again after the baby is born.
- v. While most women with gestational diabetes have normal pregnancies and healthy babies, the risk of some complications can be significantly increased for both mother and baby.
- vi. Post-delivery, the baby is also more likely to be overweight or have diabetes later in life (Knight & Nigam, 2017).

IV. AIM/ OBJECTIVES OF STUDY

Aim

The research centers on a ten years retrospective study on pregnant women with diabetes mellitus progressing to types-2-diabetes mellitus in Gombe South Senatorial District of Gombe State.

Objectives

- i. To identify the prevalence of gestational diabetes mellitus in Gombe South Senatorial District of Gombe state.
- ii. To assess complications of gestational diabetes mellitus that lead to types-2-diabetes mellitus after delivery in Gombe South Senatorial District of Gombe state.
- iii. To find out the proportion of pregnant women that developed types-2- Diabetes mellitus after delivery in Gombe South Senatorial District of Gombe state.

Research Questions

1. Is hypertension (high blood pressure) common among the pregnant women with types-2- Diabetes mellitus after delivery in Gombe South Senatorial District?
2. Is obesity prevalent among the pregnant women with Gestational Diabetes Mellitus?

3. Do the pregnant women have glucose present in their urine?
4. What is the analysis of the urine of the pregnant women?
5. Is there a relationship between their gestational age and blood pressure?
6. Is there a relationship between patients' age and obesity (BMI)?
7. Is there a relationship between patients' age and blood pressure?

V. MATERIALS AND METHOD

Research Design:

A descriptive cross sectional Hospital based research design was developed for the study to assess a ten years retrospective study on pregnant women with diabetes mellitus that progressing to types -2- diabetes mellitus in Gombe South Senatorial District, Gombe State.

Population of Study

The study population is the Hospital record of pregnant mothers for the past ten years from Gombe South Senatorial District. A total population of 716, 018 persons as of 2006 census.

Sample and Sampling Technique

Stratified random sampling was used to select from General Hospitals, comprehensive Health centers, primary Health centers,

Model Health centers, Health Clinics, and Maternity Clinics. Samples was randomly selected from four General Hospital where record of all pregnant women of different religion, culture and other characteristics was reached without being biased.

Validity of Instrument

Structured questionnaires was administered to all the patients used for this study.

Research Instrument

- i. **Section A:** Socio-demographic characteristics of the respondents.
- ii. **Section B:** Number of pregnancy.
- iii. **Section C:** Medical history
- iv. **Section D** Number of test been carried out during pregnancy

Procedure for Data Collection

Data was obtained and retrieved from the patient /client record in the hospital by a use of check list.

Method for data analysis.

The check list collected was analyzed with Statistical Package for Social Sciences (SPSS) version 23.0. Descriptive statistics such as mean, standard deviation, tables, charts and inferential statistics such as logistic regression was used to test the association between variable of interest set at $p < 0.05$.

VI. RESULTS

Demography

Table 1: Demographic characteristics of pregnant women that developed types-2- Diabetes mellitus after delivery in Gombe South Senatorial District

Parameter	N	%	
Occupation	Not indicated	1770	42.4
	Farming	243	5.8
	Applicant	96	2.3
	Security personnel	8	0.2
	Business	179	4.3
	civil servant/ public servant	173	4.1
	Professionals	3	0.1
	Housewife	1626	38.9
	Student	81	1.9
Marital status	Not indicated	135	3.2
	Married	3862	92.4
	Single	182	4.4
Blood group	A+	1255	30.0
	AB	23	0.6
	B+	1190	28.5

	N	2	.0
	O+	1649	39.5
	O-	3	0.1
	Not indicated	57	1.4
Rhesus factor	Not indicated	117	2.8
	Negative (-)	108	2.6
	Positive (+)	3954	94.6

The result presented in Table 1 shows the demography of the pregnant women that developed types-2- Diabetes mellitus after delivery in Gombe South Senatorial District. The result shows that with respect to the occupation of the women, majority are house wives, 1626 (38.9%); while others are farmers, 243(5.8%); business women, 179(4.3%); civil servants, 173(4.1%); applicant, 96(2.3%); students, 81(1.9%); security personnel, 8(0.2%); and professionals, 3(0.1%). However, 1770(42.4%) did not indicate their occupation. The data on the marital status of the women shows that majority of them, 3862(92.4%) are married, while 182(4.4%) are singles. 135(3.2%)

however, did not indicate their marital status. With respect to blood group, majority are O⁺, 1649(39.5%); followed closely by A⁺, 1255(30.0%); B⁺, 1190(28.5%); AB, 23(0.6%); and O⁻, 3(0.1%). 57(1.4%) however did not indicate their blood group. For Rhesus factor, the result shows that 3954(94.6%) are rhesus positive, while 108(2.6%) are rhesus negative.

