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Original Article

The Overview of Nutritional Status and Blood Glucose Levels of Pregnant Women at the Ubud Health Center, Bali

Luh Putu Rinawati[1,4*], I Gusti Agung Dewi Sarihati[1,2], Cokorda Dewi Widhya Hana Sundari[1,2], I Gusti Ayu Sri Dhyanaputri[1,2], Heri Setiyo Bekti[1,2], Ida Bagus Nyoman Putra Dwija[3]

[1]Medical Laboratory Technology, Polytechnic of Health Denpasar, Denpasar, Bali, Indonesia
[2]Center of Excellence in Science and Technology, Polytechnic of Health Denpasar, Denpasar, Bali, Indonesia
[3]Faculty of Medicine, Udayana University, Denpasar, Bali, Indonesia
[4]Biomedical Science Masters Study Program, Udayana University, Denpasar, Bali, Indonesia

(Correspondence author's email, luhputurinawati@gmail.com)

ABSTRACT

The nutritional status of pregnant women can be determined by measuring the size of mid-upper arm circumference (MUAC) and body mass index (BMI). Women with excessive nutritional status have a high risk of various complications. This study aims to describe the nutritional status and blood glucose levels of pregnant women at the Ubud Health Center, Bali. This descriptive study was conducted on 27 pregnant women who had antenatal care at the Ubud Health Center. MUAC size was measured using a measuring tape, while BMI was measured by calculating body weight in kilograms divided by height in meters squared. Blood glucose levels were measured using the point of care testing (POCT) method. From 27 respondents, it was found that 23 respondents had normal MUAC, 3 respondents had less than normal, and 1 respondent was obese. Based on BMI, 14 respondents had normal BMI, 5 respondents were overweight, and 8 respondents were obese. For blood glucose levels, all respondents have normal levels. Respondents who have MUAC less than normal can be at risk of chronic energy deficiency, while respondents with the obese category can be at risk of GDM, hypertension, and cesarean section. Pregnant women with GDM can increase the risk of type 2 DM, cardiovascular disease and have the potential to give birth macrosomic babies. Pregnant women with GDM almost never give complaints, so screening is necessary. Screening can be done by measuring the nutritional status of pregnant women and blood glucose levels during antenatal care at health center.

Keywords: *Blood Glucose Levels, Body Mass Index, Diabetes Mellitus Gestational, Mid-Upper Arm Circumference, Pregnant Women*

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INTRODUCTION

The gestation period is a period when the mother needs more nutritional elements than what is required from a non-pregnant state. Theses nutrients are not only needed to meet their own needs, they are also needed for the growth of the fetus in the womb. Intake the needs of pregnant women who are not fulfilled, can be bad for the mother and fetus. The fetus can experience defects or be born with low birth weight, anemia in the baby, miscarriage, and neonatal death. Pregnant women who are malnourished will suffer from a chronic lack of energy, resulting in physical weakness, anemia, bleeding, the mother's weight does not increase normally and diabetes in pregnancy which endangers the mother's life. Pregnant women

with poor nutritional status will be at risk of giving birth to babies with low birth weight 2-3 times greater than those with good nutritional status, in addition to the possibility of the baby dying by 1.5 times [1].

The nutritional status of pregnant women is determined by the balance between intake and utilization of nutrients. Pregnancy will increase the utilization of nutrients. Fetal growth is related to weight gain and changes in body composition of pregnant women. The addition of subcutaneous fat is a maternal reserve for fetal growth [2].

Assessment of nutritional status can be known by anthropometry. Anthropometric measurements as an indicator of nutritional status can be carried out by assessing several parameters. The parameter here is a single measurement of the human body. Anthropometric parameters that can be measured include body weight, length/height, upper arm circumference, head circumference, and chest circumference [3].

One of the most common measurements of the nutritional status of pregnant women can be determined by measuring the size of the upper arm circumference (MUAC). MUAC is an indicator of muscle mass and subcutaneous fat tissue. If the size of MUAC is less than 23.5 cm, the pregnant women can be at risk of chronic energy deficiency, so that the pregnant women can be at risk of giving birth to a low birth weight baby [4].

Apart from MUAC, body mass index (BMI) is also a tool or a simple way to monitor the nutritional status of adults, especially regarding underweight and overweight. Underweight can increase the risk of infectious diseases, while excess body weight will increase the risk of degenerative diseases. Therefore, maintaining a normal weight allows a person to achieve a longer life expectancy [5].

