Comparison Of The Johnson-Toshack and The Risanto Formula In Determining Estimated Fetal Weight (EFW) In Maternity Women Against The Weight Of Newborn Babies At Dr OEN Kandang Sapi Solo Hospital

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Article Info	ABSTRACT
Corresponding Author: Sumarah Kusuma Husada University Surakarta Email: marasum23888@gmail.com	Prenatal care is a crucial aspect of pregnancy and childbirth management. Among its primary activities, the measurement of the uterine fundus height (UFH) serves as a critical method for estimating fetal weight (EFW). After understanding EFW, health forces such as midwives can predict the problems that will be experienced and can carry out prevention to deal with them. The referral hospital assesses that the patient is unassisted or critical, the calculation of the usual fetal weight is able to help determine the certainty of the decision to be carried out to show the right obstetric service according to the condition of each patient. The Johnson-Toshack formula is the EFW formula commonly used in Indonesia, but the Risanto formula is an expanded formula for Indonesian researchers and is considered increasingly suitable for the material population in Indonesia. This study aims to understand the comparison of EFW evidence on infant birth weight by the use of the Johnson-Toshack and Risanto formulas. Data collection in the delivery room of Dr. OEN Kandang Sapi Hospital Solo and carried out from March to August 2024. All the mothers who have given birth and according to the inclusion specifications and are wiling to join the research. The results of the study stated that the Johnson-Toshack formula and the Risanto formula were appropriate to estimate the birth weight of the baby, with a significance value of $< 0,001$. The difference in EFW using Risanto's formula to the baby's birth weight is smaller than EFW using Johnson-Toshack EFW Risanto came out with 54 grams, EFW Johnson-Toshack came out with a value of 148 grams. In these results, it can be stated that the Risanto formula shows that the calculation follows the birth weight of the baby more than the Johnson-Toshack formula.

1. INTRODUCTION

Prenatal care is a crucial aspect of pregnancy and childbirth management. Among its primary activities, the measurement of the uterine fundus height (UFH) serves as a critical method for estimating fetal weight (EFW). After understanding EFW, health forces such as midwives are able to estimate the problems to be experienced and can implement reductions to deal with them. Thinking about fetal weight is very important because babies who want to attend by birth weight is small or very large related to the addition of intrapartum and puerperal problems. Explanation of fetal weight is a major component in the management of childbirth. The exact weight interpretation technique ensures that you understand whether the baby has a high or low birth weight so that you can carry out reductions to minimize various possible problems. Fetal weight explanation techniques that are definitely able to reduce these problems (Cunningham, 2014). Because the technique of explaining fetal weight is also included in health services which is one of the determinants of the baby's health (Saifuddin, 2013).

Dr. OEN Kandang Sapi is one of the referral hospitals in Solo and has a large number of patients such as emergency patients who have not been treated so it is used as a place for this research. The high rate of obstetric trauma, which is often unpredictable, can lead to maternal death. Efforts to reduce the prevalence of obstetric complications are to overcome 3 delays, namely late recognition of the danger signs of childbirth, late referral and late getting adequate treatment (Ujiningtyas, 2018). Infant weight at birth is not only related to mortality and morbidity rates, but also to diseases in adulthood, such as cardiovascular disease and type II diabetes. Some other factors that affect the baby's weight are those related to the low birth weight of the baby until fetal growth is inhibited, namely: gestational age during childbirth, sex of the fetus, smoking mother, maternal weight, maternal height, maternal activity, hypertension, pre-eclampsia,

uncontrolled diabetes, height of the biological father, height of the mother's residence (Pasaribu, 2019). In addition, there are also complications that occur during pregnancy of pregnant women, namely Macrosomia is a complication that has a bad impact on the birth of the baby and when the baby is born so that it will affect the baby's condition (Sarwono, 2016).

Regarding UFH, the change of the uterus during pregnancy into an organ that is able to accommodate the fetus, placenta and amniotic fluid on average at the end of pregnancy has a total volume of 20 liters or more with an average weight of 1100 grams (Prawirohardjo, 2014). The measurement of the height of the uterine fundus above the pubic symphysis is used as one of the indicators to determine the progress of fetal growth. Measurement of the height of the uterine fundus should be done with a consistent measurement technique at each measurement and by using the same tools (Lombogia, 2017).

