

Role of Glycosylated Hemoglobin (HbA1c) Estimation in cases of Gestational Diabetes

Dr. Navin Kumar Sinha¹, Dr. Binod Kumar², Dr. Uma Shanker Singh³,
Dr ILA Jha⁴,

¹associate Professor Bio Chemistry Department Mgm Medical College, Jamshedpur

²associate Professor Pathology Department Mgm Medical College, Jamshedpur

³associate Professor Pathology Department Mgm Medical College, Jamshedpur

⁴associate Professor Obs & Gynae Mgm Medical College, Jamshedpur

Corresponding Author: Dr. Navin Kumar Sinha

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I. Introduction

Diabetes Mellitus is a metabolic disorder of carbohydrate protein, lipid metabolism characterized by increased blood glucose level more than 126 mg / dl in fasting condition and more than 200 mg / dl in post prandial or random condition.

Pregnancies affected by gestational diabetes mellitus (GDM) are at risk of developing a number of serious obstetric complications such as fetal growth abnormalities, shoulder dystocia, birth injury, prematurity and increased Caesarean section rate as well as having long-term implications for the well-being of mother and infant. The risk of adverse perinatal and maternal outcomes is directly proportional to the degree of hyperglycemia with a linear relationship between maternal glucose and various neonatal outcomes.

HbA1c is a fragment of haemoglobin which result as a non –enzymatic catalysis of hemoglobin and glucose. The HbA1c is independent of accurate glucose detection or acute changes of blood glucose level.

In cases of gestational diabetes previously fasting and post prandial glucose estimation by OGTT were done to diagnose gestational diabetes mellitus (GDM).

Now a days with better diagnostic tool and easy method used for detecting HbA1c by ELISA or Immunoturbidometric or by HPLC, HbA1c is used as a tool to diagnose gestational diabetes mellitus. It is easy to calibrate the result of HbA1c from one Lab to another Lab and nationally and internationally.

Our effort to evaluate the incidence and outcome of gestational diabetes mellitus by doing HbA1c estimation in the patients attending the outdoor department of Obs & Gynae department of MGM Medical College and Hospital coming for Antenatal check ups.

Estimation of HbA1c can accelerate and facilitate patient screening diagnosis and management of diabetes.

The HbA1c is maintained in the blood at different stages of fasting or post prandial stages.

HbA1c < 7.3 % mainly maintained by PP blood glucose level

HbA1c 7.3 – 8.4 % is maintained by fasting and PP blood glucose level where as

HbA1c > 8.5 % is mainly maintained by fasting glucose level

II. Material and Methods

Patient's blood was taken in EDTA vials . HbA1c estimation

Principle (for HbA1c estimation)

The whole blood is lysed using haemolysing reagent. The lysed whole blood containing HbA1c along with other haemoglobins compete to adsorb to the unsensitised latex particles in the R1. A mouse antihuman HbA1c monoclonal antibody is added into the reaction that specially binds to the human HbA1c molecules to form latex HbA1c mouse antihuman HbA1c antibody complex. Another antibody, goat anti mouse polyclonal

antibody that react with the formed complex to give agglutination. The amount of agglutination is proportional to the amount of HbA1c adsorbed on to the surface of latex particles. It is measured at 660 nm which is used to calculate the HbA1c % from a calibration curve. By Agappe.

99 pregnant women were selected and divided into 3 groups as first trimester, second trimester and third trimester. 45 normal pregnant women without any family history of diabetes or overt diabetes mellitus were controlled.

III. Result

Range of HbA1c	Stage of Pregnancy
4.2 – 5.8 %	In pregnant women having no diabetes mellitus
5.2 %	1 st trimester of pregnancy with GDM
4.8 %	2 nd Trimester of pregnancy with GDM
5.1 %	3 rd Trimester of pregnancy with GDM

It was found that HbA1c reduced in the first trimester and further decrease at the third trimester.

IV. Discussion

Most of the GDM are due to insulin resistant in pregnancy many hormones are secreted by placenta . They are growth hormones, corticotrophin releasing hormones, lactogen, oestrogen, progesteron etc all these hormone help the pregnant women to develop insulin resistant.

