

Perinatal characteristics and prevalence of low birth weight infants in the Federation of Bosnia and Herzegovina: prospective multicentric study

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ABSTRACT

Aim To investigate the prevalence and obstetrical characteristics of low birth weight infants (LBWIs) in ten Cantons of the Federation of Bosnia and Herzegovina (FB&H).

Methods The prospective study included newborns of both genders, gestational age (GA) of 22 to 42 weeks and birth weight (BW) of less than 2,500 grams in the period 1 January 2009 to 31 December 2009.

Results In the observed period, 22897 neonates were born, out of whom 669 (2.9%) had a BW less than 2500 grams (average BW was 1295 grams; SD \pm 234.2; a coefficient of variation of 0.58). The average GA was 31.4 weeks of gestation. The average lifespan of mothers was 27.7 years (SD \pm 1.2). The average Apgar score (AS) in the first minute was 4.6 (SD \pm 2.1) and in the fifth minute it was 6.6 (SD \pm 1.9). The LBWIs were most commonly delivered by primiparas, 317 (47.5%). Of the 669 LBWIs, 411 (61.4%) were born *per vias naturalis*, with cephalic presentation. The highest number of LBWIs was born in Sarajevo Canton, 3.7%, and Central Bosnia Canton, 3.7%. The lowest prevalence was in Posavina Canton, 1.1%. The largest late fetal mortality was in Central Bosnia Canton, 7.7 %.

Conclusion This study has determined a relatively low prevalence of LBWIs and other examined obstetrical characteristics that are in correlation with European and Global World data.

Key words: neonate, perinatology, pregnancy

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INTRODUCTION

According to the World Health Organization, a newborn with a low birth weight infants (LBWIs) is a neonate with a birth weight (BW) less than 2,500 grams, regardless of the duration of pregnancy, and this term refers to preterm infants, newborns with intrauterine growth retardation (IUGR) and newborns small for gestational age (SGA) (1-3). The term *prematurus* is used for infants whose intrauterine growth lasted shorter than 37 weeks of gestation (WG), while the term IUGR implies slowing down of fetal growth (1-3). The term SGA does not indicate the rate of fetal growth, but indicates that the fetus has a low weight and/or length in relation to the gestational age (less than 3 centigrade or below 2 standard deviation adopted standards) (1-3).

The LBWIs is closely related to fetal and neonatal morbidity and mortality. These newborns represent a risk group and have high perinatal mortality, more frequent complications in the neonatal period, higher incidence of congenital anomalies, and they are more prone to infection (4). In later life, they often have suboptimal psychomotor development and more frequent chronic diseases (5).

In spite of the increasing progress of perinatal medicine and the ever-increasing perinatal care, between 9 and 19% of high-risk infants are born annually. Of this number, 80% of newborns are of LBWIs, which is more than 20 million worldwide (6). The frequency of birth LBWIs has its own geographical and social characteristics. It is estimated that more than 95% of LBWIs are born in developing countries, with a birth rate of 16.5%, and among stillbirths 20%, and does not show a tendency to weaken. In the developed part of the world, the birth rate of LBWIs is only 7%. Their participation in neonatal morbidity, mortality and in the most severe form of neuromotor damage, cerebral palsy, whose frequency ranges between 1 and 2/1000 live-born in the general population (7), are also not reduced.

Studies have shown that LBW is a result of an interaction between the biological characteristics of mother and fetus, parents, social environment, and availability of health care during the perinatal period. Furthermore, public health initiatives aimed at reducing the prevalence of births for LBWIs were largely unchanged (8,9). Populati-

on data on the characteristics of LBWIs provide unbiased information that could be applied to improving perinatal care. The quality of data derived from vital statistics records has been found reliable, because of that collection of information on maternal age, infant gender, birth weight, and delivery type are quite valid (10).

There were no studies related to the association of LBWIs and maternal sociodemographic status for the entire Federation of Bosnia and Herzegovina (FB&H). One study investigating LBWIs in Tuzla Canton during 1992-1995 period was found (11).

The aim of this study is to investigate the prevalence and obstetrical characteristics of low birth weight infants (course of pregnancy and childbirth, age of mothers, number of controls in pregnancy, mother's parity and order of birth, canton of childbirth, date and hour of birth, mode of delivery, birth weight, birth length, gestational age, Apgar score in the 1st and 5th minute) in ten Cantons of the Federation of Bosnia and Herzegovina (FB&H).

