



COMPARISON OF ACCURACY BETWEEN RISANTO, DARE AND JOHNSON TOSHACH FORMULAS IN DETERMINING ESTIMATION OF FETAL WEIGHT IN PREGNANT WOMEN

Ivan C. Pasaribu	Department of Obstetrics and Gynecology Faculty of Medicine, University of North Sumatra H. Adam Malik Hospital Medan
Muara Panusunan Lubis*	Department of Obstetrics and Gynecology Faculty of Medicine, University of North Sumatra H. Adam Malik Hospital Medan *Corresponding Author
Muhammad Rusda	Department of Obstetrics and Gynecology Faculty of Medicine, University of North Sumatra H. Adam Malik Hospital Medan
Johny Marpaung	Department of Obstetrics and Gynecology Faculty of Medicine, University of North Sumatra H. Adam Malik Hospital Medan
Cut Adeya Adella	Department of Obstetrics and Gynecology Faculty of Medicine, University of North Sumatra H. Adam Malik Hospital Medan
Hayu Lestari Haryono	Department of Obstetrics and Gynecology Faculty of Medicine, University of North Sumatra H. Adam Malik Hospital Medan

ABSTRACT

Background: Birth weight is the most important parameter to determine the neonatal survival rate.

Methods: This research used cross sectional study that compared the level of accuracy between Risanto, Dare and Johnson Toshach formulas in determining estimated fetal weight (EFW).

Results: The accuracy analysis in predicting EFW using the ROC curve for Johnson Toshach's formula was $p = 0.036$, the value of Area Under Curve (AUC) was 73.9% (IK = 95%), sensitivity of 76.1%, specificity of 75.0%. For the Risanto formula was $p = 0.02$, AUC value 84.5% (IK = 95%), sensitivity of 81.5%, specificity of 87.5%. For Dare formula was $p = 0.02$, the AUC value was 85.7% (IK = 95%), sensitivity of 92.4%, specificity of 87.5%.

Conclusion: The Dare formula was the most accurate in determining EFW compared to the Risanto formula and Johnson Toshach formula.

KEYWORDS : Accuracy, Risanto Formulas, Dare Formula, Johnson Toshach Formula, Estimated Fetal Weight

INTRODUCTION

Perinatal death refers to the number of intrauterine fetal deaths and death in the first week of life. Based on the *World Health Organization* (WHO) among the 133 million babies born alive each year, 2.8 million die in the first week of life. Meanwhile, based on the Indonesian Demographic and Health Survey (IDHS) in 2012, the perinatal mortality rate in Indonesia was 26 deaths per 1,000 births.^{1,2}

Low birth weight is a cause of death of around 9.1 million babies worldwide. Infants with low birth weight have a risk of asphyxia, septicemia, *respiratory distress syndrome*, hypothermia, hypoglycemia, jaundice in higher neonates. On the other hand, the state of fetal macrosomia is also associated with perinatal morbidity and mortality.^{3,4,5,6}

Accurate prediction of fetal weight if applied to all pregnancies, can identify gestational age and stunted fetal growth, so as to reduce preterm perinatal mortality. In addition, by knowing EFW, the delivery helper can decide whether the vaginal delivery plan is spontaneous or not.^{7,8,9}

Some researchers consider the use of ultrasound to be superior to estimations carried out by clinical methods, but some researchers who have compared the two techniques conclude that both have similar accuracy.^{10,11}

RESEARCH METHODS

This research was cross sectional study that compared the accuracy of EFW using the Risanto, Dare and Johnson Toshach formulas. It was conducted in the Department of Obstetrics and Gynecology, Faculty of Medicine University of North Sumatra, RSUP HAM, RSUD dr. Pirngadi and FK USU hospital on and June 2018 until the sample is fulfilled. The population was all pregnant women who will give birth at RSUP HAM and FK USU hospital who fulfilled the inclusion

criteria which taken by consecutive sampling with a sample size of 100 people.

RESEARCH RESULTS AND DISCUSSION

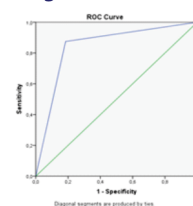
Mostly, the pregnant women were 20-29 years-old with 61 subjects (61%). The majority of sex was female with 59 subjects (59%) and 41 subjects (41%) was male. There were 97 subjects (97%) babies born with weight 2500 - 4000 grams.

The mean birth weight of a baby is 3106.8 gr with standard deviation (SD) of 257.2 g. The average EFW based on Dare formula is 3135.5 g with SD of 223.7 g, the Risanto's formula is a 3356.4 g with SD of 299.8 g and a Johnson Toshach formula is 3374.5 g with SD of 369.3 g.

From the results of statistical tests, it is known that there is no difference in the mean of EFW based on Dare formula with the birth weight, $p = 0.135$ (p value > 0.05). There is a difference in the mean of EFW based on Risanto's formula and Johnson Toshach's formula with the birth weight, $p = 0.000$ (p value < 0.05).

The accuracy analysis in predicting EFW using the ROC curve for Risanto's formula was $p = 0.02$, AUC value 84.5% (IK = 95%), sensitivity of 81.5%, specificity of 87.5%.

