

Prevalence and risk factors of low-birth-weight infants in Zahedan, Islamic Republic of Iran

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معدل انتشار الرضع ناقصي الوزن عند الولادة وعوامل اختطار نقص الوزن في مدينة زاهدان الإيرانية
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الخلاصة: تستقصي الدراسة معدل انتشار الرضع ناقصي الوزن عند الولادة وعوامل اختطار نقص الوزن في 1109 من الولدان الذين وُلدوا في المستشفيات في مدينة زاهدان في جمهورية إيران الإسلامية. فقد بلغ المعدل الإجمالي لانتشار نقص الوزن عند الولادة 11.8% (9.9% - 13.7% بفاصلة ثقة CI 95%)، وكان هذا المعدل متشابهاً بين الذكور (11.1%) والإناث (12.6%). وقد ترافق نقص الوزن عند الولادة ترافقاً يُعْتَدُّ به إحصائياً مع الأصل الأثني للأم (البلوش)، والفواصل بين الأحمال التي تقل عن ثلاث سنوات، وولادة التوائم، وعدم استخدام أي معالجة بالمقويات أثناء الحمل، ونقص عدد الزيارات لمرافق الرعاية السابقة للولادة عن 4 زيارات، كما ترافق نقص الوزن مع صغر سنّ الأم، ووجود مرض لديها. ولم يُشاهد أي تأثير ناجم عن عدد مرات حمل الأم، أو عملها، أو تدخينها. وبعد التحليل بالتحوف اللوجستي اقتصرَت عوامل الاختطار التي يُعْتَدُّ بها إحصائياً على: نقص الفواصل بين الأحمال عن ثلاث سنوات، وولادة التوائم، وعدم استخدام سلفات الحديد، ومرض الأم.

ABSTRACT The study investigated the prevalence and risk factors of low birth weight (LBW) in 1109 hospital births in Zahedan city, Islamic Republic of Iran. The overall prevalence of LBW was 11.8% (95% CI: 9.9%–13.7%), similar for boys and girls (11.1% and 12.6% respectively). LBW was significantly associated with mother's ethnic origin (Balouch), birth interval < 3 years, twin birth, no use of supplements during pregnancy, < 4 prenatal care visits, no education, younger age and presence of maternal disease. There was no effect of mother's parity, occupation and smoking status. After logistic regression analysis, the only significant risk factors were: birth interval < 3 years, twin birth, no use of ferrous sulfate and maternal disease.

Le nourrisson à faible poids de naissance : prévalence et facteurs de risque à Zahedan en République islamique d'Iran

RÉSUMÉ Cette étude a évalué la prévalence et les facteurs de risque du faible poids de naissance (FPN) au sein d'un échantillon de 1109 naissances en milieu hospitalier à Zahedan (République islamique d'Iran). La prévalence globale du FPN était de 11,8 % (IC 95 % : 9,9 - 13,7 %), comparable dans les deux sexes (garçons : 11,1 %, filles : 12,6 %). Il a été constaté une association significative entre d'une part le FPN et, d'autre part, l'origine ethnique de la mère (Balouche), un intervalle génésique < 3 ans, une naissance gémellaire, l'absence de supplémentation nutritionnelle pendant la grossesse, un nombre de visites prénatales inférieur à 4, le défaut d'instruction, la grande jeunesse de la mère et l'existence d'une pathologie maternelle. Il ressort de l'analyse de régression logistique que les seuls facteurs de risque significatifs sont : un intervalle génésique < 3 ans, une naissance gémellaire, l'absence de supplémentation en sulfate ferreux et une pathologie maternelle.

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Introduction

According to the World Health Organization (WHO) definition, infants with birth weight less than 2500 g are low birth weight (LBW) [1]. There are almost 23 million LBW infants from 121 millions births in a year, a high proportion of which are in developing countries [2]. Birth weight is an important indication of health status of the infant and the principal factor that determines the infant's survival and physical and mental growth in the future [2,3]. LBW is one of the most important factors in infant mortality, as mortality of LBW babies is 40 times more than the normal-weight babies [2].

There have been a number of previous studies on LBW in the Islamic Republic of Iran. In a study in Hamadan, twin birth, mother's education and job, and maternal disease were important risk factors for LBW, but miscarriage and the number of deliveries were not [4]. In a similar study in Bushehr port, the risk of LBW in mothers aged < 19 years was almost twice that of mothers aged 19–35 years [5]. Low educational status and not attending prenatal health care were other significant risk factors for LBW. In another study in Babol it was reported that sex, mother's age, parity 1 or 5+, twin birth and gestational age < 37 weeks were risk factors [6].

