

## RELATIONSHIP BETWEEN MATERNAL FIRST DAY POSTPARTUM BODY MASS INDEX AND LOW BIRTH WEIGHT NEONATE AT SANGLAH PUBLIC GENERAL HOSPITAL ON SEPTEMBER UNTIL NOVEMBER 2014

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### ABSTRACT

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Maternal nutritional status plays crucial role to ensure maternal and fetal well-being. The method that often used to determine someone's nutritional status is by calculating the Body Mass Index (BMI). In developing countries, researches on the effects of body mass index on maternal and low birth weight neonate are still rare to be found, especially those using first day postpartum Body Mass Index. The aim of our study is to investigate the relationship between maternal first day postpartum body mass index and low birth weight neonate at Sanglah Public General Hospital on September until November 2014. This analytic observational study with cross sectional method used primary and secondary datas which have been taken from patient's labor medical records in Sanglah Public General Hospital on September until November 2014. The samples are mothers who gave birth and were treated in Bakung Timur, Sanglah Public General Hospital who fulfilled the inclusion and the exclusion criteria. The data were described in the form of frequency tables and tested using a comparative test, Fisher Exact test. From 50 samples, there are 3 samples with low BMI (6%),

16 samples with normal BMI (32%), 12 samples with overweight BMI (24%), 14 samples with obesity I BMI (28%), 5 samples with obesity II BMI (10%). There are 6 neonates with LBW (12%), 42 neonates with NBW (84%), and 2 neonates with HBW (4%). On mothers with obesity II BMI, there are 5 neonates with NBW (100%). On mothers with obesity I BMI, there are 1 neonate with LBW (7.1%), 12 neonates with NBW (85.7%), and 1 neonate with HBW (7.1%). On mothers with overweight BMI, there are 1 neonate with LBW (8.3%), 10 neonates with NBW (83.3%), and 1 neonate with HBW (8.3%). On mothers with normal BMI, there are 2 neonates with LBW (12.5%) and 14 neonates with NBW (87.5%). On mothers with low BMI, there 2 neonates with LBW (66.7%) and 1 neonate with NBW (33.3%). By using Fisher exact test, the p value is less than the predetermined significance level ( $\alpha = 0.05$ ), it is 0.035. There is correlation between maternal first day postpartum BMI and low birth weight neonate.

**Key words** : body mass index, low birth weight, first day postpartum

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## Introduction

Maternal and neonatal mortality rates are important indicators to determine the health quality of a country. Under five mortality rate in the world is tend to decrease, but in Indonesia maternal and neonatal mortality rates tend to increase.<sup>1</sup>

Survey Demografi Kesehatan Indonesia (SDKI) in 2012, maternal mortality rate is higher than in 2007 which is 228 deaths in 100.000 partuses compare with 359 in 100.000 partuses (increase about 57 percent) which is the highest rate in Association of South East Asia Nations (ASEAN).<sup>2,3</sup>

As Millennium Development Goals (MDGs) were agreed and implemented by the United Nations in 2000, the government has target to decrease maternal and neonatal mortality rates into 102 in 100.000 partuses in 2015, it seems to be a big problem since maternal and neonatal mortality rates in Indonesia is very high.

In Bali, 2012, maternal and neonatal mortality rates are also high, and tend to increase from the previous year, 95 deaths per 100.000 partuses.<sup>4</sup>

One of the problems in health that we face is low birth weight as one of the factors that can increase the mortality risk about 10 – 20 times greater than normal birth weight neonate. World Health Organization has predicted between 16% of all babies born have body weights below 2500 gr and 90% of them were found in developing countries, while 20- 30% were found in South East Asia. In Indonesia, based on Riskesdas, the percentage of low birth weight neonate in year 2010 is 11.1%. In Bali, the percentage of low birth weight neonate in 2010 is 12.1%.<sup>5,6</sup>

A mother's nutritional status is one of the most important determinant of maternal and birth outcomes. Maternal nutrition during pregnancy is one of nutrition problem in public health in Indonesia. Pregnant woman need more nutrition than usual for the development and the growth of the fetus. Malnutrition during pregnancy may arise different types of complications such as low birth weight neonate.<sup>7,8</sup>

BMI is the most common method used to measure nutritional status whether a person is underweight, normal, overweight or obese. Several studies showed that underweight woman (low BMI) give birth to neonate with

lower weight, shorter length and with smaller head circumference (HC), and obese woman (high BMI) is in high risk to have macrosomia, thromboemboli, preeclampsia, sectio caesarian operation during delivery, miscarriage, perinatal death.<sup>9,10,11,12</sup>

Body mass index that is usually used in several studies mostly is pregravid body mass index, another studies use the increasing of body weight during pregnancy (at regular antenatal clinic appointments), but in Indonesia many women attend antenatal clinics later on in their pregnancy (>5 months) or never, and it's very rare for them to check their pregravid weight and body mass index (BMI), this phenomena can lead to an inaccurate result of study.<sup>9,10,13</sup>

In developing country, study about the correlation between maternal body mass index (BMI) and neonatal birth weight is rare to be found especially study that use maternal first day postpartum body mass index.

