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THE DIFFERENCES IN THE ACCURACY OF CALCULATION RESULTS FROM SIMPLE FORMULA, DARE FORMULA, AND JOHNSON-TOSHACK FORMULA IN CALCULATING ESTIMATED FETAL WEIGHT

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ABSTRACT

Baby weight has a significant meaning in determining diagnosis, delivery plan, and referral. Uterus fundus height measurement can be used as an indicator in the assessment of estimated gestational age and estimated fetal weight. Ideally, the measurement of the estimated fetal weight is measured using sophisticated equipment. However, in Indonesia, many deliveries are still carried out in basic services. They are limited by authority; it is necessary to develop reliable but straightforward measurement techniques. The purpose of this research is to determine the differences in the results of the calculation of the simple formula, the dare formula, and the Johnson Toshack formula in calculating the estimated fetal weight at the Batujajar Community Health Center. This research is an analytical survey research with a cross-sectional approach. There were 160 mothers involved as samples who gave birth in June-October 2020 at the Batujajar Community Health Center who met the inclusion and exclusion criteria. The data obtained were analyzed using the T-test and multiple linear regression. The results showed that there was no difference between the calculation of the simple formula (p-value = 0.188) and the dare formula (p-value = 0.734) in calculating the estimated fetal weight. There is a difference between the Johnson-Toshack formula's calculation with the newborn's actual weight (p-value = 0.001). The regression test results showed that the dare formula is more accurate in calculating the fetal body weight measurement with an r = 0.999. In conclusion, the dare formula is more accurate in calculating the estimated fetal weight.

Keywords: **Simple formula, dare formula, johnson Toshack, estimated fetal weight**

INRTODUCTION

Antenatal Care (ANC) are health services provided by health professionals for pregnant women who focus on promotion and prevention. This is aimed at escorting pregnant women to be able to give birth and have healthy babies, and to detect and anticipate early pregnancy and fetal abnormalities.(Dinas Kesehatan Jawa Barat 2015) For midwives who are delivering the baby, the fetal weight has a very important meaning in determining the diagnosis, delivery plan, and referral. Uterus fundus height measurement can be used as an indicator in the assessment of the estimated gestational age and estimated fetal weight. This is intended to anticipate possible complications of pregnancy-childbirth such as impaired baby growth or macrosomia (large babies). Fundus height is part of the standard measure of ANC examination and a vital part because it is part of the referral screening in labor. In addition to identifying the mother's gestational age, fundus uterine height measurement is also carried out to calculate the estimation of the baby's birth weight. Calculation of the estimated fetal weight is one of the most important measurements at the onset of labor. Birth weight babies who are large or less will have the potential to cause health problems for the baby, thus affecting the life and future

of the baby.(Cuningham 2014) Extremely small or large birth weight has the potential to increase perinatal morbidity, which can affect the life and future of the baby. An accurate fetal weight prediction method is useful for determining small or large birth weight so that it can help midwives to make early detection as a preventive measure to overcome complications that may occur.(Cuningham 2014),(Marmi 2015)

The results of the report from Basic Health Research (2013) showed that the highest birth attendance assisted by health workers was 81.6%, the highest birth attendance assisted by midwives was 67%, and the rest was assisted by other health workers.(Dinas Kesehatan Jawa Barat 2015) Thus, for birth attendants such as midwives, fetal weight has a very important meaning in determining the management of pregnancy and childbirth. There are various ways to determine the estimated fetal weight, including the measurement of the Fundus Uterine Height and ultrasonography (USG).(Sulistyawati 2012),(Malik N n.d.)

