

Foetus Body Mass Prepartal Assessment in Clinical Practice

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ABSTRACT

The aim of study was to examine the importance of foetus body mass prepartal assessment in normal term pregnancy. The study comprised 254 pregnant women with single pregnancy, without congenital anomalies, residing in urban (Zagreb) and small towns (Samobor, Jastrebarsko). Higher birth mass was measured in male than in female newborns, and the difference was statistically significant ($p < 0.05$, $p = 0.002$). Older pregnant women more often gave birth by Caesarean section than vaginally and, the difference was statistically significant ($p < 0.005$; $p = 0.009$). Smoking and parity did not influence birth mass. The results of the study showed good prepartal estimate of fetal mass in 207 (81.5%) and bad in 47 (18.5%) pregnant women. This study has confirmed the clinical value of ultrasound in prepartal treatment of pregnancy. Since the child gender was shown to have an impact on the assessment, it is well advised to determine the child gender as well.

Key words: ultrasound, fetal biometry, fetal body mass prepartal, birth mass

Introduction

The monitoring of the foetal mass is an important aspect of antenatal care¹. The growth of an embryo and foetus is determined by the fetal genomes at fertilization and by maternal, environmental and external factors²⁻³. Several investigators have studied the importance of foetus body mass prepartal assessment in the pregnancy and the relationship between different parameters and fetal growth. Different studies have demonstrated in which way physiological variables such as parity, fetal gender, maternal smoking, maternal mass and maternal height affect fetal mass¹⁻⁶. Ultrasound is one of the best methods for predicting fetal mass⁴⁻⁶. Applying ultrasound in the assessment of the fetal body mass contributes to the more effective control of the pregnancy and necessary procedures carried out on a pregnant woman and her baby. Analysis of the influence of fetal factor, external factor, and maternal factor on the fetal body mass and its birth body mass is important from the anthropological as well as from the clinical aspect.

Objective

The objective of this retrospective clinical study was to examine the importance of foetus body mass prepartal

assessment in normal term pregnancy for achieving better care for the mother and her newborn baby during labour. The objective of the study was to assess prepartal foetus body mass on a sample of pregnant women living in urban areas (the city of Zagreb) and smaller places (areas around Samobor and Jastrebarsko) based on biometric parameters of foetus (obtained by ultrasound foetus examination), and to determine if there are any statistically important differences in the results. The study also examined the influence of the foetal factor (gender of foetus), environmental factor (place of living), and maternal factor (smoking, contraception, parity) on the birth body mass of a newborn. Namely, University Hospital 'Sestre milosrdnice' is monitoring and delivering pregnant women from that area. Assessment of the foetus body mass in prepartal period is a routine procedure at this Clinic, and it does not endanger the life or the health of mothers or foetus. The method itself is painless and non-invasive, and routine ultrasound examinations usually last for approximately ten minutes.

Materials and Methods

This retrospective clinical study included 254 pregnant women with the residence in the urban area (the city of Zagreb) and small towns (Samobor and Jastrebarsko), admitted and delivered at the 'Sestre milosrdnice' University Hospital, and their newborns delivered upon single pregnancy between 37 and 42 gestation weeks, without congenital anomalies. The women were examined within 24 hours before delivery by ultrasound, transabdominal probe (3,5 MHz) measuring biparietal diameter, abdominal circumference and femur length of the child, to obtain the fetus body mass assessment (BMA). Since it is impossible to directly measure foetal body mass at the ultrasound examination, accessible data are measured and estimated body mass assessed by using a program from the ultrasound device Hadlock formula:

$$FM(g) : 10\exp (1.335-0.0034 \times Ac \times Fl + 0.0316 \times x \text{ BPD} + 0.0457 \times Ac + 0.1623 \times Fl).$$

The assessed foetal body mass is considered valid if it varies from the newborn's birth body mass, checked immediately after birth, up to 10%. Newborns' body mass was taken within five minutes of the delivery, on scales in the delivery room (No. 404509, Sauter Brizerba Wien ± 10% g). According to their residence, pregnant women were classified into those who live in urban areas (the city of Zagreb) and those who live in small towns (Samobor and Jastrebarsko). According to gender, pregnant women were classified into those who gave birth to male children and those who gave birth to female children. As for smoking, pregnant women were classified into smokers and non-smokers during pregnancy. According to contraception, pregnant women were classified into those who have never in their life used contraception, and those who used contraception. Depending on parity, pregnant women were classified into two groups: nulliparous and multiparous. According to the delivery type, pregnant women were classified into those who gave birth vaginally, those who gave birth by Caesarean section

(section caesarean, SC), and those whose delivery was completed by vacuum extraction (VE). According to their education, pregnant women were classified into those who finished primary school, those who finished secondary education, and those who graduated at university. According to their blood groups, pregnant women were classified into those who had A, B, O or AB, and according to the Rh factor, into Rh positive and Rh negative. Statistical analysis was carried out using χ^2 test, Mann-Whitney's test and Fisher's test.

