



## The Correlation Between Nutritional Status And Urine Glucose With Estimated Fetal Weight In Trimester III Pregnant Women At Prima Husada Hospital

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### A B S T R A C T

Estimated fetal weight is needed to predict fetal birth weight. Its predisposing factors are maternal nutritional status, age, and gestational spacing, and pregnancy complications. A pregnant woman's nutritional status consists of the Body Mass Index (BMI) and upper arm circumference. Urine glucose describes the existence of glucose in the urine. A baby's well-being in the womb can be measured through the estimated fetal weight based on gestational age. This study aims to determine the correlation between nutritional status and urine glucose with estimated fetal weight. It was conducted at the Prima Husada Hospital Sidoarjo during May-July 2020. It was a cross-sectional study with 30 respondents by purposive sampling. Independent variables were body mass index (BMI), upper arm circumference, and urine glucose, while the dependent variable was fetal weight estimation. The instrument to evaluate BMI was WHO's standard. To assess the mother's upper arm circumference was the Maternal and Child Health book, and to examine urine glucose using the dipstick method. Meanwhile, to calculate estimated fetal weight utilized the Johnson Tausack formula. Data analysis took the chi-square/Fisher exact test with a significance value of  $p < 0.05$ . The analysis chi-square between BMI and estimated fetal weight obtained  $p = 0.337$  ( $p > 0.05$ ). Its analysis between urine glucose and fetal weight estimates had  $p = 0.19$  ( $> 0.05$ ). Meanwhile, its analysis between upper arm circumference and estimated fetal weight got  $p = 0.03$  ( $< 0.05$ ). In conclusion, the upper arm circumference correlates with estimated fetal weight. Meanwhile, body mass index and urine glucose do not associate with estimated fetal weight in pregnant women in the third trimester. Women should prepare themselves before pre-pregnancy for future generations. As women's friends, midwives must routinely carry out health education to improve women's health status.

## INTRODUCTION

For a woman, pregnancy is one of the happy and essential times in her life cycle. During pregnancy, a mother must prepare herself for her baby's birth. When she is in good health, she will give birth to a physically fit and perfect baby and has enough body weight. The gestation period starts from conception until the fetus's birth. The usual range of gestational age is 280 days or 40 weeks, starting from the first menstruation of the mother's last menstruation.

Maternal mortality rate (MMR) is an indicator of public health and a measure of the health sector's success. The MMR incidence describes the magnitude of health problems and the quality of health services and resources. It is one target that has been determined in the fifth Sustainable Development Goals (SDG) to improve maternal health. The Indonesian Ministry of Health is required to work hard to reduce the death rate to the target of 102 out of 100,000 live births by 2030 (Kementerian Kesehatan RI, 2018).

The body mass index (BMI) describes pregnant women's nutritional status at the beginning of pregnancy. The health worker can determine how much pregnant women are encouraged to gain weight from the

BMI. It aims to meet the fetus's nutritional needs and prepare for the birth process. Besides, for first-time pregnant women or primigravida, health workers will measure the upper arm's circumference to determine the pregnant woman's nutritional status. When her arm circumferences are less than the health standard, the health worker will monitor the pregnancy, especially the fetus's growth in the womb (Laili & Andriyani, 2020)

A pregnant woman's nutritional status must be prepared, both from body weight and upper arm circumference. Normal nutritional status occurs when body weight is appropriate with height. Adverse effects of deficient nutritional status include growth, formation, and fetal organ development less than optimal. Furthermore, there will be congenital disorders in babies born, preterm babies, and low birth weight (less than 2500 grams). This condition can even lead to death in infants (Hidayah & Khusna, 2015).

The nutrition in pregnant women is closely correlated with the baby's weight to be born. Pregnant women are a group of people who are very vulnerable to nutritional problems. Malnutrition in pregnant women will cause Chronic Energy Deficiency (CED). Babies born to mothers with CED will have Low Birth Weight (LBW), which is less than 2500 grams. A chronic energy deficiency is a lack of energy that harms the mother's health and the fetus's growth and development. Pregnant women are categorized as chronic energy deficiency if the upper arm circumference is  $<23.5$  cm (Laili & Andriyani, 2020)

Estimating fetal weight is considered necessary during pregnancy because intrauterine fetal growth is not constant. It occurs rapidly at the beginning of the period, then slows down as gestational age increases and is associated with an increased risk of complications during labor for mothers and babies, such as low birth weight or excess birth weight (Santjaka and Walin, 2011)

Estimating the fetus's weight is one of the crucial tasks for midwives and other practitioners. They can predict labor difficulties experienced by pregnant women and count the weight baby born. Midwives will prepare for delivery and other challenges such as hemoglobin levels, pelvic width, and early labor history. Estimated fetal weight based on fundal height is universal regardless of local conditions, such as race, genetics, and geographic conditions (Astriana, 2019)

Glucosuria is glucose in the urine – usually when the serum glucose is  $> 180$ mg/dL. Excretion of glucose in urine occurs when glucose levels in the blood increase and cannot be (Welliangan et al., 2019) An increase in serum metabolites in the mother with glucose in the urine will trigger an increase in the transfer of nutrients to the fetus to cause hyperglycemia in the uterine environment. It can change the fetal body's composition and growth so that the estimated fetal weight measurement will appear more prominent than the gestational age. It will result in hypoglycemia, polycythemia, hyperbilirubinemia, respiratory complications, fetal overgrowth, or macrosomia. This study investigates the correlation between nutritional status and urine glucose on the estimated fetal weight in pregnant women.