## Method

There are some factors influence the growth and the development of the fetus that cause low birth weight neonate In this research only one risk factor that will be analyzed, it is maternal nutritional status and the correlation with low birth weight neonate. The measurement that is used to measure maternal nutritional status is body mass index measurement that will be taken in the first day after delivering the neonate. Basic theory that is used is mother with low maternal nutritional status tends to have low birth weight neonate , this is because of the low nutritional supply from the mother to the fetus through the maternal blood circulation into the placenta and finally into the fetal blood circulation, causing low birth weight neonate, under 2500 gr

Type of research that is used by the writer is an observational analitic study. Whereas the study design of this study is cross sectional using primary data.

Sample in this study is postpartum women who gave birth and were treated in Bakung Timur at Sanglah Public General Hospital on September until November 2014. Technique that is used to take the samples in this study is consecutive sampling. Some of the samples will be excluded where the exclusion criterias are subject refuses to join the study, incomplete data, twin babies.

Independent variable in this research is maternal first day postpartum body mass index. Dependent variable in this research is neonatal birth weight

The datas are collected and grouped. Then the researcher used SPSS application to process the datas.

### Result

Based on the data which were got from the emergency unit and from Bakung Timur, Sanglah Public General Hospital on September until November 2014, in this research there are 50 samples who fulfil the requirements in inclusion criteria and exclusion criteria.

**Table 1.** Characteristic of the samples based on age.

Age	Frequency (n=50)	Precentage (%)
15-25	19	38
26-35	21	42
>35	10	20

There is no data about mother who is younger than 15 years old (0%). Mothers with age between 26 until 31 years old have the highest frequency for mother who gave birth and were treated in Bakung Timur, Sanglah Public General Hospital, the percentage is 42%. The percentage for mothers who gave birth in age between 15 until 25 years old is 38%. Otherwise, the percentage for patients who are above 35 years old is only 20%.

**Table 2.** Characteristic of the samples based on occupation

Occupation	Frequency (n=50)	Precentage (%)
Jobless/ housewife	31	62
Private	18	36
Civil servant	1	2

From the data which are collected, the percentage for the mothers who are jobless or as housewife is 62% which is the highest percentage for maternal occupation compared with mothers who have job 38%. The percentage for mothers who works as private employees is 36% and the percentage for mothers who works as civil servant is 2%. These data show that most of the mothers who gave birth and were treated in Bakung Timur, Sanglah Public General Hospital are jobless.

**Table 3.** Characteristic of the samples based on education history

Education history	Frequency (n=50)	Precentage (%)
Elementary school	11	22
Junior high school	12	24
Senior high school	14	28
Vocational high school	5	10
Vocational school in economic field	1	2
DI	1	2
DII	1	2
DIII	1	2
Bachelor (S1)	1	2
Uneducated	3	6

Education history of the mothers who gave birth and were treated in Bakung Timur, Sanglah Public General Hospital is divided into elementary school, junior high school, senior high school, vocational high school, vocational high school in economic field, DI, DII, DIII, bachelor/ SI, and uneducated. The highest percentage is 28% for mother who have senior high school education history. The percentage for mothers who have elementary school education history is about 22%, junior high school 24%, vocational high school 10%. Otherwise, the percentage for vocational high school in economic field, DI, DII, DIII, bachelor/ SI are 2% for each category. The percentage for the mothers who have no education history or uneducated mothers is 6%

**Table 4.** Characteristic of the samples based on maternal body height

Maternal body height	Frequency (n=50)	Precentage (%)
<150 cm	8	16
150-160 cm	31	62
>160 cm	11	22

Based on the data which are collected, most of the mothers have body height between 150 until 160 cm with the percentage is 62%. The percentage for mothers who have body height less than 150 cm is 16% and for the mothers who have body height more than 160 cm is 22%.