Research Question 1

Is hypertension (High BP) common among pregnant women with diabetes (SBP and DBP)?

Table 2: Hypertension among pregnant women with diabetes (SBP and DBP)

	SBP		DBP	
	N	%	N	%
Low	1106	26.5%	2139	51.2%
Normal	2987	71.5%	1922	46.0%
High	86	2.1%	118	2.8%

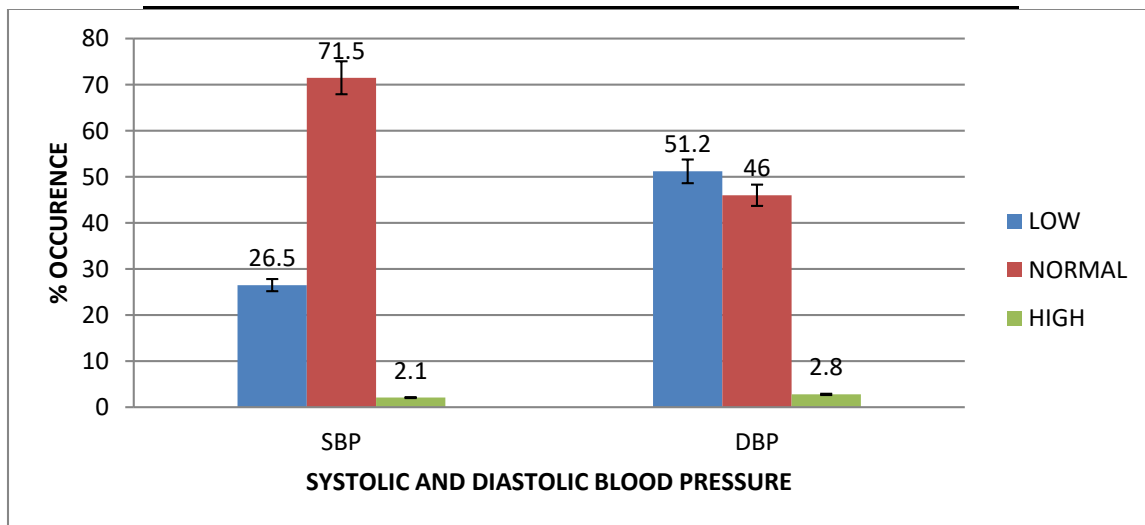


Figure 1: Hypertension among pregnant women with diabetes (SBP and DBP)

The result presented in Table 2 and Figure 1, shows that hypertension of high blood pressure is not common among the pregnant women. Using the benchmark, 141/90mmHg for High B.P.; 89/60mmHg for low B.P. and 120/80mmHg for normal B.P. Both for systolic and diastolic values, those with high B.P. are very

few, 2.1% and 2.8%, respectively. Majority of the pregnant women either have low B.P or normal B.P. Hence, hypertension is not prevalent.

Research Question 2

Is obesity prevalent among the pregnant women with Gestational diabetes Mellitus?

Table 3: Prevalence of obesity among the pregnant women with Gestational diabetes Mellitus

BMI level	Frequency	Percent
Underweight	14	.3
Normal	81	1.9
Overweight	85	2.0
Obese	2597	62.1
Severely Obese	1402	33.5
Total	4179	100.0

Using the benchmark BMI of <18.5 (underweight); 18.5- 24.9(healthy weight); 25- 29.9(Over weight); 30- 39.9(Obese) and 40 and above (severely obese), the result shows that the pregnant women were majorly obese and severely obese (62.1% and 33.5%, respectively).

Research Question 3

Do pregnant women have glucose in their Urine across the years of study?

Table 4: Level of glucose in urine

Year	+ glucose	- negative	Trace
2010	0	138 (3.3%)	0
2011	0	559 (13.4%)	0
2012	0	391 (13.4%)	0
2013	10 (0.2%)	656 (15.7)	1
2014	0	602 (14.4%)	0
2015	0	320 (7.7%)	0
2016	0	273 (6.5%)	0
2017	0	539 (12.9%)	0
2018	29 (0.7%)	651 (15.6%)	1
2019	1 (0.0%)	2 (0.0%)	0
Total	40 (1.0%)	4131 (98.9%)	2 (0.1%)

The result presented in Table 4 shows that, across the years, the glucose level recorded in the urine of the pregnant women is very low.