Results

The obtained data show there were 138 (54.3%) pregnant women from Zagreb, and 116 (45.7%) from small towns (Figure 1). By gender of the child, most pregnant women gave birth to a male child 129 (50.8%), whereas 125 (49.2%) had a female child (Figure 2). Most examined women did not smoke during pregnancy (199/254 (78.3%)) but 55/254 (21.7%) did smoke during pregnancy (Figure 3). Most of women did not use any contraception 213/254 (83.9%), whereas 41 (16.1%) pregnant-women used contraception (Figure 4). By parity, there were 144 (56.7%) nulliparous (giving birth for the first time), and 110 (43.3%) multiparous women (Figure 5). By delivery type, 231/254 (90.9%) gave vaginal birth, 22/254 (8.7%) had Caesarean section, and 1/254 (0.4%) had vacuum extraction (VE) (Figure 6). By education, most women (185/254 (72.8%)) had finished secondary school, 52/254 (20.5%) completed university, and 17/254 (6.7%) completed primary school. Most women had blood group A (86 (33.9%)), followed by blood group »O« ((79 (31.1%)), blood group »B« (67 (26.4%)), and blood group »AB« (22 (8.7%)). Most pregnant women were Rh positive (205 (80.7%)) and 49 (19.3%) pregnant women were Rh negative. The measured newborn BM of pregnant women from Zagreb was on average 3.495 g, whereas of those from small towns on average 3.400 g, and the difference was not statistically significant ($p > 0.05$; $p = 0.358$). Higher

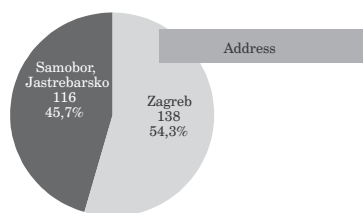


Fig. 1. Residence of pregnant women.

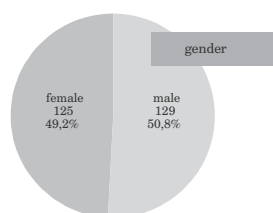


Fig. 2. Distribution of male and female child.

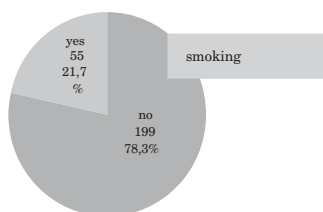


Fig. 3. Distribution of smoking and non-smoking women.

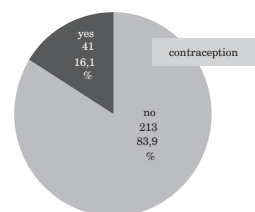


Fig. 4. Use of contraception in life pregnancy women.

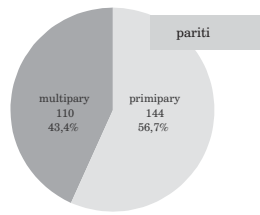


Fig. 5. Parity of pregnant women.

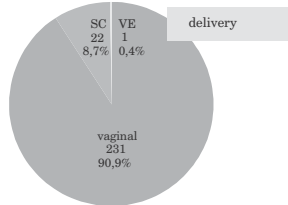


Fig. 6. Type of delivery. SC – section caesarean
VE – vacum extraction.

BM was measured in male (average 3.560 g; ranging from 2.390 to 4.880 g) than in female newborns (average 3.300 g; ranging from 2.360 to 4.720 g), and the difference was statistically significant ($p < 0.05$, $p = 0.002$). Most pregnant women from Zagreb gave birth to a female child (76 (55.1%)), 62 (44.9%) to a male child, and the difference was statistically significant ($p < 0.05$; $p = 0.042$). Average BM of newborns of non-smoking pregnant women was 3.450 g (ranging from 2.390 to 4.880 g), which was larger than in newborns of pregnant women who smoked (average BM of their newborns was 3.380 g, ranging from 2.360 to 4.390 g); however, this difference was not statistically significant ($p > 0.05$; $p = 0.532$). Contraception has not shown to have a significant impact on children's BM ($p > 0,05$; $p = 0,282$). The average BM of