Measuring UFH to determine the estimated fetal weight (EFW), EFW calculations usually accurately determine the steps that should be taken to ensure the right delivery AIDS by the circumstances of each patient (Prodi, 2017). The EFW equation commonly used today is the Johnson-Toshack equation which is interpreted as BW (baby weight) = (UFH – N) x 155. BB is shown to be gram and the N value is ascertained by the baby's head drop which is 11, 12 or 13 (Puspita, Arifiandi, and Wardani, 2019; Santjaka and Handayani, 2011). Previous observations conducted (Mardeyanti, Djulaeha, and Fatimah, 2013) states that the accuracy of the xplanation of fetal baby weight using the same Johnson-Toshack large and not expressed significant differences between the similarities Risanto by Baby's birth weight of value p value < 0,001. Ambarwati (2015) proposed the procedure for measuring UFH with the Mc Donald technique, namely preparing tools and carrying out inspections.

There is formula that has been extended by Indonesian observes since 1995, namely the Risanto

formula proposed for H. Risanto Siswosudarmo, SpoG (K). Based on a study that linked 560 pregnant women in the hospital. Dr. Sardjito Yogyakarta Risanto's formula is used by the calculation of Birth Weight = (UFH x 125) – 880 (Titisari and Siswosudarmo, 2013). Birth weight is calculated in grams and 880 is the norm. a study carried out by Esmaeilou (2016). The Risanto formula is increasingly certain in estimating fetal weight and the Risanto formula focuses enough on calculations to make it easier for midwives and medical students when studying it. The study states that a clinical technique to estimate fetal weight in women by pregnancy itself and the elaboration of the head. On the other hand, it must be believed that this technique is an easy, fast, affordable and appropriate method by those who have limited clinical experience. This is contrary to previous research conducted by Wijayanti (2016) where from the results of the research conducted there was a statistically significant difference between the Risanto formula and Johnson's formula with the actual birth weight, and the average estimated fetal weight according to Johnson was higher than the estimated fetal weight according to Risanto.

Based on the background of the discussion above, researchers are encouraged to compare what formulas can be used in addition to the evidence of Sp.OG ultrasound. In this regard, the researcher carried out a study entitled "Comparison of the Johnson-Toshack Formula and the Risanto Formula in Determining Estimated Fetal Weight (EFW) in Maternity Women Against the Weight of Newborn Babies at Dr. OEN Kandang Sapi Solo Hospital".

2. METHOD

The research method used was cross-sectional by simple random sampling technique on pregnant women in the third trimester who came to the delivery room at Dr. OEN Kandang Sapi Solo Hospital conducted in March-August 2024. The research approach (type) used in the study is *cross-sectional*. *Cross sectional* is a form of observational study that aims to find/study the relationship between independent variables (risk factors) and dependent variables (effects), by means of approach, observation, or data collection at once at a certain time or point time approach (Notoatmodjo, 2012; Sastroasmoro and Ismael, 2014).

In this study, the population determined to obtain research data was pregnant women who gave birth at Dr. OEN Kandang Sapi Solo Hospital (Arikunto, 2013) and met the inclusion criteria, which included a gestational age range of 37–42 weeks, in-labor condition (*inpartu*), normal fetal head size, a single viable fetus, and mothers willing to participate in the study. Using the Taro Yamane formula, the required sample size was calculated to be 58 (Sugiyono, 2017).

After obtaining prior acceptance to conduct research at the University of Kusuma Husada Surakarta, researchers reviewed the location of the study, namely the obstetric room of Dr. OEN Kandang Sapi Solo. Next, introduce yourself and explain the purpose of the research to the respondents, showing information related to the research, starting from the objectives, benefits and stages of the research. Then, show the acceptance form to the respondents who are willing to participate in the study. Leopold carried out research to understand the position of the fetus and even grouped the fundus height (UFH) data by calculating the center of the pubic symphysis to the center of the uterus using a centimeter tape (Dharma, 2011). Next will be carried out a pelvic examination to understand how far the cervix is opening. After the baby was born, researchers measured the weight of the baby born one to two hours after birth and wrote on a note sheet to compare the next count. The study received ethical approval by KEPK (Health Research Ethics Committee) Kusuma Husada University Surakarta, namely 2239/UKH.L.02/EC/VI/2024.