Elsewhere in the world, it has been shown that smoking during pregnancy and not attending prenatal care were the most important risk factors of LBW in Argentina [7]. In Japan, the risk factors were smoking, parity and history of LBW [8]. In research in Brazil it was reported that smoking during pregnancy increased the risk of LBW by 50-fold and no prenatal care increased the risk 3-fold [9].

As the prevalence of LBW is one of the most important health indices and as the

prevalence of LBW is a function of social status and lifestyle, it is important to know the prevalence and risk factors for LBW in different areas [2]. The aim of this study was to determine the prevalence of LBW and some of its risk factors in maternity hospitals in Zahedan city in south-east Islamic Republic of Iran, the capital city of Sistan and Baluchistan province. It was hoped that the results of this study would help to inform the health authorities about the local risk factors for LBW in order to introduce programmes to reduce its prevalence.

Methods

In a cross-sectional study, a sample of 1109 infants born over a 6-month period in spring and summer 2004 in the 3 maternity hospitals of Zahedan city were chosen using stratified random sampling.

The data were collected by measuring the infants' birth weights and also from an interview with their mothers. The interview data included: infant's sex, mother's age, mother's educational level and occupation, mother's ethnic group (Sistani, Balouch, Afghan or other), parity, attendance at prenatal care during pregnancy, history of miscarriage, time interval from previous birth, twin or singleton birth, history of cigarette and opium smoking during pregnancy and use of ferrous sulfate and other supplements (multivitamins, folic acid, calcium) during pregnancy. The mothers were also asked whether they had suffered any of the following diseases during this pregnancy: maternal infection, chronic vascular disease, pre-eclampsia, chronic renal insufficiency, sickle-cell anaemia, collagen vascular disease or cyanotic heart disease.

To establish the relation of LBW with the risk factors, a chi-squared test was applied. Also, the odd ratios (OR) of the risk factors

of LBW were found using a multivariate logistic regression. Using the coefficients of the model, the ORs were estimated with their 95% confidence intervals (CI).

Results

There were 131 infants with LBW, an overall prevalence of LBW in Zahedan hospitals of 11.8% (95% CI: 9.9%–13.7%). There was no difference in prevalence between boys and girls (11.1% versus 12.6%) ($P < 0.42$).

Table 1 shows the frequency of normal and LBW infants by the selected maternal variables. The rate of LBW in infants of women employed outside the home and housewives was 6.6% and 12.4% respectively, but this was not significant. By ethnic group, the highest rate of LBW infants was for Balouch mothers (14.9%). The prevalence of LBW in mothers with no education was 16.9% and this reduced with increasing level of education to 5.4% ($P < 0.008$). The prevalence of LBW in mothers aged < 19 years was 16.0% and it reduced significantly with increasing age of mothers to 8.9% in women aged 25–34 years ($P < 0.046$).

Obstetric history

Overall, 217 (19.6%) mothers had a history of miscarriage and the prevalence of LBW for these mothers was 7.8%, but for mothers with no history of miscarriage, it was 12.8%. The prevalence of LBW was 13.5% in mothers with < 3 years interval from the previous birth, significantly more than those with ≥ 3 years birth interval (9.3%) ($P < 0.03$). The LBW in twin births (65.4%) was significantly greater than singleton births (9.3%) ($P < 0.001$).

Only 15 (0.1%) of women reported smoking cigarettes or opium. While the prevalence of LBW for mothers with a

history of smoking was greater than for the non-smokers (20.0% versus 11.3%) this was not statistically significant. The rate of LBW among women who did not use ferrous sulfate during pregnancy was significantly higher than those who used ferrous sulfate (18.6% versus 8.1%) ($P = 0.0001$). The prevalence of LBW in mothers not using supplements such as multivitamins, folic acid or calcium during pregnancy was also significantly greater. The mothers who attended regular prenatal health care had fewer LBW babies than the mothers with irregular or no prenatal health care (9.4% versus 27.8%). The prevalence of LBW for women with maternal disease was greater than the women without disease (23.5% versus 10.2%, $P < 0.001$).