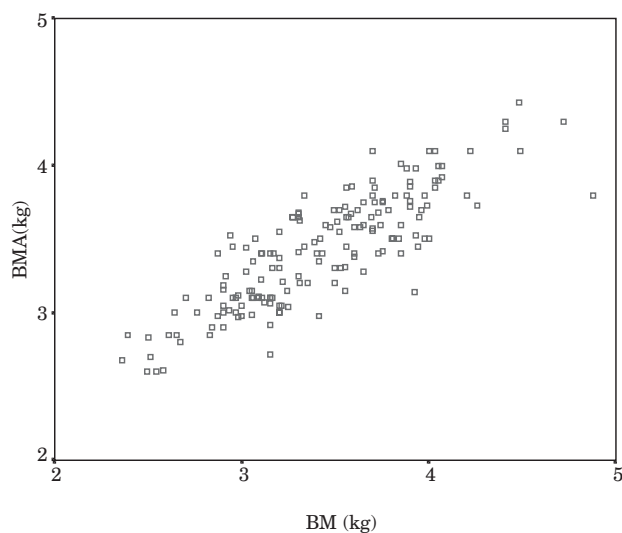


Fig. 7. Fetus body mass assessment and birth mass of newborn child. BMA – body mass assessment, BM – birth mass

TABLE 1
THE VALUE OF BODY MASS, BODY MASS AND AGE OF PREGNANT WOMEN

	Median	Min–max	p
Bodymass	78 kg	(52–127)	
Body height	168 cm	(152–186)	
Age of mother	28 g	(18–45)	
Age of mother			
vaginal	27	(18–41)	p=0.009
S.C.	31	(20–45)	

SC – section caesarean

newborn of mother who used contraception was 3.310 g, and average BM of newborn of pregnant women who did not use contraception was 3.490 g. Our study indicated that the average BM of newborns of nulliparas was 3.440 g (ranging from 2.390 to 4.880 g); the average BM of newborns of multiparas was also 3.440 g (ranging from 2.360 to 4.720 g), but the difference was not significant ($p > 0.05$; $p = 0.645$). By analyzing mass gain in pregnant woman, we obtained that the mean value of mass gain in nulliparas was 15 kg (ranging from 6 to 30 kg), while in multiparas the mean value of mass gain was 14 kg (ranging from 0 to 35 kg). This difference was not statistically significant ($p > 0.05$; $p = 0.358$). The average age of pregnant women who gave vaginal birth was 27 years (ranging from 18 to 41 years), while the average age of pregnant women who gave birth by Cesarean section was 31 years (ranging from 20 to 45 years). The difference was statistically significant ($p < 0.05$; $p = 0.009$). Mean value of all fetus BMA ranged from 2.600 to 4.660 g, (median 3.450 g) (Figure 7). Total mean BM values ranged from 2.360 to 4.880 g (median 3.440 g) (Figure 7).

In our study, carried out on 254 pregnant women, the average age of pregnant women who gave birth to male children was 28 years (ranging from 18 to 39 years), while for the mothers of female children it was 27 years (ranging from 19 to 45 years), and the results were not statistically significant ($p > 0,05$; $p = 0,382$). Range of age of the examined pregnant women was 18 to 45 years, with median 28 years (Table 1). Total body height of the examined pregnant women was 152 to 186 cm, with median 168 cm (Table 1). Body mass of the examined pregnant women before delivery was 52 to 127 kg, with median 78 kg (Table 1). The results of our study showed good prepartal estimate of fetal mass in 207 (81.5%) and bad in 47 (18.5%) pregnant women.

Discussion

Many authors have studied the importance of foetus body mass prepartal assessment in the pregnancy, and demonstrated the role of many parameters, such as parity, fetal gender, smoking, maternal mass, maternal height, etc. for the fetal mass assessment. Hansmann thinks that ultrasound-based estimate of fetal body mass made

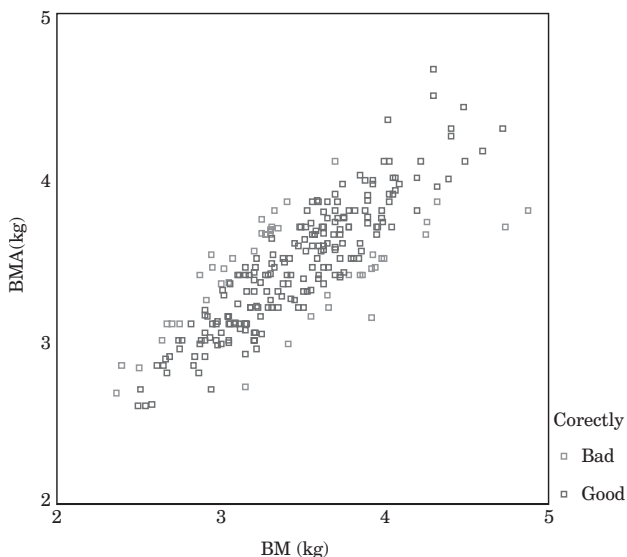


Fig. 8. Correctly of foetus body mass assesment. BMA – body mass assesment, BM – birth mass.

before delivery can be considered valid if it varies up to 10% from the newborn's BM at birth measured after delivery; which is considered today as an authoritative opinion.