## METHOD

This study used a descriptive-analytic method with a cross-sectional design. The population was third-trimester pregnant women at Prima Husada Hospital, Sidoarjo, in May-July 2020, with 30 respondents by purposive sampling. The inclusion criteria were normal pregnant women without complications of pregnancy and comorbidities. Independent variables were body mass index (BMI), upper arm circumference, and urine glucose, while the dependent variable was fetal weight estimation. The instrument to evaluate BMI was the body mass index data before pregnancy using the WHO's standard (underweight: 17.0-18.4 kg/m<sup>2</sup>; normal: 18.5-25.0 kg/m<sup>2</sup>; and overweight: 25.1- 27.0 kg/m<sup>2</sup>). The instrument to assess the mother's upper arm circumference was the Maternal and Child Health book with a normal value of upper arm circumference > 23.5. To examine urine glucose using the dipstick method – negative when a color change becomes yellow and positive when there is a color change to orange, red, or brick red. To calculate estimated fetal weight utilized the Johnson Tausack formula, with the formula (TFU-N) x 155 in grams with an N value of 11 or 12 adjusted for the baby head position. Data were processed using the SPSS 20 program. Data analysis took the chi-square / Fisher exact test with a significance value of p<0.05.

## RESULT

Table 1 Characteristics of Respondents by BMI, Upper Arm Circumference and urine glucose in pregnant women in the third Trimester at Prima Husada Hospital

Variables	Frequency	Percentage (%)
Body Mass Index		
Underweight	0	0
Normal	26	86.6
Overweight	4	13.4
Upper arm circumference		
< 23,5	2	6.6
≥ 23,5	28	93.4
Urine glucose		
Negative	23	76.6
Positive	7	23.4

Table 1 describes that most respondents have a normal body mass index (86.6%), normal upper arm circumference (93.4%), and negative urine glucose examination (86.6%).

Table 2 Estimated Fetal Weight in Pregnant Women in The Third Trimester at Prima Husada Hospital

Estimated Fetal Weight	Frequency	Percentage
Appropriate with gestational age	25	83.3
Inappropriate with gestational age	5	16.7

Table 2 explains that most respondents have an estimated fetal weight appropriate with their gestational age (83.3%).

**Table 3 Correlation Between Nutritional Status and Urine Glucose with Estimated Fetal Weight**

Variables		Estimated Fetal Weight		p-value
		Appropriate with gestational age	Inappropriate with gestational age	
Body mass index	Underweight	0	0	0.337
	Normal	22	4	
	Overweight	3	1	
Upper arm circumference	<23,5	0	2	0.03
	≥23,5	25	3	
Glucose urine	Negative	22	1	0.19
	Positive	3	4	

Table 3 shows that  $p=0.337$  ( $p>0.05$ ) means no correlation between body mass index and estimated fetal weight. The value of  $p=0.03$  ( $p<0.05$ ) implies a correlation between upper arm circumference and the estimated fetal weight. Then,  $p=0.19$  ( $p>0.05$ ) means no association between urine glucose and the estimated fetal weight.

## DISCUSSION

There was a correlation between the upper arm circumference and estimated fetal weight. It is in line with research that upper arm circumference was associated with estimated fetal weight (Astriana, 2019; Hidayah and Khusna, 2015). Other studies also stated an association between the upper arm circumference in pregnant women and the baby's birth weight (Putri, 2017; Vitriani, Ardyta and Hamidah, 2018; Astriana, 2019).

Upper arm circumference is a more accessible and more practical measurement of nutritional status because it only uses one measuring instrument, namely the upper arm circumference measuring tape. However, the upper arm's circumference can only be used for screening purposes, not for monitoring. Especially for pregnant women, the upper arm's circumference shows chronic energy deficiency risk. In general, Indonesian women do not know their prenatal weight, so the pre-pregnancy BMI cannot be measured. The BMI measurement requires two tools: a scale and a height meter. Its tools require specific requirements that must be met, such as the calibration of the weighing equipment and a hard and flat floor for height measurement. Therefore, the upper arm circumference helps detect the risk of chronic energy deficiency in pregnant women because the upper arm circumference is relatively stable. It has been a risk indicator of chronic energy deficiency for pregnant women in Indonesia because there is no pre-pregnancy weight in most pregnant women. So far, the upper arm circumference threshold is 23.5 cm. The recommendation is to use the upper arm circumference threshold of 24.95 cm to detect the risk of chronic energy deficiency in women aged 20-45 years, while 23.5 cm to estimate baby's weight (Ariyani et al., 2012).