PATIENTS AND METHODS

Patients and study design

This prospective study included newborns of both genders, gestational age (GA) from 22 to 42 weeks and birth weight (BW) of less than 2,500 grams, born in one of the childbirth centres in ten Cantons of the FB&H in the period from 1 January 2009 to 31 December 2009. The standardized formulation compiled the data necessary for this type of research and included data on pregnancy, delivery and incidence to the low birth weight infants (LBWIs).

All newborns included in the study were included in one of three groups based on the GA: Group 1 - preterm infants (22-36 weeks of gestation (WG)), Group 2 - term infants (37-41 WG), Group 3 - post-term infants (42 and more WG).

According to the BW, subgroups of the BW (500-999 grams, 1000-1449 grams, 1500-1999 grams, 2000 to 2499 grams) were formed for each of the three basic groups. Newborns with BW less than 500 grams were not among the living ones.

Methods

Data on the course of pregnancy and childbirth were collected on the basis of available medical

documentation (pregnancy booklet, mother's disease history, partograms), age of mothers, number of controls in pregnancy, mother's parity and order of birth.

Data on newborns of the LBWIs in the FB&H were collected on the basis of available medical documentation, including the canton of child-birth, date and hour of birth, mode of delivery (vaginal cephalic, caesarean section, vaginal breech, unknown birth), BW, birth length, GA (completed weeks of gestation), Apgar score (AS) in the 1st and 5th minute.

The Ethics and Investigation Committee of the University Clinic Centre Tuzla approved the study.

Statistical analysis

Standard statistical descriptive statistics (mean value, standard deviation - SD, coefficient of variation - CV) were used in statistical data processing. Quantitative data are intergrouped with the Mann-Whitney U-test, and qualitative data are compared with the χ^2 test and the exact Fisher test. The prediction power of the BW, GA of pregnancy, birthplace in predicting the results of treatment were determined by specificity, sensitivity, positive and negative predictive value, and the multiple regression analysis was used to compare two dependent on one independent variable. Statistical significance was determined at the level of the difference of 5% and 1%.

RESULTS

In the period from 1.January.2009 until 31 December 2009 in the FB&H, 22,897 neonates were born, of which 669 (2.9%) had birth weight (BW) less than 2500 grams (ranged from 500 to 2499 grams, with an average of 1295 grams; SD= \pm 234.2, CV=0.58). The average GA LBWIs was 31.4 WG (SD= \pm 5.34. CV=0.17).

The average lifespan of 661 mothers (data were missing for eight mothers) of LBWIs was 27.7 years (SD= \pm 1.2; ranged from 16 to 38 years). The average AS in the first minute for 515 LBWIs was 4.6 (SD= \pm 2.1; CV=0.78). The average AS in the fifth minute was 6.6 (SD \pm 1.9; CV=29) (data were missing for 154 LBWIs) (Table 1).

The LBWIs had a similar gender representation, 345 (51.56%) male and 324 (48.44%) female neonates were born (p=0.27). The probability distribution or the relative risk of both genders for

birth with a LBW was equal [RR = 1.133 (95% CI 0.914-1.404)].

Table 1 Number, arithmetic mean, standard deviation, lowest and highest value of individual characteristics of mothers and low birth weight infants (LBWIs) in the Federation of Bosnia and Herzegovina (FB&H) during 2009

Characteristics of mothers and newborns	Number of LBWIs	Arithmetic mean	Lowest value	Highest value	Coefficient of variation	Standard deviation
Age of mothers (years)*	661	27.5	16	38	0.25	1.2
Birth weight (grams)	669	1295	500	2480	0.58	243.2
Birth length (cm)	669	42.5	24	50	0.21	2.6
WG of pregnancy	669	31.4	24.8	38.8	0.17	5.34
AS in 1st minutes†	515	4.6	0	10	0.78	2.1
AS u 5th minutes†	515	6.6	1	10	0.29	1.9

*The life span for eight mothers was unknown, and they were excluded from this analysis; †Missing data for 154 LBWIs WG, weeks of gestation;

The LBWIs were most commonly delivered by primiparas, 317 (47.5%), followed by second and fourth birth women, 129 (19.3%) and 118 (17.6%), respectively, and the lowest LBWIs were found in third birth women, 105 (15.7%).