3. RESULTS
3.1 EFW with Johnson-Toshack Formula and Risanto Formula

Table 1. EFW with Johnson-Toshack Formula and Risanto Formula

No	Patient Name	Johnson-Toshack Formula	Risanto Formula
1	Ny. A	3255	3245
2	Ny. S	3255	3120
3	Ny. S	2325	2370
4	Ny. P	3255	3120
5	Ny. R	2635	2620
6	Ny. Y	2635	2620
7	Ny. K	3100	2995
8	Ny. S	2790	2745
9	Ny. A	3410	3245
10	Ny. N	3255	3120
11	Ny. F	3875	3620
12	Ny. W	4030	3745
13	Ny. S	2325	2370
14	Ny. M	3565	3495
15	Ny. D	3720	3620
16	Ny. R	2790	2745
17	Ny. D	2790	2745
18	Ny. S	3255	3120
19	Ny. S	3255	3120
20	Ny. E	3410	3245
21	Ny. H	2170	2245
22	Ny. T	3255	3120
23	Ny. L	3100	2995
24	Ny. N	3410	3245
25	Ny. A	2945	2870
26	Ny. O	2945	2870
27	Ny. I	3255	3120
28	Ny. A	2790	2870
29	Ny. E	3565	3370
30	Ny. S	3565	3370
31	Ny. I	3565	3370
32	Ny. H	3100	3120
33	Ny. N	3410	3245
34	Ny. S	3255	3120
35	Ny. A	3255	3120
36	Ny. A	3565	3495
37	Ny. A	3565	3370
38	Ny. T	3410	3245
39	Ny. H	2170	2245
40	Ny. D	2945	2870
41	Ny. A	2635	2620
42	Ny. I	2790	2745
43	Ny. B	3255	3120
44	Ny. A	3720	3495
45	Ny. Y	3100	3120
46	Ny. I	2945	2870
47	Ny. S	3100	2995
48	Ny. S	2480	2495
49	Ny. A	2945	2870
50	Ny. E	3100	2995
51	Ny. P	3720	3495
52	Ny. D	3100	2995
53	Ny. O	2790	2745
54	Ny. W	2945	2870
55	Ny. G	2480	2495
56	Ny. W	2635	2620
57	Ny. I	3565	3370
58	Ny. A	3410	3245

Table 1. The above shows the EFW of all samples that are in accordance with the criteria that have been set, both with the Johnson-Toshack formula and the Risanto formula. From the table above, it shows that the estimated fetal weight is better using the Johnson-Toshack formula compared to the Risanto formula because the value of the fetal weight is greater than using the Risanto formula.

3.2 Comparison of Baby's Weight at Birth, EFW with Johson-Toshack Formula and Risanto Formula

Table 2. Comparative Data on Infant Weight at Birth, EFW with Johnson-Toshack Formula and Risanto Formula

Variable	Mean	Median	Standard Deviation	Standard Error	Min-Max	C1 95%
Baby's Birth Weight	2971	3028	380,634	49,980	2000-3815	2871-3071
UFH Johnson-Toshack Formula	3119	3178	423,817	55,650	2170-4030	3007-3230
UFH Risanto Formula	3025	3120	350,681	46,047	2245-3745	2933-3117

Based on table 2. The mean value (*average*) of the baby's weight at birth is 2971, the mean is 3028, the standard deviation is 380,634, the standard error is 49,880, and the minimum and maximum values are 2000-3815, velnurable 95% confidence values 2871 and 3071. The standard deviation value stated a value of 380,634, indicating a high deviation from the average value. The standard error value that is getting less and less from the standard deviation value states that the grand mean sampling probability distribution can predict the population mean with a confidence interval value between 2871 and 3071.

The data used the Johnson-Toshack formula to predict that the baby's birth weight had an average value

of 3119, a median value of 3178, a standard deviation of 423,817, a standard error of 55,650, the smallest and largest values of 2170 to 4030, and 3007 to 3230 with a confidence interval value of 95%. It has a large standard deviation value of 423,817 which indicates a high value deviation from the mean value. The standard error value that is getting less and less from the standard deviation value states that the distribution of the grand mean value of the sampling probability can predict the population mean with a confidence interval value between 3007 and 3230.

The data that uses the Risanto formula to predict the birth weight of babies shows an average value of 3025, a median value of 3120, a standard deviation of 350,681, a standard error of 46,047, and a minimum and maximum value of 2245 to 3745. The value of the confidence interval is 95% between 2933 and 3117. The standard deviation value stated a high value, which was 350,681 which stated that there was a high deviation of the value than by the mean value. The standard error value which is getting less and less from the standard deviation value states that the distribution of the grand mean value of the sampling probability can predict the population mean with the exact population by the Confidence Interval value between 2933 – 3117.

