



## Estimating Diabetes in Pregnant Women by FINDRISC Score

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### Article Info

#### Article history:

Received 10 February 2023

Revised 04 September 2023

Accepted 05 September 2023

Available online 01 February 2024

#### Keywords:

Diabetes; Pregnant; FINDRISC; Risk

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#### How to cite this article:

Sri S, Merita ER, Sekar AP, Frichenia PH. Estimating Diabetes in Pregnant Women by FINDRISC Score. MAGNA MEDIKA Berk Ilm Kedokt dan Kesehat. 2024; 11(1): 14-20

### Abstract

**Background:** Gestational diabetes is an increased sensitivity to carbohydrates that affects pregnant women. Pregnancy-related gestational diabetes typically manifests between 24 and 36 weeks of gestation and goes away at delivery. The potential that pregnant women with gestational diabetes may continue to have the disease even after giving delivery is not disproved, nevertheless.

**Objective:** This study aims to use FINDRISC to describe the risk level of diabetes during pregnancy.

**Methods:** 50 pregnant women in this cross-sectional study served as responders. The research was completed by responding to a survey found at <https://ee.kobotoolbox.org/x/7NcWHrV1>. Then, an evaluation of diabetes is called FINDRISC. FINDRISC is frequently used for early diabetes screening to estimate a person's risk of developing diabetes. The data was processed using SPSS 25.0 after the survey's respondents completed it.

**Results:** Out of 50 respondents, it was determined that 29 people fall into the very low-risk category, 15 people fall into the low-risk category, and six people go into the suspected risk category because they had a FINDRISC score of nine or above. Out of the six individuals with probable risk of developing diabetes, three (50%) had high blood sugar levels, four (67%) had excess BMI and obesity, abdomen circumference >80 cm (100%), physical activity four days per week (67%) and had a family history (67%).

**Conclusion:** Out of 50 respondents, 29 were classified as having a shallow risk of developing diabetes, 15 as having a low risk, and six as having a suspected high risk of developing diabetes, according to the study's findings.

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## INTRODUCTION

Everyone is susceptible to the non-communicable disease diabetes, even expectant mothers. Gestational diabetes is the name typically given to diabetes in pregnant women. The Maternal Mortality Rate and Infant Mortality Rate measures health conditions and the effectiveness of implementing health development in the National Long-Term Development Plan for 2005–2025. The maternal mortality rate (MMR) and infant mortality rate (IMR) have been designated as indicators of health status and the effectiveness of implementing health development in the National Long-Term Development Plan for 2005–2025. Furthermore, the Medium-Term Development Plan (RPJMN), including RPJMN V, has consistently included MMR and IMR as targets for health development (2020–2024).

Based on research conducted by Nishikawa et al.<sup>1</sup>, logistic regression was used to explore the association between diabetes in pregnancy and BMI among women of different ethnicities, and adjusted probability estimates were used to derive risk-equivalent cut-offs. ROC curve analysis was used to assess the performance of BMI as a predictor of diabetes in pregnancy. The prevalence of diabetes in pregnancy was 2.3% overall, highest in South and East Asian women (4.6% and 3.7%). It means women in Indonesia can be suspected to be GDM.

Women with diabetes generally have difficulty conceiving or have difficulty during childbirth. If not supported by pre-conception planning, diabetes can cause morbidity and mortality in the mother and baby. In addition to type 1 and type 2 diabetes, gestational diabetes also uniquely affects women during pregnancy. Based

on research by the International Diabetes Federation, 90% of diabetes cases in pregnant women are cases of gestational diabetes.

In Kurniawan,<sup>2</sup> the second and third trimesters of pregnancy, an increase in fetomaternal relations will reduce maternal insulin sensitivity, stimulating maternal cells to use energy other than glucose, such as free fatty acids. Maternal glucose will then be transferred to the fetus. Gestational diabetes is very dangerous because it is a significant cause of maternal and infant mortality and causes severe complications during childbirth. According to data from the *Lancet* 2011, as many as 3 million babies are stillborn each year due to gestational diabetes. Pregnancy accompanied by gestational diabetes is also at risk of causing maternal death up to four times.

Although gestational diabetes is a temporary phenomenon, more than 50% of pregnant women with gestational diabetes are prone to developing type 2 diabetes. The developmental phase from gestational diabetes to type 2 diabetes generally occurs 5–10 years after delivery. Not only that, but babies born to women with gestational diabetes are at a high risk of developing type 2 diabetes as children and adolescents due to being overweight and obese. Early detection in pregnant women of the possibility of gestational diabetes (GDM) is essential, given the negative impact of the incidence of GDM. Pregnant women with gestational diabetes generally experience complications during the delivery process and tend to give birth to babies with excess weight, premature babies, or physical disabilities.<sup>2</sup>

In the Indonesian Health Profile, non-communicable diseases (NCDs) are chronic diseases not transmitted from person to person. NCDs

include heart disease, stroke, cancer, diabetes, and Chronic Obstructive Pulmonary Disease (COPD). NCDs are almost 70% of the causes of death in the world. According to the International Diabetes Federation, there were 415 million diabetics worldwide in 2015; this is up from 108 million cases in 1980, and it is expected that there will be 642 million cases of diabetes in 2040.