**Table 5.** Characteristic of the samples based on maternal body weight

Maternal body weight	Frequency (n=50)	Percentage (%)
<50 kg	4	8
50-60 kg	26	52
61-70 kg	15	30
>70 kg	5	10

The highest percentage is for mothers who have body weight between 50 until 60 kg, it is about 52%. The percentage for mothers who have body weight less than 50 kg is 8%, for mothers who have body weight between 61 until 70 kg is 30%, and for mothers who have body weight more than 70 kg is 10%. Those data explain that mothers who gave birth with first day postpartum body weight less than 50 kg are rare to be found because of some physiologic changes in their body after delivering a baby such as fluid retention in the body.

**Table 6.** Characteristic of the samples based on neonatal birth weight

Neonatal birth weight	Frequency (n=50)	Percentage (%)
Low (<2500 gr)	6	12
Normal (2500 gr-4000gr)	42	84
High (>4000 gr)	2	4

For neonatal birth weight, the highest percentage is for neonates who were born with normal birth weight (2500- 4000 gr), it is 84%. The percentage for neonates who were born with low birth weight is 12%. Neonates who were born with high birth weight have the lowest percentage, it is only 4 %.

**Table 7.** Characteristic of the samples based on maternal body mass index

Maternal BMI	Frequency (n=50)	Percentage (%)
Low	3	6
Normal	16	32
Overweight	12	24
Obesity I	14	28
Obesity II	5	10

The formula to calculate maternal body mass index is maternal body weight (kg) divided by

maternal body height in square ( $m^2$ ). From the data which were collected for maternal first day post partum body mass index, the percentage for mothers with normal body mass index (18.5- 22.9) is the highest, it is 32%. In the other hand, mothers with low body mass index (<18.5) have the lowest percentage, it is about 6%. The percentage for mothers with overweight body mass index is 24%, obesity I 28% and obesity II 10%.

#### Univariate Analysis

Based on the calculation result, the mean of maternal age is 27.78 years old with the maximum value or the oldest is 41 years old and the minimum value or the youngest is 15 years old. Standard deviation for maternal age is 6.738 and the mode or the most frequent age is 18 years old and the median is 27.50.

The mean of maternal body height is 157.22 cm with the maximum value or the highest is 168 cm and the minimum value or the shortest is 147 cm. Standard deviation for maternal body height is 6.028. The mode or the most frequent body height is 160 cm and the median is 158 cm. For maternal first day post partum body weight variables, from the calculation result, the mean or the average of maternal body weight is 59.70 kg with the maximum value or the heaviest is 88 kg and the minimum value or the lightest is 41 kg. Standard deviation for maternal first day post partum body weight is 9.620. The mode or the most frequent maternal body weight is 52 kg and the median is 60 kg.

The mean or the average for maternal first day post partum body mass index is 24.1820  $kg/m^2$  with the maximum value of maternal body mass index is 34.85  $kg/m^2$  and the minimum value of maternal body mass index is 17.01  $kg/m^2$ . Standard deviation for maternal first day post partum body mass index is 3.86136. The mode or the most frequent body mass index is 23.74  $kg/m^2$  and the median is 23.8850  $kg/m^2$ .

The mean or the average of neonatal birth weight is 3034 gr with the maximum value or the heaviest is 4250 gr and the minimum value or the lightest is 920 gr. Standard deviation for neonatal birth weight is 626.685. The mode or the most frequent value is 3000 gr and the median is 3000 gr also.

#### Bivariate Analysis

For mothers with obesity II first day postpartum body mass index, there are 5

neonates with normal birth weight (100%), and there is no neonates with high birth weight (0%) or low birth weight (0%). On mothers who have obesity I body mass index most of the neonates are in normal birth weight, there are 12 neonates with normal birth weight (85.7%), 1 neonate with high birth weight (7.1%), and 1 neonate with low birth weight (7.1%). On overweight body mass index mothers, most of the neonates are in normal birth weight also, there are 10 neonates with normal birth weight (83.3%), 1 neonate with high birth weight (8.3%), and 1 neonate with low birth weight (8.3%). For mothers who have normal body mass index, there are found 14 neonates with normal birth weight (87.5%), as the highest percentage, 2 neonates with low birth weight (12.5%), and there is not found neonate with low birth weight (0%). On low maternal first day postpartum body mass index, there are 1 neonate with normal birth weight (33.3%) and 2 neonates with low birth weight (66.7%). From the data which are served, it can be concluded that most of the mothers delivered normal birth weight neonates, but mothers who have low body mass index are tend to have low birth weight neonates, it is about 66.7%, this condition is triggered by some factors, one of them is nutrition during pregnancy which will affect the growth and the development of the fetus inside the uterus.

