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Research Article

Estimating Gestational Diabetes: FINDRISC Score

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Abstract

Objectives: This study was designed to test the correlation of the Finnish Diabetes Risk Score (FINDRISC) with the oral glucose tolerance test (OGTT) in the estimation of the presence of gestational diabetes.

Methods: In this prospective study, FINDRISC diabetes risk scoring was performed between the 24th and 28th week of pregnancy among patients referred to the outpatient clinic for gestational diabetes screening. Patients who had a one-step or a two-step OGTT test were included in the study. The diagnostic decision-making characteristics of the FINDRISC score to predict gestational diabetes were analyzed using receiver operating characteristic (ROC) curve analysis.

Results: The mean total FINDRISC score of all patients was 5.99±4.64 (possible score: 0-17) and the total FINDRISC score was 8.02±4.25 in patients with gestational diabetes. ROC analysis using a FINDRISC total score limit value of 6.5 revealed a sensitivity of 65.3%, a specificity of 90.4%, a positive predictive value of 91.2%, and a negative predictive value of 62.7% (area under the curve=0.831; p<0.01) for the detection of gestational diabetes.

Conclusion: The FINDRISC score is a simple, inexpensive, and non-invasive test used to predict gestasyonel diabetes. It should be calculated for pregnant women who do not want to have the OGTT performed, and those scoring above 6.5 should be closely monitored for gestational diabetes.

Keywords: Finnish diabetes risk score, gestational diabetes, oral glucose tolerance test

Gestational diabetes is the first all-cause glucose tolerance disorder that occurs in pregnancy or is diagnosed during pregnancy.[1] Gestational diabetes occurs in about 1/7 pregnancies.[2] There is no diagnostic method for gestational diabetes screening except for Oral Glucose Tolerance Test (OGTT). For this reason, Oral Glucose Tolerance Test (OGTT) is performed for gestational diabetes screening at 24-28th week of gestation for all pregnancies.[3]

In recent years, some non-scientific interpretations of OGTT in our country have been affected by some pregnancies and do not have OGTT for gestational diabetes screening, with concern that glucose used for testing may harm the fetus. This makes the diagnosis of Gestational Diabetes mellitus difficult and affects mother and fetus life negatively.[4]

The FINDRISC score has been used in many studies to predict diabetes and has been proven to be accurate.[5–8]

This study was designed to test the correlation of the Finnish Diabetes Risk Score (FINDRISC) with the OGTT for estimating gestational diabetes, a cheap, simple and non-invasive test used to predict diabetes.

Methods

In our prospective study, FINDRISC diabetes risk scoring was performed between the dates February 1, 2016 and December 31, 2017 at 24-28th weeks of pregnancy and referred to our polyclinic for gestational diabetes screening. The pregnant patients who had a one-stage or two-stage OGTT test were included in the study. Those who did not have OGTT in pregnancy, those with previous diagnosis of diabetes mellitus and those with additional disease were excluded from the study.

In the one-stage test, fasting glucose ≥92 mg/dl, 75 g post-

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Table 1. FINDRISC score/Risk of diabetes

Age(year)	<45	0 point
	45-54	2 point
	55-64	3 point
	>65	4 point
Body mass index(kg/m^2)	<25	0 point
	25-30	1 point
	>30	3 point
Waist circumreference (cm)	<80	0 point
	80-88	3 point
	>88	4 point
Exercise (at least 30 minutes per day)	Yes	0 point
	No	2 point
Fruit/vegetable consumption	Everyday	0 point
	Not everyday	2 point
Hipertension	No	0 point
	Yes	2 point
High glucose history	No	0 point
	Yes	5 point
Family history of diabetes	No	0 point
	2nd degree relative	3 point
	First degree relative	5 point
Boundary value of high diabetes risk (total score)	9	

glucose 1st hour glucose ≥180 mg/dl, 2nd hour glucose ≥153 mg/dl, gestational diabetes was diagnosed in the presence of any of these values.

In a two-step test, 50 grams of OGTT was performed without regard to hunger/fasting. 1 hour glucose <140 mg/dl gestational diabetes is interpreted as absent. Gestational Diabetes mellitus was diagnosed when the 1st hour value was ≥180 mg/dl. 50 grams OGTT 1. hour was 140-180 mg/dl, 100 grams OGTT was performed. After 8 hours fasting fasting glucose ≥95 mg/dl, 100 g post-glucose 1st hour glucose ≥180 mg/dl, 2nd hour glucose ≥155 mg/dl 3rd hour glucose ≥140 mg/dl. Patients with at least two positive values were diagnosed with gestational diabetes mellitus.