The prevalence of births of newborns from the first pregnancy of the mother statistically significantly differed from the birth rate of LBWIs from the second maternal labor (p<0.0001) with six times higher relative risk [RR=6.038 (95%CI 4.520-8.065)]. Statistically significant differences were not in the prevalence of newborn births of the LBWIs between the second and third births (p=0.033) with an equal relative risk [RR = 1.509 (95% CI 1.048-2.172)]. An important statistically significant difference in the prevalence of births in LBWIs was found between primiparas and multiparas (p<0.0001) with a high, seven times higher relative risk [RR=7.216 (95%CI 5.352-9.731)]. The probability of birth of LBWIs was the highest in the primiparas, similar to secundiparas, while the risk was the smallest in the multiparas with a confidence interval of 95%.

A total of 465 (69.5%) LBWIs were delivered vaginally and 141 (21.1%) by Caesarean section (CS) (p<0.0001) [RR = 10.875 (95% CI 8.331-14.197)]. Of 669 LBWIs, 411 (61.4%) were born vaginally with the cephalic presentation, 54 (8.1%) vaginal births with a breech presentation (p<0.0001) [RR = 57.929 (95% CI 38.784-

86.524)]. No data on the mode of delivery were available for 63 (9.4%) newborns.

The higher number of LBWIs including stillbirths and live births were noticed in Sarajevo Canton, 184 (out of 4898 all births; 3.7%), Central Bosnia Canton, 92 (out of 2462 all births; 3.7%), Una-Sana Canton, 104 (out of 2842 all births; 3.6%) Herzegovina-Neretva Canton, 66 (out of 1870 all births; 3.5%), and Zenica-Doboj Canton, 135 (out of 4186 all births; 3.2%). In the most populated canton, Tuzla Canton, the number of LBWIs was 146 (out of 4898 all births; 2.9%). The lowest number was registered in Posavina Canton, two (out of 255 all births; 1.1%) (Table 2).

Table 2. Prevalence distribution of stillbirths (and mortality rates) and live births among low birth weights infants (LBWIs) in the Federation of Bosnia and Herzegovina (FB&H) cantons in 2009

Canton	No (%) of LBWIs		
	Stillbirths (mortality rate, ‰)	Live births	Total number of LBW births/all births
Una-Sana	17 (0.6) (6.0)	87 (31)	104/2,842 (3.6)
Posavina	0	2 (0.8)	2/255 (1.1)
Tuzla	15 (0.3) (3.0)	131 (2.7)	146/4,898 (2.9)
Zenica– Doboj	9 (0.2) (2.1)	126 (3.0)	135/4,186 (3.2)
Bosna-Podrinje	1 (0.4) (4.2)	4 (1.7)	5/236 (2.1)
Central Bosnia	19 (0.8) (7.7)	73 (2.7)	92/ 2,462 (3.73)
Herzegovina–Neretva	11 (0.6) (5.9)	55 (2.9)	66/ 1,870 (3.5)
West Herzegovina	1 (0.1) (1.4)	18 (2.5)	19/ 722 (2.6)
Sarajevo	16 (0.3) (3.3)	168 (3.4)	184/ 4,898 (3.7)
Livno	1 (0.2) (2.3)	5 (1.1)	6/438 (1.7)
Total	90 (3.9) (3.9)	669 (2.9)	759/22,897 (3.3)

If the stillborn infants are excluded from a LBWIs the image of the prevalence of a LBWIs is different (Table 2). The highest number of LBWIs was born in Sarajevo Canton, 3.4%, Una-Sana Canton, 3.1%, and Zenica-Doboj Canton, 3%, while in Herzegovina-Neretva Canton the birth rate was 2.9%. In the most populated Tuzla Canton, the birth rate with exclusion of LBWI stillborn was 2.7%, as much as in Central Bosnia and Herzegovina and West Herzegovina Canton, 2.5%. The low prevalence of births of LBWIs was in Bosnia-Podrinje Canton, 1.7%, in Livno Canton, 1.1%, and the lowest one in Posavina Canton, 0.8%.

The highest late fetal mortality rate among the LBWIs was recorded in Central Bosnia Canton, 7.7‰, Una-Sana Canton, 6‰, and in Herzegovina-Neretva Canton, 5.9 ‰. In the two largest cantons, Sarajevo and Tuzla, mortality rates were significantly lower, 3.3‰ and 3‰, respectively.