Estimation of fetal weight is very important in making clinical decisions during pregnancy and delivery. This is a useful way to address morbidity and mortality problems, such as helping midwives in predicting possible complications of pregnancy and childbirth such as impaired baby growth, macrosomia, cephalopelvic disproportion (CPD) when labor progress is poor, or early detection of possible shoulder dystocia.[2,4] A similar opinion was also expressed by Malik[6] that birth weight would affect the accuracy of delivery management and its outcomes, such as stunted fetal growth or low birth weight. Large or underweight babies will have the potential to cause health problems for the baby, which will affect the life and future of the baby. The target of the Ministry of Health in 2019 is that the low birth weight figure was 8%, but seeing the data that in 2014 the low birth weight figure was 10.2%, so efforts are needed to reduce this figure. In West Java, the target number of LBW incidence is 2.3%. Of the target, one of the areas that did not meet was West Bandung Regency which was 2.4%. This figure is large compared to Bandung Regency which is only 1.5%. This, an accurate method of predicting fetal weight is useful for knowing small or large birth weight so that it can help midwives in particular to deal with complications that may occur.

Accuracy of fetal weight estimation is of key importance in antenatal care, as well as in the planning and management of labour and mode of delivery. In order to achieve more accurate prenatal fetal weight estimations and align these with a risk-optimizing mode of delivery, additional tools supporting the standard of use with ultrasound are needed. According to Khani(Khani et al. 2011) a significant correlation was found between EFW by ultrasound actual birth weigh and ultrasound is the best method for birth weight assessment.(Mukherjee, Goswami, and Kumari 2013) In urban setup, ultrasound is easily available for birth weight estimation. In rural setup such imaging modality are not easily available and clinical methods are still used by health workers for birth weight estimation as clinical methods of birth weight estimation don't require any costly equipment and they are easy to use and give immediate estimation of expected birth weight.(Prajapati and Patel 2018) The main ultrasonic methods used to calculate the weight of a fetus are based on measurement of fetal abdominal circumference (AC) and estimated fetal weight (EFW) using a formula first described by Hadlock et al. and the sufficient accuracy of this model has recently been proven . Antenatal magnetic resonance imaging (MRI) or soft-tissue measurements have been shown to be of no benefit in improving the accuracy of fetal weight estimation.(Preyer et al. 2019)

Sonographic estimation, although is widely used but sometime inconvenient because of the cost, acquirement of instrument and well trained physicians. Thus, keeping in view the easy procedure to do clinical estimation can be included in routine training of medical personnel.(Malik et al. 2012),(Alirezaei, Azmoude, and Ghaderi 2018) In developing countries such as Indonesia, many deliveries are carried out in basic services, such as in independent midwives who collide with authority. Therefore, simple yet superior and reliable measurement techniques are developed. Clinical methods Extensively used, convenient and virtually

costless. Various clinical formulas used for fetal weight estimation. These formulae involve a variety of sonographically obtained biometric measurements.(Prajapati and Patel 2018) There are several methods of measuring the weight of the fetus in utero. Each method has a different calculation formula, including the Johnson-Toshack formula, the Dare Formula, and the Simple Formula.(Bobak et al. 2012),(HOVLANTA 2016) Although one drawback of the palpation method is that the woman's abdominal muscles, fatness and fetal position may have an effect on the estimation of fetal size.(Khani et al. 2011) Johnson and Toshach (1954) accurately estimated fetal weight in 68% of the 200 cases, with ± 10% error in their original research. According to the present study, Johnson's formula produced more accurate estimates, especially for fetuses in the normal weight range. This method is easier than Dare's formula for objective measurements and calculations. It is also more reliable than a mother's perception method and can be easily taught to midwives, less experienced staff, medical students, and physicians.(Rianti and Dkk 2017),(Yuliza Anggraini 2017),(Santos and Souza 2016)

Most commonly used prediction models in Indonesia only use the Johnson-Toshack because it is considered more precise and easier to remember. However, the Johnson-Toshack formula is less accurate than the other three formulas. This is evidenced by research conducted by Erwin et al. in 2014(Sahputra Erwin, Pasaribu 2014) stating that the Dare Formula was more accurate to use than the Johnson-Toshack formula. Three methods were used to estimate the birth weight of the fetus, namely; Johnson-Toshack Formula [TBJ = 155 x (fundal height-K)], Simple Formula [TBJ = 100 x (fundal height -5)], and Dare Formula (TBJ = fundal height x LP). (Sahputra Erwin, Pasaribu 2014),(Mardeyanti, Djulaeha, and Fatimah 2013),(Nindrea 2017). The purpose of this research is to determine the differences in the calculation results of the Simple Formula, Dare Formula, and Johnson-Toshack Formula in calculating the estimated fetal weight compared to the weight of the newborn at the Batujajar Community Health Center.

