Original Article

Examining the methods of measuring the womb height and mother's abdomen circumference to estimate baby's weight at the birth time in term mothers referred to maternities in Isfahan during 2007-08

Mahnaz Noroozi*, Somaye Hasani*, Roshanak Hasan Zahraei*,

Nahid Aseman Rafat**

Abstract

BACKGROUND: This research aimed to examine the methods of measuring the womb height and mother's abdomen circumference to estimate infant's weight at birth time.

METHODS: In this cross-sectional descriptive-correlative research, 1070 mothers with term pregnancy (and their infants) who referred to Isfahan maternities were assessed. Questionnaire, demographic data form, patient's medical files and standard meter and scales for adults and infants were the data collection tools. Data were analyzed using SPSS software.

RESULTS: There was a significant relation between womb height and infant's weight at birth time, also between mother's abdomen circumference and baby's weight at birth time categorized by the number of childbirths, age of gestation, condition of infant's head engagement, body mass index, and mother's bulk ($p < 0.05$). The correlation coefficient of womb height and mother's abdomen circumference in estimating baby's weight at birth time were not statistically different. Besides, the positive and negative prediction value of these two methods for determining the weight of infants with less than 2.5 kilos or more than 4 kilos are the same. Finally a formula was achieved to estimate baby's weight:

Birth weight = - 2.203 + 0.035 (womb height) + 0.012 (abdomen circumference) + 0.012 (duration of gestation) - 0.114 (infant's head engagement) + 0.043 (size of bulk)

CONCLUSION: It is suggested that the personnel of maternities especially in disadvantaged parts of the society learn the correct method of measuring mother's abdomen circumference and womb height and estimate baby's weight using achieved model to improve mother's and baby's health.

KEYWORDS: Womb height, mother's abdomen circumference, estimating birth weight.

Gestation and childbirth is a great experience in women's life and the goal of midwifery studies is to help them having a satisfying experience. It should be considered that for thousands of women in the world gestation not only isn't satisfying but also lead to irrecoverable phenomenon, even the death of mother or baby. Different studies have shown that most of deaths during gestation and childbirth are because of the baby's weight at birth time and the difficulties caused by that, so that this factor is the most important individual parameter in determining baby's survival.[1] Limitation of infant's growing and the low weight at birth time which is specified with weight less than 2500 grams, increase the probability of infant's death, obstetric asphyxia, aspiration meconium, hypoglysemia, babyhood hypothermic and abnormal neurologic development. Macrocosmic which means the weight more than 4000

*MSc, Department of Midwifery, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran.
**MSc, Department of Fundamental Nursing, School of Nursing and Midwifery, Isfahan University of Medical Sciences, Isfahan, Iran.
Correspondence to: Mahnaz Noroozi MSc.
E-mail: noroozi@nm.mui.ac.ir

grams at birth time[2] also leads to disorder in libber trend, unplanned C section and obstetric damages caused by shoulder dystocia like cutting the sphincter of mother's anus, mutilate of arm's nerves, mutilate of face's nerves, fractioning the shoulder's bone and etc.[3,4] So the exact estimation of infant's weight in controlling the libber and childbirth is very important.[5]

One of the methods of weight estimation is using ultrasound[6] but the accuracy of this method will decrease during the libber and before childbirth. At the other hand this tool is not available in all societies.[7] Also the results of some of the researches showed that there is no significant difference between ultrasound and clinical assessment for estimating the birth weight.[8] Besides, the results of some researches like Hendrix et al[9] study showed that clinical estimating of infant's weight in term mothers, is significantly more exact than ultrasound and so clinical methods especially mother's anthropometric specifications have attracted researches' attention. Among different method, determining the womb height is normally used but the main difficulty of this method as a categorizing tool is its lack of exactness.[2] Measuring mother's abdomen circumference is an alternative method for estimating the infant's weight. Some of the researchers like Bathner et al[7] showed in their studies that both mother's abdomen circumference and womb height are related to the baby's weight at birth time. This is while Tatarova et al[10] showed in his study that there is no significant relation between these two methods and baby's weight at birth time.