3.3 Normality Test

Table 3. Normality test with *Kolmogorov Smirnov*

Variable	Sig.	α
Baby Birth Weight	0,31	0,05
UFH Johnson-Toshack Formula	0,22	0,05
UFH Risanto Formula	0,06	0,05

The analysis of the *Kolmogorov-Smirnov* normality test showed that the EFW data used the Johnson-Toshack formula, the EFW used the Risanto formula and the birth weight of the baby had a normal distribution value (Sig > 0,05). Because the three data are normally distributed, of course, the researcher uses non-parametric statistic, namely the paired t-test.

3.4 Paired t-Test

Table 4. Comparison of Baby's Birth Weight by Estimated Baby's Birth Weight with the Johnson-Toshack Formula

Paired Samples Correlation			
Pair I	N	Correlation	Sig.
Baby Birth Weight and Johnson-Toshack Formula	58	0,568	0,001

Based on table 4. The above analysis uses the paired t-test to show the comparison between the actual birth weight of the baby and the estimated birth weight of the baby using the Johnson-Toshack formula, the significant value shown is 0.001 < 0.05 indicating that there is a significant difference between the results of the baby's birth weight by the amount of the baby's birth weight using the Johnson-Toshack formula. The comparison of the birth weight of babies using the Johnson-Toshack formula was 148 grams.

Table 5. Comparison of Baby's Birth Weight by Estimated Baby's Birth Weight with the Risanto Formula

Paired Samples Correlation			
Pair I	N	Correlation	Sig.
Baby Birth Weight and Risanto Formula	58	0,582	0,001

Based on table 5. The above analysis uses the paired t-test to confirm the comparison of the measured birth weight of the baby and the measurement of the birth weight of the baby using the Risanto formula has a significant value of 0.001 < 0.05 indicating that there is a significant difference between the evidence of the birth weight of the baby by the birth weight using the Risanto formula. The comparison is estimated to use the Risanto formula by the average birth weight of a baby of 54 grams.

4.   DISCUSSION

From the results of statistical analysis, it was found that there was a significant difference between the birth weight of babies by the estimated birth weight based on

the Johnson-Toshack formula for births between March and August 2024 by a significant value of <0.001. The analysis evidence states that the average body weight of a newborn baby is 2971 grams, but the average weight calculated by the Johnson-Toshack formula is getting bigger, namely 3119 grams. This states that there is a real difference between the birth weight of babies by the birth weight of babies using the Johnson-Toschac formula, compared to the average of 148 grams. It states that EFW can be accurately determined using the Johnson-Toschac formula. In this observation, the evidence of calculation with the Johnson-Toshack formula shows that the mean value is higher than the mean using the Risanto formula and the ratio is far greater than the birth weight of the baby. It states that the use of the Johnson-Toshack formula results in an increasingly high evidence gap than the Risanto formula. The average of the Risanto formula is 3025 grams and the average of the Johnson-Toshack formula is 3119 grams, the difference is 94 grams.

The results are in line with previous researchers Mardeyanti et al (2013) showing that the interpretation of fetal weight using the Johnson-Toshack formula has great accuracy and the results are not significantly different between the Johnson-Toshack formula and the birth weight of the baby by a p value of 0,001. The results of a study in Thailand stated that the use of the Johnson-Toshack formula to predict the baby's weight resulted in an average of 227 grams more than the actual birth weight (Noviana, Siswosudarmo, and Hadiati, 2016).

From the statistical analysis, it was found that there was a significant difference between the birth weight of babies by the estimated birth weight based on the Johnson-Toshack formula for births between March and August 2024 by a significant value of 0,001. The analysis states that the average weight of babies born is 2971 grams, but the average weight calculated by the Risanto formula is even larger, namely 3025 grams, stating that the actual weight of the baby at birth and the estimated birth weight are higher in difference. There was a difference in the average value of 54 grams in babies who used the Risanto formula, which explains why the Risanto formula is more certain when measuring EFW (Estimated Fetal Weight).

In the study, using the Risanto formula produces a mean value that is less than by using the Johnson-Toshack formula and is further away from the birth weight. It describes the results when using the Risanto equation rather than by the Johnson-Toschac equation. The average Risanto formulation is 3025 grams and Johnson-Toshack formulation is 3119 grams, compared to 94 grams. This proves that calculating the use of the Risanto formula has an average value that is less than the average using the Johnson-Toshack formula and is far greater than by the weight of birth, which explains that by the use of the Risanto formula there is less and less accuracy of the evidence than by the Johnson-Tosach formula. The average Risanto formula is 3025 grams and the Johnson-Toshack formula is 3119 grams or is available compared to 94 grams.