FINDRISC scoring is based on measurements such as age, body mass index, waist circumference and physical activity (yes/no), consumption of fruit and vegetables in diet (yes/no), antihypertensive use (yes/no), blood glucose history (yes/family history of diabetes (yes: 1st degree/2nd degree/3rd degree, no) (Table 1).

FINDRISC score ≥9 points is considered as a risk of diabetes.

Statistical analyzes were performed using SPSS 22 version software. Patients were divided into gestational diabetic and non gestational diabetic groups according to OGTT result. The diagnostic decision-making characteristics of the FINDRISC score predicted by gestational diabetes were analyzed by Receiver Operating Characteristics (ROC) curve analysis. Sensitivity, specificity, positive predictive and negative predictive values of these limits were calculated in the presence of significant limit values. In the evaluation of the area under the curve, the cases below 5% of the Type-1 error level were interpreted as the statistical significance of the diagnostic value of the test.

The study was approved by the local ethics committee (Dicle University 05/2015).

An informed consent form was obtained from all the patients who participated in the study in line with the general recommendation of the Helsinki Declaration.

Results

A total of 108 patients were included in the study. The mean age was 31.19±5.41 (20-43), and the mean age of patients with gestational DM diagnosis was 32.97±5.10 (22-43).

FINDRISC total score was 5.99±4.64 (0-17) in all patients and FINDRISC total score was 8.02±4.25 (0-17) higher in patients with gestational diabetes. Demographic and antropometric data are given in Table 2.

Sensitivity, 65.3% Specificity, 90.2% Positive predictive value, 91.2% negative predictive value, 62.7% (AUC=0.831, p<0.01) were found in the ROC analysis when the FINDRISC total score limit value was taken as 6.5 p<0.01) (Table 3 and Fig. 1).

In patients with gestational diabetes mellitus, the family history of diabetes mellitus was 74.6%. For the FINDRISC score, the average score of the family story was 3.27±2.04 (0-5).

Table 2. Patients characteristics

	GDM (+)	GDM (−)	p value
n (Total:108)	66 (61.1%)	42 (38.9%)	
Age (year)	32.97±5.10	28.36±4.64	<0.01
Pregestasyonel BMI	26.76±5.74	23.58±3.62	<0.01
Fasting glucose (mg/dl)	99.27±24.30	83.87±9.79	<0.01
Pregnancy weight gain (kg)	7.94±4.69	7.21±3.89	<0.05
FINDRISC Total scor	8.02±4.25	7.21±3.19	<0.01

Table 3. FINDRISC gestational diabetes

Cut off	Sensitivity(%)	Spesifity(%)	Positive Predictive Value PPV (%)	Negative predictive value NPV (%)
6.5	65.3	90.4	91.2	62.7

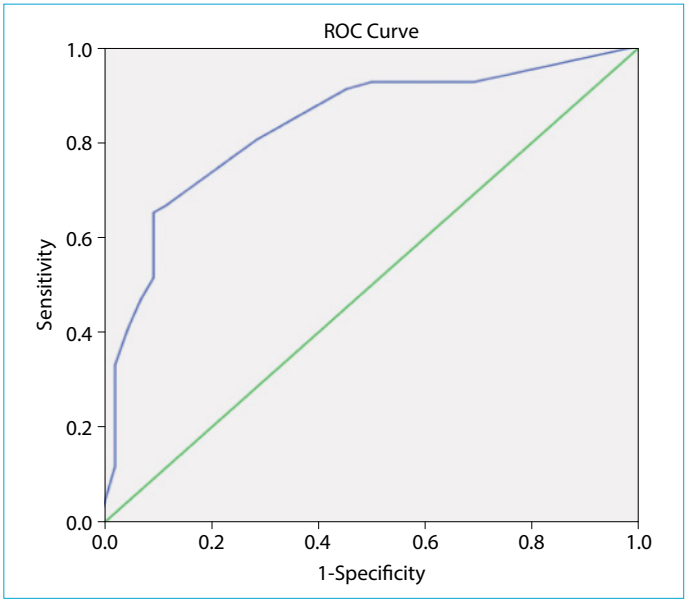

Figure 1. Roc analysis graphic.