Regression analysis

Table 2 shows the multivariate logistic regression analysis. The significant risk factors for LBW were birth interval < 3 years (OR 1.71, 95% CI: 1.11–2.64), twin birth (OR 18.81, 95% CI: 9.97–35.48), no use of ferrous sulfate (OR 1.92, 95% CI: 1.16–3.18) and presence of maternal disease (OR 2.03, 95% CI: 1.22–3.40). All other factors were not significant.

Discussion

According to WHO statistics, the rate of LBW is 17% in the whole world (6% in industrialized countries and 21% in developing countries). The rate in the Eastern Mediterranean Region is 11% and in the Islamic Republic of Iran 10% [10]. The prevalence of LBW in our study in Zahedan city maternity hospitals was 11.8%. The prevalence in other Iranian cities was 8.1% in Hamadan [11], 6.3% in Gorgan [12], 9.9% in Jiroft [13], 6.2% in Babol [6], 4.2% in Tehran [14] and 9.6% in Bushehr port [5]. Although improvements have been

Table 1 Frequency distribution of low-birth-weight (LBW) infants in maternity hospitals in Zahedan city in 2004

Variable	Total infants	LBW infants		χ^2	P-value
	No.	No.	%		
<i>Infant's sex</i>					
Male	587	65	11.1	0.65	0.42
Female	522	66	12.6		
<i>Mother's age (years)</i>					
< 19	125	20	16.0	8.0	0.046
19–24	395	55	13.9		
25–34	514	46	8.9		
> 34	75	10	13.3		
<i>Mother's education</i>					
None	296	50	16.9	13.7	0.008
Elementary	258	32	12.4		
Secondary	190	20	10.5		
High school	273	24	8.8		
University	92	5	5.4		
<i>Mother's occupation</i>					
Housewife	988	123	12.4	3.53	0.06
Employed	121	8	6.6		
<i>Mother's ethnic group</i>					
Sistani	272	28	10.3	9.9	0.019
Balouch	489	73	14.9		
Afghan	92	11	12.0		
Other	256	19	7.4		
<i>Parity</i>					
1	415	52	12.5	4.07	0.4
2	234	31	13.2		
3	161	22	13.7		
4	129	12	9.3		
> 4	170	14	8.2		
<i>Twin birth</i>					
Yes	52	34	65.4	150.31	< 0.001
No	1057	97	9.2		
<i>Birth interval (years)</i>					
< 3	657	89	13.5	4.65	0.031
≥ 3	452	42	9.3		
<i>Prenatal health care</i>					
No	133	24	18.0	16.8	< 0.001
Irregular	405	61	15.1		
Regular	571	46	8.1		

Table 1 Frequency distribution of low-birth-weight (LBW) infants in maternity hospitals in Zahedan city in 2004 (concluded)

Variable	Total infants			χ^2	P-value
	No.	No.	%		
<i>Use of ferrous sulfate in pregnancy</i>					
No	145	27	18.6	23.35	< 0.001
Irregular	285	49	17.2		
Regular	679	55	8.1		
<i>Use of supplements in pregnancy</i>					
No	474	68	14.3	10.85	0.028
Folic acid	63	10	15.9		
Multivitamins	321	36	11.2		
Multivitamins + folic acid	236	17	7.2		
Calcium	15	0	0		
<i>Smoking status^a</i>					
Cigarettes/opium	15	3	20.0	0.18	0.91
Waterpipe	127	19	15.0		
No	967	109	11.3		
<i>History of miscarriage</i>					
Yes	217	17	7.8	4.01	0.043
No	892	114	12.8		
<i>Presence of maternal disease^b</i>					
Yes	132	31	23.5	19.6	< 0.001
No	977	100	10.2		

^aEver smoked and smoked during pregnancy.

^bMaternal infection, chronic vascular disease, pre-eclampsia, chronic renal insufficiency, sickle-cell anaemia, collagen vascular disease or cyanotic heart disease.

Table 2 Multivariate logistic regression of the risk factors of low birth weight in Zahedan city maternity hospitals in 2004

Variable	Coefficient (β)	SE (β)	OR	95% CI	P-value
Birth interval < 3 years	0.54	0.22	1.71	1.11–2.64	0.014
Twin birth	2.93	0.32	18.81	9.97–35.48	< 0.001
No use of ferrous sulfate	0.65	0.26	1.92	1.16–3.18	0.011
Maternal disease	0.71	0.26	2.03	1.22–3.40	0.007

SE = standard error; OR = odds ratio; CI = confidence interval.

made in the prevalence of LBW in Zahedan within the last decade of the 20th century, the prevalence of LBW still needs to be reduced.

