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Insulin resistance (IR) in pregnant women at the Mother and Child Hospital Khadijah, Makassar, Indonesia☆

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KEYWORDS
Insulin resistance;
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Abstract

Objective: This study aimed to determine the description of the incidence of insulin resistance (IR) in pregnant women in maternal and child hospital Khadijah Makassar.

Methods: This research was a cross-sectional study, a research site at the Polyclinic of Khadijah Mother and Child Hospital, which was conducted from February 2019 to April 2019. The sample of the study were 87 pregnant women, insulin resistance calculated based on the HOMA-IR index = fasting blood glucose (mg/dl) × Fasting insulin (μ/ml)/405. HOMA-IR index was divided into 3 tertiles, namely tertile 1 (3.10–5.84), tertile 2 (5.85–8.62), and tertile 3 (8.63–35.26), categorized as insulin resistance if HOMA-IR was in tertile 3.

Results: Respondents in this study were mostly aged < 35 years, i.e., 71 (81.6%) with the majority of gestational age already in the 3rd semester and nutritional status as measured by the upper arm circumference was also the normal, and ethnic was Makassar The number who experienced insulin resistance, i.e., 29 people (33.3%) of 87 respondents. There were no differences in HOMA-IR between all groups, but in Table 2 it was seen that mothers who had insulin resistance were those under 35 years old, trimester 3, primigravida, normal nutritional status and Makassar ethnic.

Conclusion: Mothers who had insulin resistance were those under 35 years old, trimester 3, primigravida, normal nutritional status, and Makassar tribe.

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Introduction

Insulin is an important growth factor in pregnant women, high sensitivity in early pregnancy occurs due to the presence of many insulin receptors in the syncytiotrophoblast which is a layer of cells that is directly related to maternal blood and is responsible for uptake and metabolism in early pregnancy.[1] During the third trimester, insulin sensitivity gradually decreases to 40–50% of the normal value.[2] Changes in IR during pregnancy are influenced by several factors such as gestational age (trimester1, second trimester and third trimester), maternal age, obesity, maternal hormonal status, family history of diabetes, maternal weight before pregnancy, and ethnicity.[3,4]

Pregnant women with increased IR are more prone to hyperglycemia in pregnancy.[5] Hyperglycemia in pregnancy is a high-risk condition for both the mother and the fetus.[6] Hyperglycemia in pregnancy is associated with poor outcomes such as macrosomia (birth weight > 4000 g), shoulder dystocia, cesarean delivery, and fetal complications such as hypoglycemia, hypocalcemia, hyperbilirubinemia, polycythemia, respiratory distress syndrome.[7]

Based on this, this study aimed to determine the description of the incidence of insulin resistance in pregnant women in maternal and child hospital Khadijah Makassar. It is expected to provide basic data for the purposes of preventing and managing IR in pregnant women.

Methods

This research was a cross-sectional study, a research site at the Polyclinic of Khadijah Mother and Child Hospital, which was conducted from February 2019 to April 2019. The sample of the study were 87 pregnant women with inclusion criteria; Aged 18–40 years, Not suffering from type 2 diabetes mellitus, preeclampsia, Not temporarily taking diabetes medications and hypertension, Willing to participate and sign an agreement to participate in this study. Exclusion Criteria, i.e., Pregnant women who did not suffer from liver and kidney disease and other serious illnesses, pregnant women who were not cooperative.

The physical examination carried out in the polyclinic room. The blood samples taken were then examined at the Hasanuddin university laboratory.

Insulin resistance defined as a decrease in tissue response to insulin, which is characterized by an increase in plasma insulin concentration. Which can be calculated based on the HOMA-IR index = fasting blood glucose (mg/dl) × Fasting insulin (μIU/mL)/405. Fasting insulin levels are measured from serum by the chemiluminescence immunoassay method, which is expressed in units of mU. HOMA-IR index was divided into 3 tertiles, namely tertile 1 (3.10–5.84), tertile 2 (5.85–8.62), and tertile 3 (8.63–35.26), categorized as insulin resistance if HOMA-IR was in tertile 3.

Results

Respondents in this study were mostly aged < 35 years, i.e., 71 (81.6%) with the majority of gestational age already in the 3rd semester and nutritional status as measured by the upper arm circumference was also the normal, and ethnic was Makassar The number who experienced insulin resistance, i.e., 29 people (33.3%) of 87 respondents. Those categorized as insulin resistance are those in tertile 3 with Homa-IR 8.63–35.26 (Table 1).

Table 1 Characteristic of respondent ($n = 87$).