In BMI, weight and height affect the measurement results, while the pure MUAC calculation results from measuring the upper arm circumference without being affected by height. Thus, women who according to their weight and height calculations are classified as chronic energy deficiency (BMI <18.5 cm) can be detected not at risk of chronic energy deficiency. Based on the MUAC if the woman has a MUAC size of ≥23.5 cm [6].

Meanwhile, women with excessive nutritional status have a high risk of various antenatal, intrapartum, postpartum, and neonatal complications such as preeclampsia, premature labor, induction of labor, cesarean section, postpartum hemorrhage, Gestational diabetes mellitus (GDM), pregnancy-induced hypertension, and anemia related to the mother. As for the neonatal in the form of microsomia, small or large for gestational age, admission to the neonatal intensive unit care, intrauterine growth retardation, and perinatal death [7].

Gestational diabetes mellitus (GDM) is glucose intolerance during pregnancy, in normal women or those who have impaired glucose tolerance after termination of pregnancy. This situation usually occurs at 24 weeks of gestation and some sufferers will return to normal after giving birth [8].

GDM is a global health problem that affects the health of pregnant women and their babies in the short and long term. In pregnant women, GDM is associated with an increased risk of preeclampsia during pregnancy, an increased risk of type 2 diabetes and co-morbidities such as cardiovascular disease after pregnancy. The hyperglycemic intrauterine environment in GDM pregnancies can affect various aspects of the health of the offspring throughout their life journey. For example, at birth, the offspring tend to be large (macrosomia) and suffer from birth injuries. After birth, they are prone to childhood obesity, impaired glucose tolerance and vascular disorders [9].

Pregnant women with GDM almost never give complaints, so screening is necessary. With early detection in pregnant women can help improve the welfare of the mother both during pregnancy and after pregnancy [10].

METHOD

This research is a descriptive study, with an observational design. This study was used to describe the size of MUAC, BMI, and glucose levels in pregnant women in Ubud Health Center, Gianyar Regency, Bali.

Sample collection was carried out on pregnant women in the Ubud District, Bali. Sample examination was carried out in the Department of Technology Medical Laboratory of the Health Ministry's Denpasar Polytechnic. This research was conducted from June to October 2022.

The population in this study were

pregnant women in the Ubud District, Gianyar Regency, Bali. The sample in this study were pregnant women who had antenatal care at the Public Health Center Ubud, Bali.

The MUAC Measurement Method

The way to measure MUAC is that the measuring tape is stretched around the midpoint between the acromion bone and the olecranon of the left arm in a relaxed state, the midpoint has been measured before the arm is bent 90 degrees. The LILA tape used has a length of 33 cm with an accuracy level of 0.1 cm. If the tape is not sufficient, metlin tape can be used as a substitute.

BMI Method

BMI data is an anthropometric index consisting of a combination of the parameters of body weight in kilograms divided by the square of height in meters. Data on the height of the respondents were obtained using a portable stadiometer made of aluminum 2 meters long with an accuracy level of 0.1 cm which was used to collect Riskesdas 2018 data. Meanwhile, pre-pregnancy weight is the mother's weight before pregnancy in units of kg reported by the mother herself (self-reported).

Blood Glucose Method

Measuring blood glucose while using the point of care testing (POCT) method, with the brand Accugence. In this check, first it is confirmed that the Accugence tool is on and ready to use. Insert the internal control strip of the tool's reagent, and wait until the tool has finished self-checking, after that the tool is turned off, and the internal control strip is removed. Prepared a lancet for capillary blood sampling, and turned on the Accugence device which had internal controls done. After the device was turned on, a glucose test strip was inserted. The finger of the pregnant woman who will be taking capillary blood is cleaned first with 70% alcohol, and allowed to dry. Punctured in the area of the finger that has been disinfected. the first drop of blood is wiped with a sterile cotton swab, and the next drop is inserted into the glucose test strip located on the Accugence tool, and wait for the results from the Accugence tool to release the results. Capillary blood collection marks on pregnant women's fingers, covered with sterile cotton as well.

Analysis Data

The data obtained from the results of data collection is presented in the form of a frequency distribution table. This data includes data on MUAC, BMI, and blood glucose levels of pregnant women at the Ubud Health Center, Bali.