Based on our inquiry of pregnant women, we established that the body mass of male newborns at birth (median: 3.560 g) was larger than the one of female newborns (median: 3.300 g) the difference was statistically significant ($p < 0.05$). This is in accordance with observations of other authors, like Mikulandra et al., who (on the basis of studying of 1.596 couples and their newborns) found that male newborns had bigger BM than female newborns⁸⁻¹¹. In our study, the average age of pregnant women for male children is 28 years, while for female children it is 27 years. Mikulandra et al. studied 1.596 pairs and their newborns (born between 37nd and 42nd week of gestation); they concluded that older parents (older mothers and older fathers) more often have male children than female children⁸. The results obtained in our study do not show the statistically significant difference between the age of pregnant women and children's gender ($p > 0.05$). The average age of pregnant women who gave vaginal birth was 27 years, while the average age of pregnant women who gave birth by SC was 31 years. The difference was statistically significant ($p <$

0.05), i.e. older pregnant women more often gave birth by SC then vaginally. This procedure can be explained by enhanced caution in the treatment of older pregnant women, given their physical and psychic condition.

Several authors proved there was a connection between pregnant women's smoking habit and lower BM of their children^{9,12-16}. In our study, average BM of newborns of non-smoking pregnant women was larger than in newborns of pregnant women who smoked; however, this difference is not statistically significant ($p > 0.05$). Some authors examined the influence of parity on fetal mass (Mongelli and Gardosi); they indicated that multiparas give birth to children with larger BM than nulliparas⁸⁻¹⁰. Our study indicated that average BM of newborns of nulliparas was 3.440 g and the average BM of newborns of multiparas was also 3.440 g and the difference was not statistically significant ($p > 0.05$). Ultrasound-based estimate of fetal body mass made before delivery can be considered as good if it varies up to 10% from the newborn's BM at birth measured after delivery⁷. The results of our study indicate good prepartal estimate of fetal mass in 207 (81.5%) pregnant women and bad prepartal estimate of fetal mass in 47 (18.5%) pregnant women (Figure 8). This makes us conclude that good prepartal estimate of fetal mass in pregnant women is much higher and that, for this reason, prepartal estimation of fetal mass before birth makes sense and is useful. Since the child gender was shown to have an impact on the assesment, it is well advised to determine the child gender as well.

In clinical work, it is very important to be able to assess foetal body mass precisely before the very delivery, since it can direct the delivery itself. It is also significant to anticipate lower foetus body mass and higher foetus body mass by timely monitoring, and because of the risks involved, organize and secure the presence of paediatricians during delivery, as well as anticipate possible surgical delivery if necessary. If doing so, we can ensure fast and high quality care for both, mother and her newborn baby during delivery.

Conclusion

This study has confirmed the clinical value of ultrasound in prepartal treatment of pregnancy. We conclude that antepartal assesment of fetal mass by ultrasound has an important role in giving a proper care for both, mother and her newborn child.

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PREPARTALNA PROCJENA FETALNE MASE U KLINIČKOJ PRAKSI

SAŽETAK

Cilj ove studije bio je ispitati važnost prepartalno procijenjene fetalne mase u normalnoj terminskoj trudnoći. Studija je obuhvatila 254 trudnica s jednoplodnom trudnoćom, bez kongenitalnih anomalija, koje su stanovale u velikom gradu (Zagreb) ili manjim mjestima (Samobor, Jastrebarsko). Veća rodna masa je izmjerena u muške nego u ženske novorođenčadi, a razlika je bila statistički značajna ($p < 0,05\%$, $p = 0,002$). Starije trudnice su češće rodile carskim rezom nego vaginalnim putem uz statistički značajnu razliku ($p < 0,005$; $p = 0,009$). Pušenje i paritet nisu utjecali na rodnu masu novorođenčadi. Rezultati studije su pokazali dobru prepartalnu procjenu fetalne mase kod 207 (81,5%) trudnica, a lošu prepartalnu procjenu kod 47 (18,5%) trudnica. Ova studija je potvrdila kliničku vrijednost ultrazvuka u prepartalnom postupku kod trudnica. Budući da se spol djeteta pokazao značajnim u procjeni, savjetujemo također prepartalno odrediti spol djeteta.