Research carried out for Esmaeilou (2016) also stated that abdominal palpation and Risanto's formula are increasingly certain when estimating fetal weight. Because the technique using the Risanto formula is quite based on calculations, the technique is easy to understand for midwives and medical students, so that midwives in developing countries are able to use their clinical experience to determine birth weight predictions rather than showing money to pay for more modern equipment.

The learning states that clinical techniques to estimate the birth weight in women by the pregnancy itself with the position of the head into the pelvis are

very certain. On the other hand, it must be believed that clinical techniques to determine fetal weight prediction are easy, fast, economical and appropriate techniques by those who have limited clinical experience.

This formulation arises because the data used is primary data taken from March to August 2024. Information was obtained when measuring UFH and internal checks for midwives who are already experts, as well as the level of certainty of measuring is assessed through observation for the midwives.

The advantage of Risanto's formula is that some studies on the maternal population in Indonesia state that the formula shows evidence that the estimated weight of the fetus follows the birth weight of the baby rather than other techniques. In fact, Risanto's formula is getting easier because it requires enough UFH calculations to measure EFW. The disadvantage of Risanto's formula is that it is less well-known and used by medical experts and still needs more scientific evidence to show its certainty in various circumstances (Puspita, 2019).

The Johnson-Toshack and Risanto formulas both have advantages and disadvantages. The advantage of the Johnson-Toshack formula is that it is widely used and its certainty is scientifically proven. The advantage of the Risanto formula is that it provides EFW results that are closer to birth weight than other methods.

On the other hand, the disadvantage of the Johnson-Toshack formula is the availability of the N value that must be determined by knowing the decrease in the fetal head. Great sensitivity and experience of medical forces are the main position when determining the appropriate N value so that the appropriate EFW can be shown. On the other hand, the availability of the fetal head reduction variable by the Johnson - Toshack formula is not able to reduce the prediction of errors when thinking about the baby's weight and is able to raise subjectivity problems. Except, if there is a

restriction appeal to understand the fetal station by the minimum failure.

The advantage of Risanto's formula is that some studies on the maternal population in Indonesia state that the formula shows evidence that EFW follows birth weight rather than other techniques. The disadvantage is that it is still unknown and used by health workers. In addition, there is still a lot of scientific evidence that proves its accuracy under various conditions.

Another case is that Risanto's formula is getting easier because it requires enough UFH calculations to measure EFW. The disadvantage of Risanto's formula is that it is less well-known and used by medical experts. In this study, it can be stated that the Risanto formula shows that the prediction of the birth weight of the baby is closer than the Johnson-Toshhack formula. The Risanto formula can be used as a recommended formula to measure EFW in health facilities that do not have modern equipment such as ultrasound. Risanto's formula is considered to be increasingly easy to use and learn because it does not want head reduction data like the Johnson-Toshhack formula.

5. CONCLUSION

The calculation of the birth weight of the baby by the Johnson-Toshack formula obtained data with a mean value (average) of 3119 grams, a median value of 3178 grams, a standard deviation of 423.817, a standard error of 55.650, and the minimum and maximum values were obtained from 2170 to 4030, Confidence Interval of 95% between 3007 to 3230 grams.

The use of the Risanto formula to predict the birth weight of the baby was obtained with an average value of 3025 grams, a middle value of 3120 grams and a standard deviation of 350,681, a standard error of 46,047, a minimum and maximum value of 2245 to 3745 grams, a 95% confidence interval of 2933 to 3117

grams. A more effective estimate of the baby's birth weight is to use the Risanto formula to predict the baby's birth weight. Because the formula is quite 54 grams. The research is based on the average birth weight of a baby worth 3025 grams using the Risanto formula to reduce the average birth weight of a baby worth 2971 grams.

The comparison of the baby's birth weight using the Johnson-Toshack formula is 148 grams. The research is based on the prediction of an average birth value of 3119 grams by using the Johnson-Toshack formula to reduce the average birth weight of 2971 grams. The comparison of the calculation of birth weight by using the Risanto formula is 54 grams. Where the results were obtained from the average TBJ using the Risanto formula of 3025 grams minus the average birth weight of the baby worth 2971 grams. The comparison of birth weight calculations uses the Johnson – Toshack formula and the Risanto formula of 94 grams. Where the results were obtained from the average birth weight count using the Johnson – Toshack formula of 3119 grams minus the birth weight count using the Risanto formula of 3025 grams.

The number of parity does not have an impact on the calculation of the UFH until the entire sample can be decided through the concern of the parity number. To prospective respondents that the UFH calculation carried out is an SOP that must be carried out and the inclusion of evidence of UFH calculation and even the weight of the baby's birth is not intended to have an impact on the treatment or services received by the patient.

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