Research Question 4

What is the analysis of the urine of the pregnant women?

Table 5: Parameter of urine of the pregnant women

S/N	PARAMETER	PRESENT(+) [N(%)]	ABSENT (-) [N(%)]
1	Glucose	40 (1.0)	4131 (98.9)
2	Nitrate	36(0.9)	4143(99.1)
3	Urobilirubin	15(0.4)	4164(99.6)
4	Bilirubin	2(0.00)	4177(100.0)

5	Blood	6(0.1)	4173(99.9)
6	Protein	21 (0.5)	4158(99.5)
7	Ketone	25(0.6)	4154(99.4)
8	Ascorbic acid	7(0.2)	4172(99.8)
9	Amino acid	18(0.4)	4161(99.6)

The result shows that generally, only traces of urine analysis parameter were recorded, except for bilirubin which recorded 0.0% presence. However, of all the parameters, glucose, which indicates diabetes, and nitrate, which indicates infections, where most occurring.

Table 6: The pH level of the urine of the pregnant women

PARAMETER	ACIDIC N(%)	NEUTRAL N(%)	ALKALINE N(%)
pH	1(0.0)	4100(98.1)	78(1.9)

The results presented in Table 6, shows that almost all the pregenat women (98.1%) studied have a neutral pH level recorded for their urine samples.

Research Question 5

Is there a relationship between their gestational age and blood pressure?

Research Question 6

Is there a relationship between patients age and obesity (BMI)?

Research Question 7

Is there a relationship between patients’ age and blood pressure?

To answer research question 5, 6 and 7, Pearson’s Product Moment Correlation was used to check for relationships, and the results are presented in Table 7.

Table 7: Relationship between their gestational age and blood pressure; between patient’s age and BMI; and between patients’ age and blood pressure.

Variables	r	p	Remark
Gestational age versus blood pressure	-0.02	0.14	Not significant
Patient’s age versus BMI	-0.01	0.63	Not significant
Patient’s age and blood pressure	-0.04	0.02	Significant

Table 7 shows that there is a negative but not significant relationship between their gestational age and blood pressure ($r = -0.02, p > 0.05$); there is a negative but not significant relationship between patients age and BMI ($r = -0.01, p > 0.05$). However, there is a significant negative relationship between patients’ age and blood pressure ($r = -0.04, p < 0.05$). This result summarily explains that, as gestational age increases blood pressure reduces; as patient’s age increases BMI reduces; as patient’s age increases, blood pressure reduces.

VII. DISCUSSION

Despite high rates of morbidity, most women remain asymptomatic for the duration of their pregnancy and GDM goes unnoticed until a routine screening of blood sugar is carried out. The study was carried out as a research on a ten years retrospective study on pregnant women with diabetes mellitus progressing to

types-2- diabetes mellitus in Gombe South Senatorial District of Gombe State.

The study revealed that majority of the pregnant women in the study area are house wives (38.9%); farmers (5.8%); business women (4.3%); civil servants (4.1%); applicant (2.3%); students (1.9%); security personnel (0.2%); and professionals (0.1%). The majority of them (92.4%) are married, while 4.4% are singles. The majority of the pregnant women in the study area are of blood

group O⁺ (39.5%); A⁺ (30.0%); B⁺ (28.5%); AB (0.6%); and O⁻ (0.1%). 94.6% are rhesus positive, while 2.6% are rhesus negative.

The study revealed that high blood pressure has low prevalence among the pregnant women (2.1% for systolic, and 2.8% for diastolic). This agrees with the report of Seshiah *et al.*, (2009) who reported prevalence that vary widely from 3.8 to 21% in different parts of India. The variation in the results may be as a result of different locations. According to Ben *et al.*, (2014) the prevalence of GDM closely resembles that of T2DM in a population. That added that there is evidence to show that GDM is a forerunner of type 2 diabetes in predisposed women who are faced with the metabolic challenges of pregnancy (Bentley *et al.*; 2014).

The study revealed that the pregnant women were majorly obese and severely obese (62.1% and 33.5%, respectively). This agrees with the findings in Knight & Nigam (2017), where obesity was explained as a predisposing factor to gestational diabetes.