METHOD

This research is an analytical survey research with a cross-sectional approach. The samples in this study were 160 mothers who gave birth with a mature gestational age in June-October 2020 at the Batujajar Community Health Center who met the inclusion criteria, namely the mothers who had clear last menstrual period, and gestational age of 37–40 weeks. The exclusion criteria included: maternal complications such as fetal malpoition, premature rupture of membranes (PROM), Intra Uterine Fetal Death (IUFD), Anencepalhi, Gemelli, Oligohydramnios, Polyhydramnios, IUGR, and Diabetes Mellitus.

The data collection process was carried out with primary data, namely by measuring the height of the uterine fundus, abdominal circumference, and lowering of the head. Then, the estimated fetal weight was calculated using the Simple Formula, the Dare Formula, and the Johsons-Toshack Formula. The actual baby weight data was obtained by weighing the baby after birth with digital scales.

The analysis used was univariate and bivariate analysis using the T-test statistical test to determine the difference in the accuracy of the Simple Formula, Dare Formula, and the Johsons-Toshack Formula with the fetal weight. Multivariate analysis in this research was used to see which formula was the most accurate in calculating the estimated fetal weight. This research has received ethical clearance from the Bakti Tunas Husada Tasikmalaya School of Health Sciences No. 080/kepk-bth/IX/2020.

RESULTS

Table 1. Characteristics of First Stage Maternity at Batujajar Community Health Center

Parameter	Total [n = 160]
Age (years)	
≤ 20	11
20–35	120
>50	29
Parity	
Primigravida	105
Multigravida	52
Grandemultigravida	3

Based on Table 1 above, it was found that most of the women who gave birth at Batujajar Community Health Center were aged 20–35 years, which was 75 people. Most of the parity of the respondents was primigravida.

Table 2. Overview of The Fundal Height, Abdominal Circumference, Simple Formula, Dare Formula, Johnson-Toshack Formula, and Actual Baby Weight at Batujajar Community Health Center

Variable	n	Min.	Max.	Mean	Standard Deviation
The Fundal Height	160	27	45	34.34	3.7
Abdominal Circumference		81	89	85.39	1.65
Simple Formula		2200	4000	2934.38	372.3
Dare Formula		2187	3960	2937.68	369.1
Johnson-Toshack		2325	5115	3515.59	564.4
Actual Baby Weight		2190	3975	2937.31	368.6

Based on Table 2 above, the average uterine fundal height of mothers who were giving birth at the Batujajar Community Health Center was 34.34 cm and the average abdominal circumference was 85.39 cm. The calculation result of the average estimated fetal weight using the simple formula was 2934.38 grams, the average estimated fetal weight using the dare formula was 2937.68 grams, and the average calculation result using the Johnson-Toshack formula was 3515.59 grams. The largest standard deviation was based on the calculation of the estimated fetal weight using the Johnson-Toshack formula, which is 564.4 grams.

Table 3. Differences in the Calculation Results of Simple Formula and Body Weight for Newborns at Batujajar Community Health Center

Variable	n	Mean	Standard Deviation	Diff Mean	CI 95%	p-value
Simple Formula	160	2934.3	372.3	-2931	-7.305 – 1.443	0.188
Actual Baby Weight		2937.31	368.6			

Based on Table 3 above, the mean estimated fetal weight for simple formula fetuses was 2934.4 grams with a standard deviation of 372.3 grams. Meanwhile, the average actual baby weight was 2937.31 grams with a standard deviation of 368.6 grams. The result of the difference test between the estimated baby weight with a simple formula and the actual weight of the newborn was p-value=0.1888 (α=0.05). Thus, Ho was accepted, which means that there was no significant difference between the birth weight of the newborn and the estimated results using a simple formula

