

CORRELATION BETWEEN SERUM GAMMA GLUTAMYL TRANSFERASE AND GESTATIONAL DIABETES MELLITUS IN PREGNANCY

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ABSTRACT

BACKGROUND

The incidence of Gestational Diabetes Mellitus is increasing in recent years. Gestational Diabetes Mellitus has significant maternal and perinatal mortality. Hence it is important to identify a screening test in the early pregnancy period so that preventive measures can be used to avoid maternal and fetal adverse effects.

The aim of this study is to evaluate the relationship between Serum Gamma Glutamyl Transferase (Serum GGT) and Gestational Diabetes Mellitus in the first trimester.

Previously many studies have been conducted showing positive correlation between them in the mid trimester of pregnancy. Here sufficient time is not available to take preventive measures. Our study aims to show the correlation between them in the first trimester itself, so that sufficient time is available to the doctor and the patient to take preventive measures to avoid perinatal and maternal morbidity.

MATERIALS AND METHODS

A prospective study was done in a tertiary care hospital during a period of 6 months. One hundred random pregnant women who came for booking visit were selected and Serum GGT was done. Later they were followed up with OGGT and diagnosed with GDM as per WHO criteria.

RESULTS

In our study, we found pregnant women in the age group of 30-40 years had higher incidence of GDM. The incidence rate of GDM in our study was 12%, which was high. Also, women with high BMI (Class 2 and Class 3) had higher incidence of GDM. A cut off of 30 U/L of Sr GGT was taken in our study. In our study of the 12 GDM patients, 10 had high Sr GGT. (83.3%) and 2 of them had normal values. Among non GDM women 2 had high Sr GGT values.

A positive correlation with high GGT and GDM was done. GGT was found to be an independent risk factor for GDM especially with high FBS values.

CONCLUSION

GGT can be used as screening test for GDM.

KEYWORDS

GDM, GCT, OGTT, Glutathione.

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BACKGROUND

GDM is defined as any degree of glucose intolerance with onset or first detection during pregnancy. It may also include women with pre-existing but unrecognised diabetes.¹ Gestational diabetes mellitus is diabetes diagnosed in second or third trimester of pregnancy that is not clearly either type 1 or type 2 DM (ADA2016). Gestational Diabetes Mellitus is the commonest metabolic disorder of pregnancy. About 50%

of women with GDM ultimately develop overt diabetes in the ensuing 20 years. GDM complicates 7% of all pregnancies. Prevalence rates are reported to be between 4.6% and 14% in urban areas and 1.7% and 13% in rural areas of India.² The importance of GDM is that two generations are at risk of developing diabetes in future. The fine tuning of glycaemic control during pregnancy is possible due to the compensatory hyperinsulinemia, as the normal pregnancy is characterised by increase in insulin resistance and decrease in insulin sensitivity. A pregnant woman who is not able to increase her insulin secretion to overcome the insulin resistance that occur during normal pregnancy develops GDM. Increased insulin resistance is due to hormones secreted by placenta that are diabetogenic like Growth Hormone, Human Placental Lactogen, Progesterone, and Corticotrophin Releasing Hormone.

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GDM is associated with many maternal and foetal complications. Hence identifying and treating maternal hyperglycaemia was made in HAPO study (Hyperglycaemia and adverse pregnancy outcome). It will benefit high risk women from intervention during early pregnancy.³

Aims and Objectives

The aim of this study is to screen pregnant women at booking visit with Serum Gamma Glutamyl Transferase (GGT) and correlate high levels with OGGT values at 24-28 weeks to diagnose GDM. The main purpose was to find correlation between them in the first trimester.

MATERIALS AND METHODS

This study was done in a tertiary care hospital during the period of 6 months. It was a prospective cohort study done on a total of 100 antenatal women presenting for booking visit between 6-10 weeks. They were followed up with Oral Glucose Tolerance Test at 24-28 weeks and then till term. Blood samples were collected for serum GGT along with other necessary booking blood tests. A proper history was taken.