The study revealed that glucose, which indicates diabetes, and nitrate, which indicates infections, were most occurring in the urine samples. Although, the presence of glucose was low, hence diabetes mellitus was not common among the women. In addition, almost all the pregnant women (98.1%) studied have a neutral pH level recorded for their urine samples. This indicates that gestational diabetes was not prevalent among these pregnant women. Another study conducted by Ozumba *et al.* (2004) in Nigeria revealed a prevalence of diabetes mellitus among pregnant mothers of 1.7% (Ozumba *et al.*, 2004).

The study revealed that as gestational age increases blood pressure reduces; as patient's age increases BMI reduces; as patient's age increases, blood pressure reduces ($p < 0.05$).

VIII. CONCLUSION

Based on the findings in this study, it can be concluded that diabetes mellitus is not prevalent among the pregnant women with diabetes mellitus progressing to types-2- diabetes mellitus in Gombe South Senatorial District of Gombe State. Also, high blood pressure is not prevalent among the women. However, a large number of the pregnant women are obese. There was a negative but significant relationship between patient's age and blood pressure, indicating that as patient's grow older their blood pressure reduces.

IX. RECOMMENDATIONS

It is therefore recommended that pregnant women in the study area should be educated on the dangers and possibility of GDM progressing to type II diabetes if not prevented or properly treated. Therefore, health workers and government should ensure the pregnant women are properly attended to so as to prevent

diabetes, as such reduce maternal mortality or both maternal and neonatal mortality.

REFERENCES

- [1] American Diabetes Association. (2013). "Diagnosis and classification of diabetes mellitus". *Diabetes Care*. 36 :67–74.
- [2] Bellamy, L., Casas, J-P, Hingorani, A.D., Williams, D. (2009). "Type 2 diabetes mellitus after gestational diabetes: A systematic review and meta-analysis". *Lancet*. 373(9677):1773.
- [3] Ben Haroush, A., Yogeve, Y., Hod, M. (2004). "Epidemiology of gestational diabetes mellitus and its association with type 2 diabetes". *Diabet Med*. :21:103–13.
- [4] Bentley-Lewis R. (2009). "Gestational diabetes mellitus: an opportunity of a lifetime". *Lancet*. :1738–40.
- [5] Ferrara, A., Weiss, N., and Hedderson, M. (2007). Pregnancy plasma glucose levels exceeding the American Diabetes Association thresholds, but below the National Diabetes Data Group thresholds for gestational diabetes mellitus, are related to the risk of neonatal macrosomia, hypoglycaemia and hyperbilirubinaemia. *Diabetologia*. 50: 298–306.
- [6] Gunderson, E.P., Chiang, V., Pletcher, M.J., Jacobs, D.R., Quesenberry, C.P., Sidney, S. (2014). "History of gestational diabetes mellitus and future risk of atherosclerosis in mid-life: the Coronary Artery Risk Development in Young Adults study". *J Am Heart Assoc*;3(2):490.
- [7] Gunderson, E.P., Hedderson, M.M., Chiang, V., Crites, Y., Walton, D., Azevedo, R.A., Fox, G., Elmasian, C., Young, S., Salvador, N.(2012). "Lactation intensity and postpartum maternal glucose tolerance and insulin resistance in women with recent GDM": the SWIFT cohort. *Diabetes Care*. 35:50–56.
- [8] Hunt, K.J., Schuller, K.L. (2007). The increasing prevalence of diabetes in pregnancy. *Obstet*. 30:251–260.
- [9] Kim, C., Newton, K.M., Knopp, R.H. (2002). "Gestational Diabetes and the Incidence of Type 2 Diabetes A systematic review". *Diabetis Care*. 25(10):1862.
- [10] Peacock, A.S., Bogossian, F., McIntyre, H.D., Wilkinson, S. (2014). "A review of interventions to prevent Type 2 Diabetes after Gestational Diabetes". *Women and Birth*. 27(4):7–15.
- [11] Saxena, P., Tyagi, S., Prakash, A., Nigam, A., Trivedi, S.S. (2011). "Pregnancy outcome of women with gestational diabetes in a tertiary level hospital of north India". *Indian J Community Med*. 36:120–123.
- [12] Seshiah, V., Balaji, V. and Madhuri, B. (2011). Gestational Diabetes Mellitus - A Perspective. *Gestational Diabetes*. 20- 38.

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