Variable	n	%
Age		
<35 year	71	81.6
≥35 year	16	18.4
Maternal age		
Trimester 2	19	21.8
Trimester 3	68	78.2
Nutritional status (arm upper circumference)		
Lean	3	3.45
Normal	82	94.25
Obese	2	2.3
Parity		
Primi Gravida	27	31.0
Multi Gravida	60	69.0
Diabetes history		
Yes	4	4.6
No	83	95.4
Buginese	32	36.8
Makassar	55	63.2
Tertil HOMA-IR		
T1 (3.10–5.84)	29	33.3
T2 (5.85–8.62)	29	33.3
T3 (8.63–35.26)	29	33.3
Insulin resistance		
Yes[a]	29	33.3
No	58	66.7

[a] Categorized as insulin resistance are those in tertile 3 with Homa-IR 8.63–35.26.

There were no differences in Homa-IR between all groups, but in Table 2 it was seen that mothers who had insulin resistance were those under 35 years old, trimester 3, primigravida, normal nutritional status and Makassar ethnic.

Discussion

The results showed that the age < 35 years had more IR experience; this age was a productive period. The same research results obtained by research reported by Jeon et al. (2017), in Korea which showed that the age of pregnant women is not a risk factor for insulin resistance, where age under 35 years and above 35 years have HOMA-IR values that are not different meaningful.[8] This study is different from that reported by Sudasinghe et al. (2016), in Sri Lanka, that age over 35 years have a risk of pregnancy hyperglycemia of 2.98 times compared to age under 35 years.[9] General theory, one of the factors that influence IR in pregnant women is age of mother; this is due to the increase of age, insulin sensitivity decreases which means that the progression of insulin resistance increases.[10]

IR occurs in both trimester 2 and 3 gestational age but is more experienced by trimester 3 pregnant women. Insulin

Table 2 characteristics of respondents with the HOMA-IR category in tertile 3.

Variable	*N*	HOMA – IR Mean ± SD	Mean difference	*P*[a]
Age				
<35 year	24	13.17 ± 5.11	3.23	0.305
≥35 year	5	16.98 ± 1.79		
Maternal age				
Trimester 2	5	11.79 ± 3.13	3.03	0.336
Trimester 3	24	14.83 ± 6.70		
Parity				
Primigravida	18	16.10 ± 7.35	4.70	0.490
Multigravida	11	11.99 ± 1.10		
Nutritional status				
Lean (<23 cm)	1	9.01 ± 5.99	5.49	0.401
Upper arm circumference				
Normal (23–33 cm)	28	14.50 ± 0.40		
Diabetes history				
Yes	1	12.10 ± 6.32	6.36	0.836
No	28	14.35 ± 6.40		
Ethnic				
Buginese	12	14.43 ± 5.25	2.15	0.930
Makassar	17	14.21 ± 7.10		

[a] Mann-Whitney test as test for all *P*-value.

resistance in trimester 3 is a physiological metabolic change during pregnancy to maintain glucose levels according to the rapidly developing metabolic needs of the fetus (Hwang et al., 2014). These metabolic changes aim to ensure the availability of adequate nutrition for the fetus for its growth. Gestational diabetes mellitus will develop during pregnancy if pancreatic β cell function is unable to compensate for insulin resistance that occurs during pregnancy.[11]

Research shows that pregnant women with normal categorized nutritional status based on measurement of upper arm circumference have more IR, however further discussion should indeed be more careful given the number of respondents who have normal LILA indeed more so that research into retrospective case-control or cohorts would be better done.

The results of this study found that primigravida and multigravida did not have a significant difference in IR, even though primigravida had a higher incidence of IR. The same research results reported by Iversen et al. (2016) found that there were no detectable effects on insulin sensitivity in women with parity is high when compared to low parity at the same age and body mass index.[12]

Family history of diabetes is a risk factor for pregnancy hyperglycemia, which is a result of insulin resistance (Dirar et al., 2017). In this study, even though they did not have a history of diabetes mellitus but still had a high IR.[13] Other factors, such as nutritional intake or diet, are not examined in this study so that it becomes a limitation of the study to explain this. Research reports on the relationship of ethnicity with insulin resistance in pregnant women in the last 5 years are very rarely found; in this study, more Makassar tribes experienced IR.

This study is still lacking in exploring various characteristics that could be risk factors for IR events. Researchers from South Sulawesi, Indonesia are expected to explore further to provide treatment and prevention of IR events.

Conclusion

Statistically, HOMA-IR based on pregnant women age, gestational age, nutritional status with LILA parameters, parity, family history of diabetes mellitus and ethnicity did not have significant differences but in frequency, it appears that mothers who had insulin resistance were those under 35 years old, trimester 3, primigravida, normal nutritional status and Makassar ethnicity.

Conflict of interest

The authors declare no conflict of interest.

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