Table 4. Differences in the Calculation Results of Dare Formula and Body Weight for Newborns at Batujajar Community Health Center

Variable	n	Mean	Standard Deviation	Diff Mean	CI 95%	p-value
Dare Formula	160	2937.68	369.1			
Actual Baby Weight	160	2937.31	368.6	0.375	-1.801 – 2.551	0.734

Based on Table 4 above, the average weight estimation for infants in the dare formula was 2937.68 grams with a standard deviation of 369.10 grams. Meanwhile, the average actual baby weight was 2937.31 grams and the standard deviation was 368,699 grams. Therefore, there was no difference in the mean estimate of fetal body weight from dare formula with birth weight of infants with p-value=0.734 (p>0.05).

Table 5. Differences in the Calculation Results of Johnson-Toshack Formula and Body Weight for Newborns at Batujajar Community Health Center

Variable	n	Mean	Standard Deviation	Diff Mean	CI 95%	p-value
Johnson-Toshack	160	3,515.59	564.4	578.2	545.915 – 610.060	0.0001
Actual Baby Weight		2,937.31	368.6			

Based on Table 5 above, the mean weight estimate for infants according to the Johnson-Toshack formula was 3515.59 grams with a standard deviation of 564.4 grams. Meanwhile, the average actual baby weight was 2937.31 grams with a standard deviation of 368.6 grams. From the results of the statistical tests, it was known that there was a difference in the mean estimated fetal weight with Johnson-Toshack formula with birth weight of infants with a p-value=0.0001 (p > 0.05).

Table 6. Regression Analysis of the Accuracy of Calculation Results of Simple Formula, Dare Formula, and Johnson-Toshack Formula in Calculating the Estimated Body Weight

Variable	r	R^2	p-value
Simple Formula	0.997	0.994	0.0001
Dare Formula	0.999	0.999	0.0001

Johnson-Toshack Formula	0.989	0.978	0.0001

Based on Table 6 above, there was a strong and positive relationship between Simple Formula and actual baby weight. Simple Formula affected actual baby weight by 99.4%. Dare Formula with actual baby weight showed a very strong relationship (r=0.999). The coefficient value with a determination of 0.999 means that the Dare Formula affected the actual baby weight by 99.9%. The Johnson-Toshack formula with actual baby weight showed a very strong relationship (r=0.989) and had a positive pattern. This means that the higher the Johnson-Toshack value, the higher the actual baby weight. The coefficient value had a determination of 0.978. This means that Johnson-Toshack Formula affected the actual baby weight by 97.8% and the remaining 2.2% was influenced by other variables.

DISCUSSION

Birth weight is a key factor affecting fetal and neonatal morbidity. Accurate fetal weight estimation is extremely useful in the management of pregnancy and delivery. The growth of a fetus for a period of pregnancy is said to be good if its weight is in accordance with the weight it should be for that gestation. This is done to see if the baby has growth retardation or not.(Santjaka, Walin, and Handayani 2011) The results of a study conducted by Siddiqua et al.(Hospitals, Hospitals, and Author 2014) stated that ultrasonographic estimation was quite accurate in measuring fetal weight estimates. Clinical estimation by external palpation of fetal parts and uterine contour is easy in practice, inexpensive and reliable. Sonographic estimation, although is widely used but sometime inconvenient because of the cost, acquirement of instrument and well trained physicians. Thus, keeping in view the easy procedure to do clinical estimation can be included in routine training of medical personnel.(Malik N n.d.), (Alirezaei, Azmoude, and Ghaderi 2018) It is just that, the availability of facilities and services for ultrasound examination in Indonesia is still rare and the highest assistance for childbirth has been done by midwives so that it will have boundaries with authority.(Dinas Kesehatan Jawa Barat 2015) Thus, an alternative means of monitoring fetal weight growth is needed where ultrasound facilities are not available. One easy way to estimate fetal weight is to measure the uterine fundus height and then estimate the fetal weight using a certain formula.(Gayatri and Afiyanti 2014)