Figure 1. Receiver Operating Curve (ROC) Accuracy in Risanto's Formula in Determining EFW



The accuracy analysis in predicting EFW using the ROC curve for

Dare formula was $p = 0.02$, the AUC value was 85.7% (IK =95%), sensitivity of 92.4%, specificity of 87.5%.

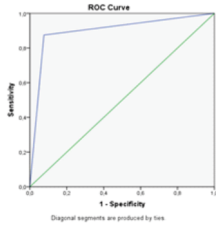


Figure 2. Receiver Operating Curve (ROC) Accuracy of Dare Formula in Determining Fetal Body Weight

The accuracy analysis in predicting EFW using the ROC curve for Johnson Toshach's formula was $p = 0.036$, the value of Area Under Curve (AUC) was 73.9% (IK = 95%), sensitivity of 76.1%, specificity of 75.0%.

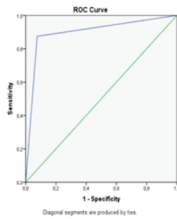


Figure 3. Receiver Operating Curve (ROC) Accuracy of Johnson Toshach Formula in Determining EFW

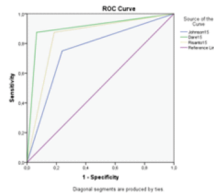


Figure 4. Receiver Operating Curve (ROC) Accuracy of EFW Between Dare, Risanto's and Johnson Toshach's Formula with Infant Birth Weight

DISCUSSION

Chithra conducted a study to assess the accuracy of the Hadlock formula with Johnson and its correlation with infant birth weight of 150 women with 37-40 weeks of gestation.¹² The mean age of the mother in this study was 25.24 years with a minimum age of 16 years, and a maximum of 37 years. There was no significant increase in birth weight with maternal age.¹³

Yadav in his study compared clinical methods and ultrasound in predicting fetal weight in pregnant women. Most of infant birth weight were between 2501 - 3000 grams (35.5%), followed by 3001 - 3500 grams (33.4%).¹⁴

Comparison of Risanto, Dare and Johnson Toshach Formula in Predicting EFW

The analytic results showed that Dare formula was more accurate in predicting EFW with AUC of 85.7%, while Johnson Toshach Formula 73.9%, and Risanto Formula 84.8%. The AUC is considered to have good specificity and sensitivity if $\geq 70\%$. The results of the study were conducted by Nindrea in 2016 at the Satellite Hospital of Andalas University Medical Faculty to find out the average comparison of EFW using the Dare formula with the Risanto formula. It was found that the Dare formula was more accurate than the Risanto formula. There was no significant difference in the mean of EFW based on Dare formula with infant birth weight ($p > 0.05$), whereas a significant difference in the mean EFW of the Risanto formula with the infant birth weight was $p < 0.05$.¹⁵

Dare et al. in 1990 this formula was revised by multiplying the height of the uterine fundus (measurement of McDonald) with the

abdominal circumference at the umbilicus point measured in centimeters, and the result was body weight expressed in grams. In his study of 498 patients, a good correlation ($r = 0.742$) was found between TBJ of the Dare formula and the birth weight of the baby. Dare's formula is superior to Johnson's formula for obese women.¹⁷ Njoku et al. (2014) conducted a study to compare EFW with clinical or radiological methods. The results showed that the average Dare formula was inferior in determining EFW <3500 grams, while Johnson's formula was inferior in determining EFW > 3500 grams. USG was superior to the two formulas for determining LBW and macrosomic infants.⁴

The study of Haji et al. which compared the accuracy of Risanto's formula and Johnson's formula in determining the EFW, showed that there was a statistically significant difference ($p = 0,000$). This study shows that Risanto's is more accurate than Johnson's.¹⁶

CONCLUSION

1. Of the 100 research subjects, the pregnant women mostly 20-29 years-old were 61%, age 30-39 years were 29%, under 20 years-old were 8%, and 40-49 years-old were 2%.
2. Based on sex, there were 41 (41%) male babies and 51 (51%) female babies.
3. Based on the birth weight it is known that 97 subjects (97%) were born with a body weight of 2500 - 4000 grams and three subjects (3%) were born with a weight <2500 grams. The mean birth weight of a baby is 3106.8 gr with a standard deviation of 257.2 gr.
4. The accuracy analysis of Johnson Toshach's formula in predicting the EFW using the ROC curve the value of $p = 0.036$ with the value of AUC was 73.9% (IK = 95%). The sensitivity is 76.1% and the specificity is 75.0%.
5. The accuracy analysis of the Risanto's formula in predicting the EFW using the ROC curve, the value of $p = 0.02$ was obtained with the value of AUC of 84.5% (IK = 95%). The sensitivity is 81.5% and the specificity is 87.5%.
6. The accuracy analysis of the Dare formula in predicting the EFW using the ROC curve the value of $p = 0.02$ was obtained with the value of Area Under Curve (AUC) of 85.7% (IK = 95%). The sensitivity is 92.4% and the specificity is 87.5%.
7. The Dare Formula is more accurate in determining the EFW compared to Risanto's formulas and Johnson Toshach's formulas.

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