Other trials have given the normal mean HbA1c value $5.36 \pm$ in women with GDM is Asian Indian women. In women with pre-existing diabetes before conception are attempted, HbA1c target below 6.1 % is recommended by National Institute for Health and Clinical Excellence (NICE) [8], < 7% by American Diabetes Association (ADA). Women with diabetes whose HbA1c is above 10% should be strongly advised to avoid pregnancy. Pre- existing diabetes both type 1 and Type 2) is associated with an increased risk of stillbirth. How about the relation between HbA1c and stillbirth ? Tennant found increasing periconception HbA1c concentration above value of 49 mmol/mol (6.6%) was significantly associated with either fetal death (OR 1.02[95 %CI 1.01, 1.04], P=0.01) or infant death (OR 1.03 [95 % CI 1.00, 1.06], p= 0.0a), with each 1 mmol/mol increase (above 49mmol/mol) conferring a 2 % and 3 % relative increase, respectively. Increasing third trimester HbA1c concentration above values of 43 mmol/mol (6.1 %) was significantly associated with the odds of a late stillbirth or infant death (aOR 1.06 [95 %CI 1.03, 1.09], p<0.001) [10].

Inkster et al evaluated the association between HbA1c and outcomes (congenital malformation miscarriage and perinatal mortality) in pregnant women with type 1 or type II DM in the first trimester while patients were classified as good control group and poor control group according to HbA1c, result showed the poor HbA1c control had the pooled odds ratio of 3.23 for miscarriage, 3.03 for prenatal mortality and 3.44 for congenital malformation (especially the cardiovascular malformation). In addition the relative risk for congenital malformation reduced by 0.39-0.59 when the HbA1c reduced by 1 % the relative risk for congenital malformation increased by 1.63-2.34 when the HbA1c increased by 1 % [11].

Nielsen et al conducted a study on perinatal outcome in pregnant women with type I DM, outcome classified as good 9 neonates surviving for at least 1 month and having no severe congenital abnormality or poor (spontaneous abortion, therapeutic abortion, stillbirth, neonatal death or severe congenital abnormalities identified within 1 month after birth). They found the poor outcome was 12 % with HbA1c <7.2%, 79% with HbA1c >10.3 %. The poor outcome had a nearly linear relationship with HbA1c >7 % An increment of HbA1c of 1 % increased the risk for poor outcome by 5.5%. Moreover, there was no linear association between HbA1c < 7% and outcome [12].

Women with pregestational diabetes are at significant risk for fetal anomalies due to the effect of hyperglycemia on the developing embryo. Fetal anomalies involve cardiac, musculoskeletal, urogenital and central nervous systems. Studies show that poor glycemic control in early pregnancy is associated with an increased risk of CHD in offspring. In type 1 or type 2 diabetes patients with the worst control (HbA1c > 8.5%), the risk of CHD increases dramatically, more than 10 times higher than the background.

V. Conclusion

This study a small one was aimed at getting preliminary data to include HbA1c at antenatal associated screening test in second trimester. Quantifying 2nd and 3rd trimester can be advised to peer groups for further specifying and collaborative studies to develop and review All India obstetrics guideline. If included in routine guideline a cost effective less invasive and informative parameter can be reviewed.

We will discuss and prepare a detail proposal to be send to ICMR in Multi Disciplinary Research UNIT for Research Activity at low cost and for habit of research accumen development in our institute.

We accept our short commings in conduction of this work which could have been better designed and executed. Our limitations of hands and the resources in Govt system needs more efforts which we are trying to improve.

Our Institution with 50 years history of mostly undergraduate teaching and no post graduate teaching needs improvement on many fronts. We are thankful to Govt for this initiative and support.

The Australian, Italian, US and Indian group values correlate with each other. Sensitivity, specificity, predictive positive values needs further investigation and evolving correlations between different markers and pregnancy outcome.

Our poor society call us to develop an attitude for health care. Pregnancy in many cases as disease in individuals groups.

Our policymakers at the Govt level is considered as a mainly are addering these issues at the core level. Thurst area of our research is going towards community health and our effort in reducing maternal mortality and better pregnancy outcome.

Refrence Intervals & Screening of HbA1c should be broadbased Diabetic control and monitoring of pregnancy outcome is to be taken care of.

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