The technique of estimating fetal weight which is mostly used by midwives is by measuring the height of the uterine fundus. Measurement of the fundal height is precisely done on a centimeter scale. Uterine fundus height has a strong and meaningful relationship with baby weight and reflects fetal growth and fetal size more accurately. In the measurement of uterine fundal height, there are various formulas to determine the estimated fetal weight including the formula of Johnson-Toshack, Dare, Simple, Niswander, and so on.(Varney, H. M Kriebs, J.l Gegor 2010),(Irianti Bayu. Erda MH, Fitra Duhita, Fitria Prabandari 2015)

Based on Table 3, it was found that the difference between the calculation of the simple formula and the actual weight of the baby, the average estimated weight of babies according to the simple formula was 2934.38 grams with a standard deviation of 372.3 grams. Meanwhile, the average actual baby weight was 2937.31 grams with a standard deviation of 368.7 grams. The p value=0.188 (p>0.05), so that Ho was accepted, which means that there was a significant difference between the estimated fetal weight using a simple formula and the actual infant weight. His result is similar to the research conducted by Rianti et al.(Rianti and Dkk 2017) with a standard deviation of 367.70 grams. Thus, this formula also had a tendency to calculate the estimated fetal weight thatwas greater than the weight of the baby at birth and simple

formulas tended to be more appropriate for clients who had intact membranes, because the deviation was smaller.

This is also in line with research conducted by Rizki in 2018 that the simple formula is quite easy to use because the calculation does not use a calculation tool and is simpler than the dare formula which has to measure abdominal circumference. The simple formula only uses the uterine fundus height measure, and when compared to other formulas like Johnson-Toshack which have to measure the fundus height and determine lowering of the head, the Simple Formula is simpler.(Rizki 2019)

The uterine fundus height measurements can give different results that are more than 2 cm. This can suggest that the fetus is smaller or larger, multiple pregnancies, and mismatching of gestational age and uterine fundus height size. Some things that need to be considered in measuring the fundus height besides that are the condition of the bladder.(Irianti Bayu. Erda MH, Fitra Duhita, Fitria Prabandari 2015) As explained by Worthen and Bustillo (1980), the location of the fundus will be 3 cm higher when the bladder is full. Therefore, the bladder was very influential in calculating the estimated fetal weight when using a Simple Formula.(HOVLANTA 2016)

In the research conducted by Gayatri and Afiyanti,(Gayatri and Afiyanti 2014) it was found that all the formulas made by western scientists were not suitable for estimating birth weight in Indonesia (Niswander, Johnson, and SFH formulas). This was possible because of racial differences as stated by Euans et al. (1995) in their research, that fundus height measurement could replace ultrasound measurement but this measurement was influenced by race. This was in accordance with the results of research in Table 3 that the standard deviation of the estimated calculation using the Johnson-Toshack formula was 564.475 grams and the result of the p-value difference test = 0.0001 ($p < 0.05$), so that Ho was rejected, which means that there was a significant difference between the Johnson-Toshack formula assessments and actual infant weight. The results obtained tended to be greater when compared to actual body weight. According to Santjaka et al.(Santjaka, Walin, and Handayani 2011) in their research which was conducted on 359 pregnant women at Manado Hospital, the Johnson-Toshack formula was not good for estimating birth weight because the results tended to be higher. The Johnson-Toshack formula was more appropriate for clients who had a waist circumference of 90-100 cm because they had a smaller deviation. This result may be due to inaccurate measurement of fundal height and examination of the lowering of the head or fetal presentation so that the calculation of the estimated fetal weight was not accurate. Personnel taking different estimated fetal weight measurements may have different interpretations of the test.(Puspita, Arifiandi, and Wardani 2019)