Regarding that the available information about mother's abdomen circumference and womb height are against each other and estimating the infant's weight while libber can decrease mortality and other side effects of childbirth and also recognizing infants with improper growth is still one of the recognition difficulties,[2] this research aimed to find a clinical method which is simple and usable in all societies to estimate the birth weight and would lead to improvement in mothers' and babies' health.

Methods

This research is a descriptive-correlative research of temporary type and has one stage, two groups and is multivariate. The samples were 1070 of term pregnant mothers (and their babies) that referred to Isfahan maternities and were selected with simple random sampling. The acceptance criteria in this research were considered having vertical and vertex face for infant, one baby pregnancy, healthy water sinus and referring to finish pregnancy with conveying the childbirth, selective surgery or with the start of obstetric pains. Severe polyhydramnios and oligohydramnios, non-Iranian nationality, womb myoma or recognized pelvic tumor or bulk, bleeding before childbirth in the type of soon placental abruption, molar improper pregnancy, recognized liver and intestinal illnesses and unrecognized LMP were the criteria for excluding pregnant mothers from study. Required information was gathered by interviewing, observing and measuring. Data collection tools included patients' documents, data collection forms, questionnaire, standard meter and scale of adult and baby.

First the questionnaire form was completed by interviewing. The mother's womb height was measured after evacuating cyst, lying on the back, between womb retractions (in active childbirth phase) and by using non-elastic strip from the upper edge of pubic symphysis to the most upper point of womb in centimeters. Then mother's abdomen circumference was measured in lying on the back situation between womb retractions with the legs straighten out, in navel level and in the end of a natural breath out, in centimeters. Then the mother's weight with only one dress and scarf, her height in standing mode leaning toward the wall without shoes and body bulk index were measured. After that the circumference of her right wrist and her bulk was measured.

Immediately after birth, the babies' weight was measured and the mothers whose babies were born death or with recognized disabilities were eliminated from the study.

Content validation method used for verifying the scientific validation. Also the used meter and scale were from the same type. To determine scientific confidence, in addition to necessary educations for questioners, final coefficient between researchers and questioners and between questioners themselves was determined which its minimum was 0.8.

The gathered data was analyzed using descriptive and inferential statistical methods (Pearson correlation coefficient, regression analysis, comparing correlation coefficients and prediction value test) and SPSS statistical software.

Results

The research's results about the individual and productivity specifications of cases showed that 44.5% of mothers were younger than 25 years old and 50.8% had their first pregnancies when referred to maternities. About 55.5% were having their first child. Pregnancy duration of 54.6% of mothers was 40-42 weeks. About 89.3% were housewives, the education level of 46.7% was diploma and 50.3% of mothers selected cesarean.

The obtained results showed that there is a significant relation between womb height and birth weight categorized by the number of childbirths, age of gestation, situation of infant's head engagement, body mass index, and mother's bulk (Table 1).

Table 1. The relation between womb height and birth weight categorized by some mother and infantile characteristics

	r	p
First childbirth	0.444	< 0.001
More than one childbirth	0.329	< 0.001
Pregnancy duration from 37 to 39 weeks	0.403	< 0.001
Pregnancy duration from 40 to 42 weeks	0.399	< 0.001
Existence of infant's head engagement	0.55	< 0.001
Non-existence of infant's head engagement	0.38	< 0.001
Body mass index less than 25 kg/m^2	0.303	< 0.001
Body mass index from 25 to 34 kg/m^2	0.388	< 0.001
Body mass index more than 34 kg/m^2	0.36	< 0.001
Big bulk	0.372	< 0.001
Medium bulk	0.377	< 0.001
Small bulk	0.388	< 0.001

Also there is a significant relation between mother's abdomen circumference and birth weight categorized by the number of childbirths, age of gestation, situation of infant's head engagement, body mass index, and mother's bulk (Table 2).

The findings showed that there is a direct linear relation between womb height and birth weight (r = 0.399, p < 0.001) and between mother's abdomen circumference and birth weight (r = 0.383, p < 0.001) according to Pearson correlation coefficient.