RESULTS

a. The MUAC Result

From the research results obtained a sample of 27 respondents. From the 27 respondents, it was found that 3 respondents had a MUAC size that was less than normal (MUAC ≤ 23,5 cm) and 23 respondents had a normal MUAC size (≥ 23,5 cm) and 1 respondent suggest obesity (> 33 cm) [11]. The average value of the MUAC was 28.11 cm with the highest size was 35 cm and the smallest size was 23 cm.

Table 1. Subject's MUAC Characteristics

Category	N	%
Normal	23	85,19
Less Than Normal	3	11,11
Obese	1	3,70
Total	27	100

b. BMI Results

From the results of the study it was found that as many as 5 respondents were classified as overweight (25,1 – 27,0), 8 respondents were obese (> 27,0), and 14 respondents had a normal BMI [12]. The average value of BMI was 25,31kg/m^2 with the highest size was 32,89 kg/m^2 and the smallest size was 20 kg/m^2.

Table 2. BMI's Subject Characteristics

Category	N	%
Normal	14	51,85
Overweight	5	18,52
Obese	8	29,63
Total	27	100

c. Blood Glucose Results

Based on the results of the study, all respondents blood glucose values were within normal values. None of the respondents had blood glucose above normal values. The average value of blood glucose was 115.96 mg/dl with the highest value was 184 mg/dl and the smallest value was 77 mg/dl.

DISCUSSION

Nutrition during pregnancy has implications for both mother and fetus, therefore an accurate assessment at the antenatal visit is essential. Excess and deficiency of nutrition during pregnancy can affect pregnancy outcome [11].

Over the last decades MUAC has been used to assess malnutrition in children aged <5 years. MUAC is a simple anthropometric measure because it only uses a simple measuring instrument, namely a standard measuring tape. MUAC is also easier to perform in an inpatient setting. Another important advantage of MUAC is that there is minimal change from MUAC during pregnancy, so that MUAC can be a good indicator for detecting women of childbearing age and pregnant women at risk of giving birth to babies with low birth weight. BMI is the gold standard for measuring a person's underweight and overweight. BMI can also be used to measure a person's nutritional status [11].

From the results of the study it was found that there were 3 respondents who had MUAC size less than normal and were at risk of chronic energy deficiency, while 23 respondents had normal MUAC size, and 1 respondent was obese. Meanwhile, according to the results of BMI, there were 14 respondents with normal BMI, 5 respondents with overweight category, and 8 respondents with obesity category.

Chronic energy deficiency is a condition of malnutrition caused by low energy consumption in daily food which lasts for years so it does not meet nutritional adequacy rates. The cumulative impact on health and nutritional status of women of reproductive age is the result of suboptimal nutritional intake from infancy to puberty [13].

Obesity has major implications for the mother and fetus. Maternal risks include an increased risk of GDM, hypertension, caesarean section, venous thromboembolism, postpartum hemorrhage, and sepsis. For the fetus, there is an increased risk of miscarriage, macrosomia, stillbirth, and defects. While malnutrition can be associated with anemia, increased risk of infection, low birth weight, and premature birth[11].

Obese pregnant women have a higher risk of experiencing pregnancy complications, including GDM. The relationship between obesity and diabetes mellitus is very complex. Obesity can make cells insensitive to insulin (insulin resistance). Insulin plays a role in increasing glucose uptake in many cells and in this way also regulates carbohydrate metabolism, so that if there is insulin resistance by cells, then blood glucose levels can also be disrupted [14].

Increased levels of serum metabolites in diabetic mothers (e.g. glucose, free fatty acids, ketone compounds in the body, triglycerides, and amino acids) will trigger an increase in nutrient transfer to the fetus which in turn will cause hyperglycemia in the uterine environment so that it can change growth and fetal body composition [15].

Women with GDM are more likely to develop hypertension and preeclampsia during pregnancy, as well as cardiovascular disease and type 2 DM later in life. Babies born to women with GDM are more likely to be born with a large gestational age and macrosomia, increasing the risk of complications during delivery including shoulder distortion. In addition, the risk of offspring from GDM mothers has a higher risk of being overweight or obese, developing diabetes, or other metabolic diseases in the future [16].

CONCLUSION

The conclusion is screening can be done by measuring the nutritional status of pregnant women and blood glucose levels during antenatal care at health center.

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