The Johnson-Toshack formula is calculated based on the height of the uterine fundus, which is the distance from the top of the pubic bone (symphysis pubis) to the top of the uterus (fundus) in centimeters (cm) which is subtracted by 11,12,13 and the result is multiplied by 155. The result is obtained in grams. The Johnson-Toshack formula divided by weight = (fundus height - N)x155. The results of the research from all respondents showed that when the fundus height measurement was carried out, the position of the head was below the ischial spine, so the fundus height calculation was N=11.(Irianti Bayu. Erda MH, Fitra Duhita, Fitria Prabandari 2015)'(Rianti and Dkk 2017) In contrast to this, according to Merdeyanti,(Mardeyanti, Djulaeha, and Fatimah 2013) the use of the Johnson-Toshack formula in estimating fetal body weight had higher accuracy, but caution was needed when measuring the height of the uterine fundus. In interpreting fetal weight, the formula is used only in normal pregnancies, that is, in fetuses with a head presentation. This formula cannot be used in breech presentations or other malpresentations. The sensitivity of this method was 86% and the specificity was 59%. In use, the Johnson-Toshack formula had 47% of cases assessed in + 10% of actual birth weight. In the case of polyhydramnios and oligohydramnios, the

estimated fetal body weight was overestimated when fluids were adequate. Maternal obesity also caused overestimation of fetal weight, so the Johnson-Toshack formula was less accurate. The accuracy of this method increased when the fetal weight is in the range of 2,500-3,500 grams.Tabe

Newborn weight cannot be predicted accurately and precisely because during pregnancy, the uterus contains many organs and tissue structures, such as the amniotic fluid, placenta, umbilical cord, and the fetus. Apart from that, the lowering of the head also greatly affected the estimated body weight. This is also explained in Merdeyanti's research(Mardeyanti, Djulaeha, and Fatimah 2013) that factors that could affect birth weight include internal environmental factors, namely mother's age, birth spacing, parity, hemoglobin levels, nutritional status of pregnant women, pregnancy checks, and disease during pregnancy. In the research conducted by Fairuz,(Kesehatan et al. 2019) it was stated that the Johnson-Toshack formula had a high correlation value in calculating the estimated fetal weight in multigravida mothers. This is closely related to the research respondents who were actually dominated by primigravida mothers.

When viewed from the age factor, this is in accordance with the results of research in Table 1. Most of the respondents were 20-35 years old, which is the reproductive age of women to give birth. From the results of the research, it can be seen that the older the age of the mother, the more the baby's weight tended to increase. Similar to this, in a research conducted on 359 pregnant women, the average birth weight increased according to age, but at the age of pregnant women more than 40 years old, the baby's weight tended to decrease due to vascular factors or systemic disease.(Irianti Bayu. Erda MH, Fitra Duhita, Fitria Prabandari 2015),(Mardeyanti, Djulaeha, and Fatimah 2013)

Based on Table 3, the mean value of the Dare Formula accuracy calculation with the newborn weight was 2937.7 grams, with a standard deviation tending to be lower than the calculation results of the Simple Formula or Johnson-Toshack formula, which was 369.1 grams with p-value = 0.734 ($p > 0.05$). Thus, Ho was accepted, which means that there was no significant difference between the estimated fetal weight using the Dare Formula and the actual infant weight. The Dare formula itself is a measurement of the mother's abdominal circumference in centimeters which is then multiplied by the size of the uterine fundus in centimeters, then an estimate of the fetal weight is obtained. This formula was considered easier to use and has minimal bias.(Nindrea 2017) In his research, Kumari(Mukherjee, Goswami, and Kumari 2013) stated that the Dare Formula achieved a high degree of accuracy in predicting birth weight, which is < 4 kg.