Neonates with high birth weight are found on 1 overweight body mass index mother (50%) and on 1 obesity I body mass index mother (50%), but it is not found in obesity II (0%), normal (0%), and also low body mass index mothers (0%).

Neonates with normal birth weight are found on 14 mothers who have normal body mass index (33.3%), 12 mothers who have obesity I body mass index (28.6%), 10 mothers with overweight body mass index (23.8%), 5 mothers with obesity II body mass index (11.9%), and on 1 mother who has low body mass index (2.4%). Neonates who have low birth weigh are found on 2 mothers with low body mass index (33.3%), 2 mothers with normal body mass index (33.3%), 1 mother with overweight body mass index (16.7%) and 1 mother with obesity I body mass index (16.7%).

Fisher exact test is a non parametric test to analyse discrete data (nominal or ordinal)

when two independent samples are small in frequency. The result of fisher exact non parametric test between maternal first day postpartum body mass index and neonatal birth weight is 0.035 for the p- value and predetermined significance level ( $\alpha$ ) that is used in this research is 0.05. It can be concluded that the p- value is smaller than the predetermined significance level ( $\alpha$ ) ( $0.035 < 0.05$ ) so null hypothesis ( $H_0$ ) is rejected and alternative hypothesis ( $H_a$ ) is accepted. From the result of fisher exact non parametric test, it can be concluded that maternal first day postpartum body mass index has relationship with low birth weight neonate.

### Discussion

This study demonstrates the impact of maternal first day postpartum BMI on pregnancy outcome. Pregnancy outcome is worst in babies from mothers with decreased body mass index as compared to healthy weight mothers with respect to increased incidence of preterm birth, lower birth weight and increased neonate morbidity and mortality on the neonatal ward.

There is no source from the previous study about the correlation between first day postpartum BMI and pregnancy outcome but earlier studies report significant correlation between pre-pregnancy body mass index and weight gain during pregnancy with the birth weight of the neonates. The results indicate that increased maternal BMI was associated with an increased blood pressure and increased incidence of peripheral edema, caesarean section, fetal macrosomia and admission of the newborn to a neonatal care unit, whereas decreased BMI was associated with preterm birth and lower birthweight.<sup>7,10,13,15,16,21</sup>

### Conclusion and Suggestion

Mothers who gave birth and were treated in Bakung Timur, Sanglah Public General Hospital have some kind of characteristics. The age of the mothers mostly between 26 until 35 years old where it is the productive age of a human, mother under 15 years old is not found in this research. Most of the mothers are jobless or as a housewife. Most of the mothers are having senior high school as their education history, only a few of them who have higher level than senior high school for their education history. The body height of the mothers mostly between 150 until 160 cm

which is the mean height for Indonesian people. For maternal first day postpartum body weight, the highest frequency in this research is for mothers who have body weight between 50 until 60 kg, otherwise the lowest frequency is for mothers with body weight less than 50 kg. In the case of neonates, most of them were born with normal birth weight, only a few of them were born with low and high birth weight. For the maternal first day postpartum body mass index, normal, overweight, and obesity I body mass index are higher in frequency compared with obesity II and low body mass index.

In this research, the correlation between maternal first day postpartum body mass index and neonatal birth weight is analysed. On mothers with obesity II body mass index, all of the neonates are in normal birth weight. On obesity I, overweight, and normal body mass index, most of the neonates are in normal birth weight also. It is very different with mothers who have low body mass index, most of the neonates are in low birth weight.

Neonates with high birth weight are tend to be found on mothers with overweight and obesity body mass index. Neonates with normal birth weight are often found on normal body mass index mothers and rarely to be found on mothers who have low body mass index. In the other hand, neonates with low birth weight are usually found on mothers who have low or normal body mass index.

In this research, fisher exact non parametric test is done to analyse the correlation between maternal first day postpartum body mass index and neonatal birth weight. The result of fisher exact test is the p value is less than the predetermined significance level that is used in this research ( $\alpha=0.05$ ), it is 0.035, so it can be concluded that the null hypothesis (H<sub>0</sub>) is rejected and the alternative hypothesis (H<sub>a</sub>) is accepted. Based on the result of fisher exact test, it is found that Maternal first day postpartum Body Mass Index (BMI) has relationship with low birth weight neonate.

Based on the result of this research, it's known that there is a correlation between maternal first day post partum body mass index and low birth weight neonate, so every mother must take a consideration about the nutrition in pregnancy and after delivering the fetus and also there must be some programs about nutrition for pregnant woman and for

breastfeeding mother to increase mother's knowledge so it can decrease the maternal mortality rate and also neonatal mortality rate in general.

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