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Screening Test for Women at Risk of Development Gestational Diabetes Mellitus by Glycosylated Hemoglobin in Tikrit City.

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Abstract

Background: Gestational diabetes mellitus (GDM) is a carbohydrate intolerance with onset or first recognition in pregnancy. GDM is characterized by insulin levels that are insufficient to meet insulin demands. The causes of pancreatic β-cell dysfunction that lead to insulin insufficiency in GDM are not fully defined.

Aim: To measure glycosylated hemoglobin (HbA1c) in the screening GDM (for women at risk of development of GDM).

Patients and Methods: The study was carried out in Salahadeen general hospital in Tikrit city from beginning of February to the end of June 2018. One hundred and 23 women in the 2nd trimester of pregnancy, who admitted to Salahadeen general hospital/Obstetric part were participated in the study. HbA1c, fasting blood sugar and hemoglobin levels were measured.

Results: The study found that a 40.7% of pregnant women in the 3rd trimester of pregnancy have increased HbA1c level comparing with 0.82% of the same women when they were in 2nd trimester. Also, the highest mean percentage of HbA1c was recorded among women in the 3rd trimester of pregnancy comparing with them when they were in the 2nd trimester (5.77and4.89% respectively). The study showed that the

highest rate of increased HbA1c was recorded among 3rd trimester pregnant women who belonged to the age group 30- 35 and 36-40 years.

Conclusion: The present study concluded that; the highest mean level of HbA1c was recorded in 3rd trimester pregnant women comparing with 2nd trimester pregnant women. The evaluation of HbA1c level was most simple, accurate screening manner for GDM than blood sugar.

Keywords: GDM, HbA1c, FBS, pregnant women, Tikrit city.

Introduction

Gestational diabetes mellitus (GDM) is the impaired carbohydrate metabolism during pregnancy, [1-2]. The complications of GDM may lead to the necessity of caesarean section, and pre-eclampsia [3]. Gestational diabetes mellitus (GDM) represents the single largest risk factor for future development of full T2DM [4]. In women with GDM, 35–40% of pregnant women with GDM will develop type II diabetes mellitus (T2DM) within ten years after the index pregnancy [5-6].

Analysis of glycated hemoglobin (HbA1c) in blood provides evidence about an individual's average blood glucose levels during the previous two to three months, which is the predicted half-life of red blood cells (RBCs) [7-8].

For the previous 30 years, investigators have attempted to determine whether HbA1c level during pregnancy may be used as a screening or diagnostic test for gestational diabetes (GDM) [9-10]. Technological advances have made HbA1c a more standardized and user-friendly test with broad availability; however, in general, previous studies have been consistent with previous unsuccessful attempts, [11]. Ho *et al* (2017) found that the sensitivity of HbA1c in screening of GDM was 45%, and the specificity was 84%, [12]. The study aimed measure of the glycosylated hemoglobin (HbA1c) in the screening GDM development.

Patients and methods.

The study was carried out in Salahadeen general hospital in Tikrit city from beginning of February to the end of June 2018. One hundred and twenty three (123) pregnant women in the 2nd trimester of pregnancy were participated in the present study. Fasting blood sugar, HbA1c and hemoglobin levels were measured in the 1st trimester and a second tests were measured in the 3rd trimester of pregnancy.

Inclusion criteria:

Pregnant women at age 20 to 40 years.

Exclusion criteria:

Patients who take treatment affecting blood glucose, Type 1 and type 2 diabetic patients and non fasting pregnant women.

Method:

Five ml of blood was collected by vein puncture by using 5 ml syringe from each patient in fasting state. Blood samples were placed into two tubes, one of them containing anticoagulant: Ethylenediaminetetraacetic acid (EDTA) for hemoglobin and HbA1c assessments. The second part of the sample was 3 ml which placed in plane tubes, left for 30 minutes at room temperature for clotting, then centrifuged at

3000 rpm for 15 minutes. Hemoglobin level less than 10.5 g/dl in pregnant women considered as anemic. All measurements were done according to standard procedures, [6,7].

Results

Relation of HbA1c with pregnancy.

The study showed that 40.7% of pregnant women in the 3rd trimester of pregnancy have increased HbA1c level comparing with 0.82% of the same women when they were in 2nd trimester, Table 1. The result was highly significant (P ≤0.01).

Table 1 :Frequency of HbA1c levels in pregnant women at 2nd and 3rd trimester, (Normal range of HbA1c: 4.2-6.2%).

HbA1c level	2nd trimester		3rd trimester	
	No.	%	No.	%
Normal	122	99.18	73	59.3
Increased	1	0.82	50	40.7
Total	123	100	123	100
X^2: 59.39 *P.* value: 0.01 Highly significant				

Relation of HbA1c with gestational age of pregnancy

The highest mean percentage of HbA1c was recorded among women in the 3rd trimester of pregnancy comparing with them when they were in the 2nd trimester (5.77 and 4.89% respectively), Table 2.