In Bosnia Podrinje, Livno Canton 10, Zenica-Doboj and West Herzegovina Canton mortality rates of 4.2‰, 2.3‰, 2.1‰ and 1.4‰, respectively, were noticed. No stillbirths were registered in Posavina Canton (Table 2).

DISCUSSION

The results of this study have shown low prevalence of LBWIs of 2.9%, which is somewhat lower than those of other authors who estimate 4.2-10.6%, depending on geographical area and socio-economic conditions (12,13). In favour of the impact of socioeconomic status in the FB&H Tuzla canton, an increase in LBWIs was recorded in the war period in relation to before and after the war (11). In a study by Tough et al. the LBWIs prevalence in Alberta was 6.4%, and it was greater than the national rate of 5.5% and comparable to the estimates in the United States of 7.0% (14,15). In a study by Sun et al, the incidence of births for LBWIs was 2.8% (16). Very low birth weight (VLBW) infants account for less than 2% (0.6-1.4%) of all live births according to European Perinatal Health Report (13), which correlates with a Croatian study (17).

In our study the birth weight (BW) ranged from 500 to 2499 grams, with an average BW of 1295 grams, and in the study by Filipović Grčić (17) the average BW was 1135.4 g (\pm 250.1 g) (17). In a study by Porta et al. average birth weight was 1100 grams (18). In our study, the birth length ranging from 24 to 50 cm, with an average birth length of 42.5 cm, was less than in the study by Filipović Grčić (17), ranging from 25 to 46 with an average of 36.9. In the study by Skokić et al. (11) both BW and birth length for LBWIs were significantly higher in all periods investigated, pre- and post-war, as well as during the war comparing to our and other studies. This can be explained by the higher average length of gestation in all three analysed periods (11).

In our study the higher average gestational age of 31.4 weeks of gestation was found as compared to studies by Filipović Grčić (17) and Porta et al. (18), the average GA was 29.0 WG and study 29.4 WG.

The average lifespan of 661 mothers of LBWIs in our study was 27.7 years ranging from 16 to 38 years. In the study by Sun et al. the mean maternal age for pregnancy was lower, 25.9 \pm 5.1 ye-

ars old (16), but in Filipović Grčić study it was higher, 29.3 years, ranging from 15 to 44 (17).

The average Apgar score in the first minute for LBWIs in the presented study was 4.6, in the fifth minute it was slightly higher, 6.6, which is lower in first minute and higher in the fifth minute in comparison with Filipović Grčić study with the average 4.9 and 6.5, respectively (17). In the study by Porta et al. it was 6 and 8, respectively (18). The LBWIs in our study had a similar gender representation, similarly to other studies (17,18).

In our study, as well as in others, the highest number of LBWIs was related to vaginal births, however, lower prevalence of Caesarean sections was found in our study (17,18).

Stillbirths were lower in our study in FB&H and in Tuzla Canton in comparison with the pre-war period and the period during the war in Tuzla Canton (11).

FB&H has been administratively divided into ten cantons. Prevalence of LBWIs according to the cantons of the FB&H significantly differed depending on the geographical area. Most of the births were in the two largest cantons in Sarajevo and Tuzla, and the birth rate of the newborn babies was the highest. The low prevalence of LBWIs was found in Bosnian-Podrinje Canton, Livno Canton and the lowest one in Posavina Canton.

The fact that it has been more than 8 years since the research was conducted might be a limitation of the study. However, there is still importance of the results even today, because no recent studies on similar topics have been conducted, while the

investigated topic is not subject to rapid change over time. Currently, we are working on a similar study, and the results of presented study could serve for comparison. The strength of the study is prospective and multi-centre data collection with standards of the primary to tertiary level of care.

This report is our first attempt to prospectively conduct a multi-centric survey of the characteristics of LBWIs in FB&H according to the international definitions, from a low-income, as well as low maternal and infant health care setting.

This study has determined the relatively low prevalence of LBWIs and other examined obstetrical characteristics that are correlated with European and Global World data.

In spite of evident progress in perinatology and significant improvement in perinatal outcome over the past decade, LBWIs remain a major problem in the world, which is the dominant risk factor for infant mortality and/or for subsequent permanent damage. Efforts to prevent the birth of LBWIs have not yielded satisfactory results, and with limited diagnostic and therapeutic options, such a newborn is a significant daily problem of a perinatologist.

Providing adequate care for newborns is an important issue for perinatal medicine.

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TRANSPARENCY DECLARATION

Conflict of interest: None to declare.

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