Pregnant women with previous history of Diabetes Mellitus, Hypertension. Chronic Renal Diseases, Heart Diseases, Connective Tissue Disorders, alcohol abuse and on drugs such as anticonvulsants, pain killers were excluded. A thorough physical examination with recording of BMI, age, parity was recorded.

Serum Gamma Glutamyl Transferase or Transpeptidase is an enzyme produced by all living cells more so by the liver. It is measured as an index of liver dysfunction. Its function is to counteract oxidative stress by breaking down extracellular Glutathione and making its component amino acids available to the cells. Oxidative stress plays an important role in pathogenesis of GDM. The normal range is 0-10 U/L.⁴ When Glutathione is depleted, there is oxidative stress and damage starts to occur. Over time this process leads to vicious cycle of irreversible cell, tissue and DNA damage and ultimately to severe impairment of vital organs. Sr GGT plays an important role in the aetiology of Type 2 DM by inducing insulin resistance in the peripheral tissues and impairing insulin secretion from pancreatic beta cells.⁵

OGTT was done with 75 grams 2 hr. test to screen GDM using WHO guidelines. (2013) OGTT is performed in the morning after an overnight fast of at least 8 hrs but not more than 14 hours and after 3 days of unrestricted diet and physical activity. Fasting and 2 hours values are estimated. All women were screened with single step approach OGTT (ADA 2013). Since it is a high-risk area Universal Screening Method by WHO is used.

WHO criteria for diagnosing GDM.

GDM should be diagnosed at any time in pregnancy if one or more of the following criteria are met:

- Fasting plasma glucose 5.1–6.9 mmol/L (92–125 mg/dL)
- 1-hour plasma glucose 10.0 mmol/L (180 mg/dL) following a 75 g oral glucose load 2-hour plasma

glucose 8.5–11.0 mmol/L (153–199 mg/dL) following a 75 g oral glucose load.⁶

RESULTS

Age	GDM (n=12)	% (n)	NON-GDM (n=78)	% (n)
<20 Years	0	0%	12	15.4%
20-30 Years	2	16.6%	45	57.7%
30-40 Years	9	75%	20	25.6%
>40 Years	1	8.4%	1	1.3%

Table 1. Age Relation of Pregnant Women to GDM

In our study highest incidence of GDM was in the age group of 30-40 years.

BMI	GDM (n=12)	% (n)	NON GDM (n=78)	% (n)
Normal	0	0%	7	8.9%
Pre-Obese	1	8.9%	1	1.3%
Class 1	0	0%	60	76.9%
Class 2	6	50%	10	12%
Class 3	5	40%	0	0%

Table 2. BMI Relation to GDM

In our study most of the GDM cases were of Class 2 obesity.

GGT	GDM (n=12)	% (n)	NON GDM (n=78)	% (n)
0-10 U/L	0	0%	60	76%
10-30 U/L	2	16%	16	20.5%
>30 U/L	10	83%	2	2.6%

Table 3. Sr GGT and GDM Correlation

In our study most of the GDM cases had GGT more than 30.

DISCUSSION

In our study OF 100 pregnant women, the GDM rate was 12% whereas worldwide the incidence is 7%. Hence this region is high risk area for GDM. Sr GGT levels were higher in GDM women than normal pregnant women. Twelve women with GDM had high Sr GGT values while only 2 women with normal OGTT had high Sr GGT values (12 Vs 2). Seventy-eight pregnant women without GDM were found. Among them only two of them had high Sr GGT values. In our study of the 12 GDM women, 2 had borderline high Sr GGT values (10-30) and 10 of them had high values (>30). The cut-off for Sr GGT was taken at 30U/L, which was significantly associated with increased risk of GDM. Of the 12 GDM women, 8 had high FBS values while 4 had high PPBS values. Significant positive correlation between GGT and FBS level in GDM was found. In a study by M. Ghosh in 2016 Sr GGT was higher in GDM women compared to normal pregnant women. This correlates with our study.⁷ In a study

by Shridhar in 2014, pregravid GGT levels correlated with increased GDM risk in subsequent pregnancies. They stated that liver fat accumulation such as increased GGT levels are present years before pregnancy and may help to identify women at increased risk of subsequent GDM.² GGT is also an independent risk factor for development of DM Type 2.⁸