According to data from the International Diabetes Federation, to date, as many as 199 million women worldwide have diabetes. This description is projected to increase to 313 million women in 2040. Diabetes is the ninth leading cause of death in women worldwide. The number of women dying from diabetes is 2.1 million every year.

## METHODS

This research is cross-sectional, involving 50 pregnant women as respondents. The research was conducted by filling out a questionnaire (<https://ee.kobotoolbox.org/x/7NcWHrV1>). This collected data is followed by an assessment of diabetes, namely FINDRISC. Diabetes risk assessment using FINDRISC is widely used for early screening of someone who has diabetes. After the respondents filled out the questionnaire, the data was processed using SPSS 25.0. This research has obtained an ethical statement from the Ethics Commission in Indonesia, No. 076.3/FIKES/PL/VI/2022. Score classified low risk (<7), slightly increased risk (7-11), moderate risk (12-14), high risk (15-20)

## RESULTS

Characteristic of response is listed at Tabel 1, FINDRISC Score by BMI is shown on Tabel 2 and by physical activity on Tabel 3.

## DISCUSSION

The condition of overweight and obesity, according to Nora and Mursyidah in a study<sup>3</sup> (Yunus, Delilah, and Santi, 2021), states that one of the factors for increasing blood sugar in pregnant women is caused by increased weight during pregnancy.

Based on Table 2, it can be seen that most of the BMI of pregnant women is normal and has a shallow FINDRISC score category. When looking at the number of pregnant women who are thought to be at the highest risk, they are in the category of pregnant women who have the BMI/BMI category of excess weight and obesity, namely four people (8%). Based on a systematic review conducted Mulyani et al.<sup>4</sup>, obesity in women before pregnancy was noted to have a relationship with the occurrence of gestational diabetes in 96% of studies from a total of 25 studies that were observed in as many as 16 studies showed that obesity was significantly associated with the incidence of gestational diabetes. with  $p < 0.05$  ( $n=7$ ) and  $p < 0.001$  ( $n=9$ ). This result aligns with Neni's test that the Pearson correlation test shows that body mass index correlates with blood sugar levels ( $p = 0.007$ ;  $r = 0.345$ ).<sup>5</sup>

Table 1. Characteristic Respondents

Aspects	Category	Freq.	%
Gestational age	Trimester 1	2	4
	Trimester 2	11	22
	Trimester 3	37	74
Knowledge	Good	11	22
	Intermediate	22	44
	Low	17	34
Blood sugar level	Normal	47	94
	High	3	6
BMI*	Underweight	2	4
	Normal	38	76
	Overweight and Obese	10	20
Waist circumference*	<80cm	31	62
	80<sd<88	15	30
	>88	4	8
Blood pressure	Hypertension	3	6
	Normal	47	94
Use of blood pressure medication	Yes	2	4
	No	48	96
Physical activity	< 4 days/week	18	36
	≥4 days/week	32	64
Daily consumption of vegetables, fruits	Yes	46	92
	No	4	8
Family history of diabetes	Yes	13	26
	No	37	74
FINDRISC score	Low risk (<7)	36	72
	Slightly increased risk (7-11)	14	28
	Moderate risk (12-14)	0	0
	High risk (15-20)	0	0

Table 2. FINDRISC Score Category by BMI

Category BMI	Category score of FINDRISC			Total
	Very low	Low	Suspected to be a Risk	
Underweight	2	0	0	2
Normal	24	12	2	38
Overweight and Obese	3	3	4	10
Total	29	15	6	50

Table 3. FINDRISC Score Category by Physical Activity

Physical activity	Kategori skor FINDRISC			Total
	Very low	Low	Suspected to be at Risk	
<4 days/week	6	8	4	18
≥4 days/week	23	7	2	32
Total	29	15	6	50

Based on Zhang et al.<sup>6</sup> the correlation between maternal BMI and GDM by a large community-based cohort. The prevalence of GDM increases gradually with early pregnancy BMI. Women with excess nutritional status or obesity have a higher risk for gestational diabetes, cesarean section, uterine rupture, postpartum hemorrhage, fetal macrosomia, fetal death, spontaneous abortion, meconium aspiration, fetal distress, and congenital abnormalities<sup>4</sup>.