The results of the study using a multivariate logistic regression revealed that only birth interval (< 3 years), twin birth, no use of ferrous sulfate and maternal disease significantly increased the risk of LBW.

The finding about short birth interval is similar to another study in the Islamic Republic of Iran in 5 maternity hospitals of Yazd [15]. The study showed that a birth interval of < 12 months is a major risk factor for LBW. Also, a study in Tehran found that birth interval had a close relation to LBW [16]. Twin birth was also an important risk factor for LBW in other studies in Hamadan [4] and Babol [6] and elsewhere in the Islamic Republic of Iran [13, 15].

We also found that no use of ferrous sulfate in pregnancy was associated with LBW. In many studies, not using ferrous sulfate was a risk factor for LBW but in some it was not. In a study on Chinese pregnant women, the level of ferritin was measured in all women before delivery. It was shown that for women with iron deficiency the mean weight of their infants was 242 g less, and the risk of LBW was significantly greater among women with moderate anaemia compared with those without anaemia (OR = 6.5, $P = 0.009$) [17]. In a study in the United States, pregnant women randomly received either ferrous sulfate (case) or placebo (control) until 28 weeks of gestation. The rates of LBW infants in case and control groups were 4% and 17% respectively ($P = 0.003$) [18]. However, in a study in Zimbabwe on pregnant women with gestational age of 22 to 35 weeks, the mean birth weight of the case group infants was higher than the control infants but there was no difference in LBW incidence [19].

The presence of maternal diseases increased the risk of LBW by 2-fold in our study. Hypertension, pre-eclampsia, urinary tract infection (UTI), malnutrition and fetal infections (rubella, cytomegalovirus, toxoplasmosis, tuberculosis and herpes simplex) are some of the most important risk factors for LBW.

Hypertension causes blood vessel stenosis in some pregnant women and results in LBW in infants. The effect of hypertension on birth weight was investigated in studies in Yazd [15] and Isfahan [20]. Pre-eclampsia is another risk factor for LBW [15]. Pregnant women are usually well-monitored during pregnancy for their own health as well as the health of the fetus. During this period, regular prenatal visits in the Islamic Republic of Iran are made by the community health workers (*behvarz*). Normally, monthly visits are made in the first 6 months of pregnancy, increasing to 2 visits in months 7 and 8, and 4 visits in the last month of pregnancy to check for hypertension and any adverse effects.

Maternal UTI has also been shown to be a risk for LBW in pregnant women in the Islamic Republic of Iran [15]. Normally, physicians ask for a urine test during pregnancy in order to check for UTI. Therefore, prenatal care for detection of UTI is very important and necessary in pregnancy. Fetal infection is also important. The effects on the embryo of bacteriuria, intrauterine infection and other infections may result not only in restriction of weight in newborns, but may also lead to future complications for the infants [21–23].

Malnutrition is a major problem causing LBW in newborns, especially in developing countries. Pregnant women who are undernourished are at greater risk of LBW [24, 25]. Health centres can assess possible maternal malnutrition during prenatal care

and provide advice for the nutrition of pregnant women.

In the majority of studies worldwide, mothers smoking during pregnancy is one of the most important risk factors for LBW [4,8,9]. This was not shown in the present study. However, the prevalence of smoking (cigarettes and opium) might be underestimated as Iranian women may be reluctant to reveal their smoking habits in an interview.

In general, LBW is a population health problem, so it is essential to provide the necessary facilities for prenatal health care. The role of health managers in health planning and educational programmes is important. Health authorities worldwide have begun to taken action on this and it is possible to see the results in the decreasing prevalence of LBW in the world. At the same time, it is necessary to screen pregnant mothers for the important risk factors of LBW, such as low birth interval, maternal disease, twin

pregnancies and non-use of ferrous sulfate, to provide them with prenatal health care facilities. To do this job, skilled staff and managers are needed in the health centres, together with sufficient facilities and planning programmes.

For further research on LBW in this country, it is recommended that other factors be considered, such as delivery outside hospital, gestational age, maternal age, maternal height and lack of weight gain in second trimester of pregnancy.

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