Table 2: The mean and standard deviation of HbA1c levels in pregnant women according to their gestational age.

HbA1c (%)	Pregnant women	
	2nd trimester	3rd trimester
Number	123	123
Mean	4.89	5.77
SD.	0.65	0.93
t. test: 8.60 *P.* value: 0.01 Highly significant		

Normal range of HbA1c: 4.2-6.2%

Distribution of pregnant women with increases HbA1c according to age groups in 3rd trimester.

Fifty pregnant women had a significant increase in HbA1c in 3rd trimester. The study showed that the highest rate of increased HbA1c (24%) was recorded among 3rd trimester pregnant women who belonged to the age group 31-35 and 36-40 years.

Table 3: Distribution of pregnant women in 3rd trimester according to increase in HbA1c and age groups.

Age groups (years)	Number	Percent
Less than 20	**0**	**0**
20-25	**8**	**16**
26-30	**14**	**28**
31-35	**12**	**24**
36-40	**12**	**24**
More than 40	**4**	**8**
Total	**50**	**100**
X2: 21.53	**P. value: 0.01**	

Distribution of pregnant women with increased in HbA1c at 3rd trimester according to Residence.

The study indicated that 94% of pregnant women who belonged to urban area have an increased HbA1c percentage comparing with 6% of women in rural area, Table 4.

Table 4: Distribution of pregnant women with increased HbA1c according to residence.

Residence	Number	Percent
Rural	**3**	**6**
Urban	**47**	**94**
Total	**50**	**100**
X2: 3.02	**P. value: 0.01**	

Discussion

Relation of HbA1c with pregnancy.

The present study found that 40.7% of pregnant women in the 3rd trimester of pregnancy have increased HbA1c level comparing with 0.82% of the same women when they were in 2nd trimester. In Osmundson and colleagues' report, pregnant women indicated a first-trimester HbA1c level of 5.7–6.4% was associated with a low sensitivity (13%) and a 94% specificity in the prediction of GDM [13]. In a study by Renz and colleagues exhibited 95% specificity but low sensitivity (26%) [14]. In another study, the HbA1c tests was performed in 500 pregnant women at 24–28

weeks of gestation. The cut-off point of the HbA1c level had a sensitivity of 95.6% and a low specificity (52%) [15, 16].

In previous studies, the second-trimester and later pregnancy, the HbA1c level could not replace the oral glucose tolerance test (OGTT) for GDM diagnosis [11, 17]. Claesson *et al [*2017] indicated that the HbA1c level in mid-pregnancy was investigated as a predictor of diabetes following GDM, [18].

Sengupta *et al [*19] found that Hb1c level was increased in 3rd trimester pregnant women, especially those with uncontrolled diabetes. However, Previous study indicated that HbA1c levels are significantly lower in late pregnancy than those in 2nd trimester, although the study was on non GDM women, [20]. Another previous study, showed increased HbA1c level in late pregnancy time as well as in 2nd trimester, [21, 22]. Some other studies have focused primarily on HbA_{1c}measured in the second trimester or at the time of GDM diagnosis who denoted that HbA_{1c} decreased slightly from the first to the second trimester and then tended to increase in the third trimester of pregnancy, [23,24].

The present finding is intuitive and in line with the high erythrocyte turnover in pregnancy, and the decrease in insulin sensitivity with increasing gestation [25]. Very few studies have evaluated the clinical usefulness of third-trimester HbA1c levels as a way of predicting the development of post-partum diabetes [26,27].

Relation of HbA1c and age of pregnant women.

The study showed that the highest rate of increased HbA1c was recorded among 3rd trimester pregnant women who belonged to the age group 31-35 and 36-40 years and no one of women under 20 year have increased HbA1c percentage. Very few studies study the relation of HbA1c and age of pregnant women while some studies studied the role of age in diabetic patients on HbA1c level. Current HbA1C targets for diabetes treatment set by the American Diabetes Association (HbA1C <7%) [27, 28]. The central role played by HbA1C in the management of diabetes and possibly in its diagnosis raises the question of whether there are age-related differences in HbA1C, [29]. Two previous studies indicated that age is a significant independent impact factor of HbA1c and confirmed the result of the current study, [27, 30].

Relation of HbA1c and residence of 3rd trimester pregnant women.

The present study indicated that 94% of pregnant women who belonged to urban area have an increased HbA1c percentage comparing with 6% of women in rural area. Patients living in the country had a higher body mass index in comparison to town inhabitants and shorter diabetes duration correlated positively with elevated HbA1c level [31,32, 33].

The present study recommends; self-care guidelines in improving women's knowledge and self-care practices regarding GDM. The study also, recommends regular and continuous health educational programs to enhance women's knowledge and self-care practices regarding GDM.

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