In a study at Malaysia in 2012, GGT were measured at the time of 50-gram GCT, prior to the 2-hour 75-gram OGTT. The study found no positive correlation.⁹ In a study conducted by Alanby et al in 2012, GGT was determined to be an independent metabolic parameter for GDM.⁵ In a study conducted by Kong et al in 2018, high Sr GGT in mid pregnancy are associated with increased risk of developing GDM. In our study we found a positive correlation in the first trimester.¹⁰ In a study by Shridhar, mean age of GDM women was 28 years. These findings are similar to our study.²

CONCLUSION

The results of our study indicate that pregnant women with high GGT at booking visit had greater risk of developing GDM. Earlier studies correlated with higher levels of GGT during mid pregnancy with increased risk of GDM.¹¹ Most researches have demonstrated that elevated GGT is independent of other risk factors and predicts increased disease risk and mortality. Strategies to prevent GDM hold great potential as a means by which to prevent or delay the onset of diabetes. It is found that even a minimal increase in GGT level could be seen as an indirect marker of enhanced hepatic insulin resistance and impaired glucose disposal in skeletal muscles. Elevation in GGT, thought to be produced in part as a result of oxidative stress, result in increased transportation of tripeptide Glutathione into the cells, where it can protect the cells from oxidative damage. Based on our study, the liver enzyme GGT, which is known to be associated with an increased risk of development of Type 2 DM, appears to be associated with subsequent GDM, which is characterised by reduced insulin sensitivity and increased insulin resistance.⁴

Measurement of GGT is easy, in expensive and easy to carry out. So, it can be used as an alternative method to screen diabetes. It will benefit high risk women from intervention during early pregnancy.

REFERENCES

- [1] Standards of Medical Care in Diabetes. American Diabetes Association. *Diabetes Care* 2010;33(3):692.
- [2] Sridhar SB, Xu F, Darbinian J, et al. Pregravid liver enzyme levels and risk of GDM during subsequent pregnancy. *American Diabetes Association. Diabetes Care* 2014;37(7):1878-1884.
- [3] Metzger BE, Lowe LP, Dyer AR, et al. Hyperglycemia and adverse pregnancy outcomes. *New England Journal of Medicine* 2008;358(19):1991-2002.
- [4] Whitfield JB. Gamma Glutamyl Transferase. *Critical Review in Clinical Laboratory Science* 2001;38(4):263-355.
- [5] Alanbay I, Coksuer H, Ercan M, et al. Can Serum GGT levels be useful at diagnosing GDM? *Gynecological Endocrinology* 2012;28(3):208-211.
- [6] WHO. *Reproductive Health Library*, Geneva: WHO. December 2016.
- [7] Ghosh M, Paul D, Md Saiful I, et al. Gamma-glutamyl transferase is an indicator of gestational diabetes mellitus. *Bangladesh Medical Journal* 2016;44(3):152-156.
- [8] Nakanishi N, Suzuki K, Tatara K. Serum GGT and risk of metabolic syndrome and type 2 diabetes in middle-aged Japanese women. *Diabetes Care* 2004;27(6):1427-32.
- [9] Tan PC, Mubarak S, Omar SZ. GGT level in pregnancy is an independent risk factor for GDM. *Journal of Obstetrics and Gynecology* 2008;34(4):512-517.
- [10] Kong M, Liu C, Guo Y, et al. Higher levels of GGT in mid pregnancy is associated with high risk of GDM. *Clinical Endocrinology (Oxf)* 2018;88(5):700-705.
- [11] Tan PC, Aziz AZ, Ismail IS, et al. GGT, alanine transaminase and aspartate transaminase levels and the diagnosis of GDM. *Clinical Biochemistry* 2012;45(15):1192-1196.