Table 2. The relation between mother's abdomen circumference and birth weight categorized by some mother and infantile characteristics

	r	p
First childbirth	0.428	< 0.001
More than one childbirth	0.336	< 0.001
Pregnancy duration from 37 to 39 weeks	0.391	< 0.001
Pregnancy duration from 40 to 42 weeks	0.38	< 0.001
Existence of infant's head engagement	0.492	< 0.001
Non-existence of infant's head engagement	0.368	< 0.001
Body mass index less than 25 kg/m^2	0.381	< 0.001
Body mass index from 25 to 34 kg/m^2	0.373	< 0.001
Body mass index more than 34 kg/m^2	0.433	< 0.001
Big bulk	0.36	< 0.001
Medium bulk	0.386	< 0.001
Small bulk	0.319	< 0.001

Besides, the findings showed that the values of sensibility, specification and the power of positive and negative prediction for womb height less than 29.5 and more than 35.5 centimeters and for mother's abdomen circumference less than 98 and more than 114 centimeters for the birth weight less than 2.5 kilograms and more than 4 kilograms respectively are as follow:

Weight less than 2.5 kilograms:
72%, 83%, 11%, 98%
56%, 76%, 7%, 98%
Weight more than 4 kilograms:
69%, 88%, 7%, 99.6%
46%, 90%, 6%, 99%

According to research's findings which showed that both measuring womb height and mother's abdomen circumference aren't different in coefficient correlation, a model considering

these two variables and other effective factors on the relation between womb height and mother's abdomen circumference with birth weight is provided as follow:

Birth weight = - 2.203 + 0.035 (womb height) + 0.012 (mother's abdomen circumference) + 0.012 (pregnancy duration) - 0.114 (infant's head engagement) + 0.043 (bulk's size)

In this equation all variables will be replaced with their value and if engagement exists it will be replaced with 1 and otherwise replaced with 2.

Discussion

The research's findings showed that there is a significant and linear relation ($p < 0.05$) between womb height and birth weight, and also between mother's abdomen circumference and birth weight categorized by the number of childbirths, duration of gestation, situation of infant's head engagement, body mass index and mother's bulk. Also the findings showed that both measuring womb height and mother's abdomen circumference are significantly related to birth weight and there is no statistical difference between their correlations of coefficient.

Bothner et al[7] showed that there is a significant relation between womb height and birth weight with r = 0.56 and $p < 0.001$, also there is a significant relation between mother's abdomen circumference and birth weight with r = 0.47 and $p < 0.001$ while Tatarova et al[10] showed that there is no significant relation between them. The research's findings showed that the womb height less than 29.5 centimeters has sensibility of 72%, specification of 83%, the power of positive prediction of 11% and negative prediction of 98% in recognizing infants with weight less than 2.5 kilograms. And the womb height more than 35.5 centimeters has sensibility of 69%, specification of 88%, the power of positive prediction of 7% and negative prediction of 99.6% in recognizing infants with weight more than 4 kilograms.

Rondo et al[11] in Brazil reported that the womb height of 33 centimeters has sensibility of 60.8%, specification of 78.7%, the power of positive prediction of 16.1% and negative prediction of 95.4% in recognizing infants with less than normal weight.

In the present research, the low power of positive prediction in recognizing weight less than 2.5 kilograms might be caused by the low number of babies with weight less than 2.5 kilograms in comparison with other studies.

During searching no study found about the value of measuring womb height in recognizing macrodome cases, but the present research's findings showed that the power of positive prediction about these cases is low because of the low number of babies with weight more than 4 kilograms. Besides the research's findings showed that abdomen circumference less than 98 centimeters has sensibility of 56%, specification of 76%, the power of positive prediction of 7% and negative prediction of 98% in recognizing infants with weight less than 2.5 kilograms and abdomen circumference more than 114 centimeters has sensibility of 46%, specification of 90%, the power of positive prediction of 6% and negative prediction of 99% in recognizing infants with weight more than 4 kilograms.

Mohanty et al[12] showed that abdomen circumference less than 84 centimeters with sensibility of 65.3%, specification of 82.8%, the power of positive prediction of 66.6% and negative prediction of 82% is the best predictor for birth weight.

In present research, the low power of positive prediction of mother's abdomen circumference in recognizing weight less than 2.5 kilograms might be caused by the low number of babies with weight less than 2.5 kilograms in comparison with other societies such as India.