The study Fathurohman,<sup>7</sup> results, which measured the relationship between BMI/BMI and the level of risk of type 2 diabetes mellitus, obtained a statistical test result of  $p < 0.001$ . It can be concluded that there is a difference in the proportion of the risk level of type 2 diabetes mellitus between respondents with a normal BMI and those with a normal BMI and excess weight or obesity. Some studies have found that diet and exercise interventions during pregnancy could reduce risks of GDM<sup>89</sup>, and this effect may be relevant to the lifestyle improvements at the beginning of pregnancy that decrease the gestational weight gain (GWG) before the mid-second trimester<sup>1011</sup>. Based on research conducted by<sup>6</sup>, logistic regression analysis was performed to confirm the role of inter-gestational BMI on the risk of GDM. The result showed that early pregnancy BMI was a risk factor for GDM (OR 1.131, 95% CI 1.122–1.139). BMI gain was associated with a decreased risk of GDM in unadjusted univariate analysis (OR 0.895, 95% CI 0.869–0.922), as well as the rate of weight gain (OR 0.956, 95% CI 0.946–0.967)

Using conventional BMI thresholds, differences in BMI distributions by ethnic group are shown. Black women had the highest proportion of both overweight (34%) and obese

(25%). Women of other ethnicities had the highest level of overweight and obesity (25% overweight, 13.5% obesity), followed by South Asians (24.3% overweight, 9.7% obesity) and White women (19.6%, 9.5%). East Asian women had the lowest proportions of being overweight and obese (10.8% and 3.3%, respectively). When Asian-specific BMI cut-offs (overweight 2327.4 kg/m<sup>2</sup>, obesity 27.5 kg/m<sup>2</sup>) were used in this population, 52.3% of South Asian women were classified as overweight or obese, compared to 34.0% when conventional thresholds were used. When Asian-specific BMI cut-offs were used, the percentage of East Asian women classified as overweight or obese more than doubled (29.2% vs. 14.0%)<sup>1</sup>

Implementing universal screening for all Asian women, regardless of BMI, would be a more effective method of identifying Asian women with GDM. The inappropriateness of defining a BMI of  $\geq 30$  kg/m<sup>2</sup> as a risk factor for diabetes in pregnancy among South and East Asian women is supported by a study conducted in Singapore among Chinese, Malay, and Indian women, in which high-risk screening (based on NICE guidelines) detected only one-third of GDM cases in Chinese women and one-half of cases in all women, compared to universal screening<sup>12</sup>.

Based on Table 3, it can be seen that the majority of pregnant women have done physical activity four days per week (64%). In the group of mothers suspected of being at risk, 4 out of 6 people did physical activity  $< 4$  days per week (67%). According to<sup>13</sup>, planned and structured physical activity is a component of efforts to control blood glucose in pregnant women with

diabetes and reduce the risk of being overweight. The results of the study<sup>14</sup> showed that WUS who had physical activity <600 MET per week had a 4.17 times risk of suffering from DM compared to WUS with physical activity 600 MET.

Physical activity during pregnancy is one of the most widely recommended treatments for gestational diabetes mellitus (GDM). GDM is commonly managed through glycemic control, according to common experience.<sup>15,16</sup> Based on Ming et al.<sup>11</sup> in normal-weight women, exercising during pregnancy may reduce the risk of GDM without lowering gestational age at delivery or increasing the likelihood of c-delivery.

In Hjerkind et al.<sup>17</sup>, high levels of physical activity were associated with lower diabetes risk in all body mass index categories, but there is no clear evidence that being physically active can fully compensate for the adverse effects of adiposity on diabetes risk. In Hjerkind et al.<sup>17</sup>, it was also stated that women with high physical activity have a 0.76 times risk of suffering from DM compared to those who do not do physical activity (95% CI = 0.61-0.95). Based on Mishra & Kishore,<sup>18</sup> the current study found that cases across all domains had higher exposure rates for low to moderate physical activity levels, especially for some involved in domestic and gardening activities during pregnancy. GDM risk was higher in women less moderately active in their pregnancy. Prolonged sitting was also a significant risk factor. Physical activity and blood glucose levels had no or only a weak relationship. High odds of GDM were among those involved in low-to-moderate physical activities ( $P < 0.001$ ).

Finding Mishra & Kishore,<sup>18</sup> that the odds of GDM in those spending  $\geq 3000$  min/week of their time in sitting are 11 times higher than those spending <2900 min/week ( $P < 0.001$ ), consistent with the works of Gradmark et al.,<sup>19</sup><sup>20</sup> who found increased sedentary behavior during pregnancy associated with abnormal glucose tolerance. The effects of regular aerobic exercise on blood glucose levels in non-pregnant people have been well studied, including improvements in both hepatic and peripheral (skeletal muscle) insulin sensitivity.<sup>21</sup>

## CONCLUSION

Out of 50 respondents, 29 people are included in the very low-risk category, 15 in the low category, and six in the category suspected to be at risk of developing diabetes.

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