Discussion

Gestational diabetes is a common metabolic complication in pregnancy.[9] Gestational diabetes is the result of insufficient insulin synthesis to overcome insulin resistance in pregnancy. In one aspect, pregnancy can be perceived as an effort test for the development of diabetes. Gestational diabetes does not occur when insulin resistance is overcome. Gestational diabetes occurs in those who fail to overcome insulin resistance. Gestational diabetes usually disappears after pregnancy. Patients with gestational diabetes are confronted with a 50% chance of being at risk for Type 2 diabetes within the next 10 years.[10]

Gestational diabetes mellitus causes hyperglycaemia in the mother through the placenta directly to the fetus, resulting in fetal pancreatic excretion of excess insulin. An excess of insulin leads to fetal macrosomia. Infants of diabetic mothers are at risk for cardiac malformations, premature birth, shoulder dystocia, respiratory distress syndrome, hyperbilirubinemia, and early neonatal hypoglycaemia.[11] Gestational diabetes is generally observed in the third decade of life. In our study, the average age of the patients with gestational diabetes was 32 years. The mean age of gestational diabetes mellitus was found to be 32.5 years in the TURGEP study, a gestational diabetes prevalence study in Turkish population.[12] The average age of our study was found to be in accordance with our country data. In our study, the family history of diabetes mellitus was 74.6% in gestational diabetes mellitus. For the FINDRISC score, the average score of the family history was 3.27±2.04 (0-5).

Nombo et al., Tanzania society It has been observed that family history is an important parameter in the risk assessment of gestational diabetes. This data supports our study.[13]

When the FINDRISC total score limit value of 6.5 was taken in the Roc analysis of our Gestational Diabetes Mellitus study, sensitivity of 65.0%, specificity 90.2%, positive predictive value(PPV) 91.2% and negative predictive value(NPV) 62.7% were determined for the detection of gestational diabetes mellitus (ROC-AUC 0.831, p<0.01).

The specificity of the FINDRISC score and the positive predictive value(PPV) of over 90% is the most important finding of our study.

In the design of the FINDRISC study, a questionnaire consisting of 8 questions in the 35-64 age group with no diagnosis of diabetes in Finland society was administered. The survey score is calculated. These patients were then followed-up and tested for diabetes development 5 years later. There was a relationship between score on the test and development of diabetes. The relationship between the test score ≥9 and the risk of diabetes was found.[14]

Soriguer et al. predicting diabetes with the FINDRISC score of Pizarra study found a diagnosis of diabetes mellitus with FINDRISC score ≥9. It is also referred to as ROC-AUC (0.75). They suggest that the FINDRISC score can be used to determine diabetes in this high-risk population they are screening.[15]

Lin and colleagues have shown that the FINDRISC score can be used to predict diabetes in high-risk individuals, and may also be a predictor of metabolic syndrome and renal failure.[16]

Helgren et al. applied a FINDRISC score of >35 years of age in Swedish population and found a mean score of 8.5±4.5 and applied a OGTT score of ≥15 and a FINDRISC positive predictive value of 70% for impaired glucose metabolism.[17]

For the risk of high diabetes in the literature, the FINDRISC score was taken as the limit value 9. Patient groups with a limit of 9 were diagnosed with impaired fasting glucose, impaired glucose tolerance or apparently diabetes and were not diagnosed with the disease. However, gestational diabetes is a clinically mild form of diabetes that only occurs in pregnancy and mostly disappears after pregnancy, and is a parameter that shows the risk of diabetes in the fol-

lowing years. In our study, a cut-off value of 6.5 was considered a gestational diabetes-specific threshold value, which is clinically a mild diabetes type.

Our study limitations include the fact that our patient count is low, the patients are from a local center, the lower limit of the age scale for FINDRISC score was <45 years (0 points). All of our patients, <45 years of age, could not score points for their age. Therefore, the contribution of patient ages to work has not been determined. However, in our study, the average age is higher in the gestational diabetic population. In addition, assessment of consumption of fruit and vegetables consumed in score is subjective.

There is a need for multi-center, multi-community prospective studies involving large numbers of patients for the use of the FINDRISC score to predict gestational diabetes.

In the literature review we conducted, we could not reach a study on the use of the FINDRISC score to predict Gestational Diabetes. Our study is the first study in the literature.

Conclusion

Gestational diabetes is an important disease for mother and fetus health. Not having OGTT for gestational diabetes screening makes diagnosis difficult and affects maternal and fetal health negatively. The FINDRISC score should be calculated for pregnant who do not want to have OGTT. If the FINDRISC score is 6.5 and above, OGTT should be performed and should be closely monitored for gestational diabetes if the patient does not give consent.

Disclosures

Ethics Committee Approval: The study was approved by the local ethics committee (Dicle University 05/2015).

Peer-review: Externally peer-reviewed.

Conflict of Interest: The author declares that there is no conflict of interest.

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