In searches no study found about the value of measuring mother's abdomen circumference in recognizing macrodome cases, but the low power of positive prediction about these cases is low because of the low number of babies with weight more than 4 kilograms.

In general, this research's findings showed that the value of positive and negative prediction of womb height is the same as mother's abdomen circumference in recognizing infants with weight less than 2.5 kilograms and more than 4 kilograms.

According to research's findings which showed that there is no difference between mea-

suring womb height's and mother's abdomen circumference's coefficient correlation, these two variables and other effective factors on the relation between womb height and mother's abdomen circumference with birth weight gathered into a regression model, but because the p value of body mass index and the number of childbirths in full model increased, these two variables removed from the model and the final regression is as follow:

Birth weight = - 2.203 + 0.035 (womb height) + 0.012 (mother's abdomen circumference) + 0.012 (pregnancy duration) - 0.114 (infant's head engagement) + 0.043 (bulk size)

It is worth mentioning that studying different effective factors on the relation between womb height and mother's abdomen circumference with birth weight separately and putting them in a model for estimating birth weight is the main difference of this study with others.

Az one of the reasons of mortality and irrecoverable damages for mothers and babies is low birth weight or infant's macrodome[1] and there is no suitable method for estimating baby's weight correctly before birth and recognizing these infants is still a difficulty, with respect to the results of this research, it is suggested to pay more attention to measuring womb height and mother's abdomen circumference before childbirth for estimating baby's weight at birth by teaching the personnel of maternities especially in disadvantaged parts of society which aren't equipped with ultrasound, the correct method of measuring mother's abdomen circumference and womb height and estimate baby's weight using achieved model for in time recognition to do special cares before, while and after childbirth or sending mothers for cesarean surgery to decrease the mortality and damages that may cause to mothers and babies and step forward to make before, while and after childbirth's care more scientific.

The authors declare that have no conflict of interest in this study and they have surveyed under the research ethics.

References

1. Shittu AS, Kuti O, Orji EO, Makinde NO, Ogunniy SO, Ayoola OO, et al. Clinical versus sonographic estimation of foetal weight in southwest Nigeria. J Health Popul Nutr 2007; 25(1): 14-23.
2. Cunningham FG, Gant NF, Leveno KG, Gilstrap LC, Hauth JC, Wenstrom KD. William's obstetrics. Trans. Ghazi Jahani B. 21st ed. New York: McGraw-Hill Professional; 2001. [In Persian].
3. Walsh CA, Mahony RT, Foley ME, Daly L, O'Herlihy C. Recurrence of fetal macrosomia in non-diabetic pregnancies. J Obstet Gynaecol 2007; 27(4): 374-8.
4. Piasek G, Starzewski J, Chil A, Wrona-Cyranowska A, Gutowski J, Anisiewicz A, et al. Analysis of labor and prenatal complications in case of foetus weight over 4000 g. Wiad Lek. 2006; 59(5-6): 326-31.
5. Bloemenkamp KWM. Fetal growth. International Congress series 2005; 1279: 295-301.
6. Fraser DM, Cooper MA. Myles' textbook for midwives. 14th ed. Edinburgh: Churchill Livingstone; 2003.
7. Bothner BK, Golmezoglu AM, Hofmeyer GJ. Symphysis fundus height measurements during labour: a prospective, descriptive study. Afr J Reprod Health 2000; 4(1): 48-55.
8. Mehdizadeh A, Alaghebandan R, Horsan H. Comparison of clinical versus ultra sound estimation of fetal weight. American Journal of Perinatology 2000; 17(5): 233-6.
9. Hendrix NW, Grady CS, Chauhan SP. Clinical vs. sonographic estimate of birth weight in term parturient: a randomized clinical trial. J Reprod Med 2000; 45(4): 317-22.
10. Tatarova S, Popov I, Khristova P. Fetal macrosomia: mode of delivery. Akush Ginekol (Sofiia) 2004; 43(6): 9-12.
11. Rondo PHC, Maia Filho NL, Valverde KK. Symphysis-fundal height and size at birth. Int J Gynaecol Obstet 2003; 81(1): 53-4.
12. Mohanty C, Das BK, Mishra OP. Parturient abdominal circumference as a predictor of low birth weight. J Trop Pediatr. 2000; 46(6): 363-4.