CED causes pregnant women not to have adequate nutritional reserves to provide physiological pregnancy needs – hormonal changes and increased blood volume for fetal growth. As a result, there is a

reduced fetus's supply of nutrients and stunted fetus's growth and development. Furthermore, they will have low birth weight (Putri, 2017).

Most respondents who had normal BMI showed an appropriate estimated fetal weight with gestational age. Only a few respondents who had normal BMI exhibited an inappropriate estimated fetal weight with gestational age. Body mass index did not correlate with estimated fetal weight. This result occurs because the fetus's genetic weight during pregnancy is influenced by age, birth spacing, normal weight of pregnant women, hemoglobin levels, and disease presence during pregnancy. Fetal weight in the womb is an important and reliable indicator of neonatal survival (physical growth, development, and mental status). Age, diet, genetics, and mother's activity predispose factors in pregnant women's body mass index. So mothers with normal body mass index and high activity can have an estimated fetal weight appropriate for their gestational age. Body mass index does not differentiate between muscle levels and fat levels in the body. A study reported that mothers' average pre-pregnancy BMI was  $22.3 \pm 3.9 \text{ kg/m}^2$  (the smallest BMI  $17 \text{ kg/m}^2$  and the most significant BMI of  $30 \text{ kg/m}^2$ ), and the average birth weight was  $2800 \pm 390.8$  grams (the smallest was 2200 grams and the largest was 3800 grams). The average birth length was  $48.3 \pm 1.4 \text{ cm}$ , with the shortest body length of 46 cm and the longest 50 cm. The pre-pregnancy BMI (nutritional status) correlated with the estimated baby birth weight and length (Ningrum & Cahyaningrum, 2018).

Most respondents who had negative urine glucose tests showed an appropriate estimated fetal weight with gestational age. Only a few respondents who had positive glucose tests exhibited an inappropriate estimated fetal weight with gestational age. Urine glucose did not correlate with estimated fetal weight. Glucose will be secreted into the liver to be stored as fat reserves in the body, which in the end will increase the mother's weight. This result probably occurs because of false-positive urine glucose tests because of excess sugar consumption before the test. The dipstick method examination is carried out randomly without fasting or reducing sugar consumption excess before checking urine glucose. Factors that cause positive urine glucose test results are excess sugar consumption before the test, gestational diabetes, or liver disease.

Glucosuria is a condition of glucose urine. One of the causes of glucosuria is diabetes. The risk of maternal and infant mortality increases in pregnancy with diabetes. Gestational diabetes mellitus (DMG) is diabetes diagnosed in the second or third trimester of pregnancy that is not diabetes before pregnancy. The chance of DMG in women with a history of diabetes in the family was 3.46 greater. In this study, primigravidas with negative glucosuria were more than positive glucosuria, namely three samples (10%). Urine glucose levels are closely correlated with blood glucose levels. Several factors influence the increase in blood glucose, especially in GDM. The most likely factors in this study were primigravida and

a family history of diabetes. High glucose levels in the body at risk indicate a big baby at birth (Welliangan et al., 2019)

It is essential to measure a woman's body weight before the pregnancy to anticipate the complication risks. One of the methods commonly used to estimate a newborn's weight is to use the estimated fundal uterine height with the Johnson formula. This formula is calculated based on the fundal height (FH), which is the distance from the top of the pubic bone (pubic symphysis) to the top of the uterus (fundus) in centimeters (cm) minus 11,12,13. The result is times 155, and the baby's weight is in grams. The Johnson Toshack formula:  $BB = (FH - N) \times 155$ . All respondents' TFU measurement in the head position is below the ischial spine, so the TFU calculation is  $N = 11$  ( Santjaka et al. 2011)

Calculation or estimation of fetal weight is vital in antenatal care performed during pregnancy and before delivery. Determining the estimated fetal weight during pregnancy can reduce the morbidity and mortality rates associated with complication risks during the delivery process. The accuracy of the assessment of fetal weight will also affect the management of delivery. There are several ways to determine the estimated fetal weight, including measuring the uterine fundus' height and using an ultrasound examination (USG). Fundal height measurement can be done by all health workers, practical, relatively simple, and with reasonable accuracy (Simanjuntak & Simanjuntak, 2020).

## CONCLUSION

The upper arm circumference correlates with estimated fetal weight. Meanwhile, body mass index and urine glucose do not associate with estimated fetal weight in pregnant women in the third trimester at Prima Husada Hospital. All women should prepare themselves before pre-pregnancy for future generations. As women's friends, midwives must routinely carry out health education to improve women's health status.

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