Based on research conducted by Ujiningtyas in 2014,(Sahputra Erwin, Pasaribu 2014) it was found that the Dare Formula had a higher correlation than the Johnson-Toshack Formula. This is possibly because the measurement of the Johnson-Toshack Formula which was based on the height of the uterine fundus with the fetal head that has or has not entered PAP. While the head of the fetus that was entered is not measured how much length of the head has been entered into the PAP. Based on Table 2, whereas the measurement of the fundal height is used in calculating the fetal weight. so that the average resulting from the calculation of the Johnsons Toshack formula tends to be larger than the other formula.

Calculation using the Dare Formula is based on fundal height and considers abdominal circumference. From the results of the research with the Dare Formula in 498 patients, it was found that there was a good correlation between the estimated numbers and the real fetal weight ($r=0.742$). In the current research, the Dare Formula was slightly more accurate than the Johnson-Toshack Formula. This can be explained by the lack of correction for obesity in the Dare Formula and the high prevalence of 90-kilogram women in the population. Larger studies involving obese patients are needed to test the hypothesis of the Dare Formula for estimated fetal weight in obese women. This formula was considered easier to use in various circles and

had minimal bias than the symphysis fundus height. From the research of Mohanty, Das, and Misra, it was found that the abdominal girth method had a good predictive value for low birth weight babies.(HOVLANTA 2016)

The regression test results in Table 4 showed that the closeness value was very strong and the coefficient of determination of the Dare Formula was greater than the Simple Formula and Johnson-Toshack, with r value = 0.999 and R^2=0.999, which means that the Dare Formula affected the actual baby weight by 99.9%. Then, the accuracy of these two results was similar to the regression test conducted by Santjaka,(Santjaka, Walin, and Handayani 2011) where if there is a change in the mother's weight during pregnancy, the baby's weight also changes. Then, if the mother's weight increases but is not too high, then the baby's weight is also low. However, if the mother's weight increases high enough, the baby's weight will also increase along with the mother's weight gain.

The results of the calculation of actual body weight are not much different from the results of calculating the estimated fetal weight using the Dare Formula. The clinical method for predicting fetal weight using measurements of fundal height and maternal abdominal circumference is objective and easy to teach. The Dare Formula tended to be more appropriate for primigravida clients because the deviation was smaller and also tended to be more appropriate for clients who had a waist circumference of 90–100 cm.(Nindrea 2017) Thus, tests to determine estimated fetal weight by calculating uterine fundal height and abdominal circumference such as Dare Formula are easy to study and are still being used and are widely used in daily practice.

In this research, the Johnson-Toshack formula had a very strong relationship and has a determination coefficient value of 97.8%. However, it has the same results as the research conducted in Padang that the Dare Formula, when compared with the Johnson-Toshack Formula in predicting fetal weight at birth in aterm pregnant patients, was more significant and the measurement was closer to the value of the baby’s final birth weight.(Sahputra Erwin, Pasaribu 2014) Essentially, each formula has its advantages and disadvantages. The advantages of the Johnson-Toshack Formula were that it is commonly used and its accuracy has been scientifically proven. While the weakness of the Johnson-Toshack Formula was that there is an N value in the formula that needws to be known by examining the lowering of the fetal head. The high sensitivity and experience of health workers plays an important role in getting the N value correctly so that it can provide the right estimated fetal weight. In addition, the existence of a variable of the lowering of the fetal head in the Johnson-Toshack formula cannot reduce prediction errors in estimating fetal weight and can cause problems of subjectivity. Unless, there is a standard protocol for locating fetal stations with minimal errors. Meanwhile, the advantages of using the Simple Formula are also quite easy, including the unnecessary use of counting tools and it is simpler than the Dare Formula which has to measure abdominal circumference and the lowering of the head.(Rizki 2019)

CONCLUSION

There was no significant difference between the calculation results of the Dare Formula and the Simple Formula in calculating the estimated fetal weight. There was a difference between the Johnson-Toshack Formula and the actual baby's weight. The Dare Formula was more accurate in calculating the estimated fetal weight compared to the Simple Formula and the Johnson-Toshack Formula. It is necessary to use the Dare Formula to determine the estimated fetal weight that could be used in antenatal care, counseling, diagnosis, and delivery management.

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