

# Low birth weight in Lebanon: a morphological parameter and a health status indicator

A.R. Jurjus<sup>1</sup>

الوزن المنخفض عند الميلاد في لبنان: معلم مورفولوجي، ومُشعر (مؤشر) للحالة الصحية  
عبد رومانوس جرجس

تمثل هذه الدراسة، محاولة لتعيين معدل حدوث الوزن المنخفض عند الميلاد في لبنان. وتم فيها استقصاء القياسات البيولوجية، والمعالم الطبية البيولوجية إلى جانب المعالم الاجتماعية السلوكية. ولوحظ ارتفاع معدل حدوث الوزن المنخفض عند الميلاد من سنة 1986 إلى سنة 1990، مع حدوث الذروة في سنة 1990 أثناء احتدام الحرب الأهلية. ولكن المعدل تراجع في سنة 1991. وإلى جانب ذلك، كان الأطفال المولودون بأوزان تتراوح بين 2500 و2999 غراماً يمثلون حوالي ربع المواليد الأحياء في حين كان متوسط الوزن عند الميلاد أكثر من ذلك. وثبت أن هناك صلة بين طول مدة الحمل وبين الوزن عند الميلاد. وثمة حاجة إلى مزيد من المعلومات حول أوزان المواليد على مستوى البلاد. ويقتضي ذلك إزالة المشكلة التي تطرحها الولادات خارج المستشفيات والعمل على تحسين نظام تسجيل الأحداث الحيرية، وسجلات ما قبل الولادة.

This study is an attempt to determine the incidence of low birth weight (LBW) in Lebanon. Biometric, biomedical and sociobehavioural parameters were investigated. The incidence of LBW showed an upward trend from 1986 to 1990; a peak was observed in 1990 at the height of the war, but rates fell in 1991. Infants born with weights of 2500 to 2999 grams represented about a quarter of live births, although the mean birth weight was higher. The length of gestation was associated with birth weight. More information is needed regarding birth weights at the country level. This would require elimination of the problem of nonhospital births and improvement of the registration system for vital events and of prenatal records.

## L'insuffisance pondérale à la naissance au Liban: paramètre morphologique et indicateur de l'état de santé

Cette étude constitue une tentative afin de déterminer l'incidence de l'insuffisance pondérale à la naissance (IPN) au Liban. Des paramètres biométriques, biomédicaux et sociocomportementaux ont été examinés. L'incidence de l'IPN a eu tendance à diminuer de 1986 à 1990; un niveau maximum a été observé en 1990 lorsque la guerre était à son paroxysme, mais les taux ont diminué en 1991. Les nouveau-nés dont le poids à la naissance se situait entre 2500g et 2999g représentaient environ un quart des naissances vivantes, quoique le poids moyen à la naissance était plus élevé. La durée de la grossesse a été associée au poids à la naissance. Davantage d'informations sont nécessaires en ce qui concerne le poids à la naissance au niveau national. Pour ce faire, il faudrait éliminer le problème des naissances hors milieu hospitalier et améliorer les systèmes d'enregistrement des événements vitaux ainsi que les registres prénatals.

<sup>1</sup>Associate Professor, Department of Human Morphology, Faculty of Medicine, American University of Beirut, Beirut, Lebanon.

## Introduction

The prevention of low birth weight (LBW, birth weight less than 2500 grams) is a major public health priority. LBW is an essential determinant of neonatal mortality [1] and a reliable indicator in monitoring and evaluating the success of maternal and child health programmes [2]. Worldwide, about 16% of live births, or some 20 million infants per year, are LBW [3]. Over 90% of these infants are born in developing countries. Asia is the region with the highest incidence (19.7%), almost three times that of Europe (6.5%), or the USA (7%) [4,5]. A direct correlation between the neonatal mortality rate and LBW exists [7]. It is illustrated by the fact that the risk of neonatal mortality for LBW infants is 25 to 30 times greater than for infants with birth weight exceeding 2500 grams, and it increases sharply as birth weight decreases [5,7,8].

Several studies indicate a wide range of factors implicated in the risk of LBW [4-7]. Such factors include heredity, *in utero* environment, environmental stress and lack of social support [9,10,11]. Other studies [12] attach greater significance to the socioeconomic variables for birth weight and the interaction of social and biological factors. Ethnicity also has a marked effect, even when confounding factors are controlled [11-15]. Many of the above features are prevalent among disadvantaged communities [11], like the present Lebanese community, which has been suffering from a long and devastating war, culminating in the outrageous 1989-1990 outbreak of violence.

In the absence of a recent national census (the most recent was in 1932) and a good system of birth registration, this study is an attempt to survey the incidence of LBW in Lebanon during the period of the war from 1986 to 1991 and evaluate the possible determinants of LBW.

## Methods

### Study population

This study was performed in three stages. Stage one (Group 1) was performed in 1986. It consisted of a cohort study interviewing pregnant women, and following up all deliveries in 19 major hospitals covering various regions in Lebanon for a period of one month. It included all newborn babies (912) during that period. Stage two (Group 2) was a retrospective study. It reviewed the files of all pregnant women (602) in two hospitals during the months of January, February and March 1990, a few months after the outbreak of the last round of fierce fighting and violence. Stage three (Group 3) was a retrospective longitudinal study of 967 maternity files in one hospital: it covered a period of five years, 1987-1991, with an average of 200 files per year randomly selected.

### Variables studied

The variables studied included biometric and biomedical data as well as sociobehavioural parameters such as: weight and sex of the newborn, age of the mother at conception, gestational age, number of pregnancies, diseases during pregnancy, medications, smoking, alcohol and residence (urban vs. rural). However, only the parameters that had been well documented in the records were reported.

### Data processing and analysis

The data were processed and analysed using proprietary computer spreadsheet programs. The *t* test was also used for comparison.

## Results

### Incidence of LBW

All three groups showed concordant results. As illustrated in Table 1, the incidence of

LBW was 4.9% in Group 1 (1986) and increased to 9.5% in 1990. Similarly, in the longitudinal study (Group 3), performed over a period of five years (1987–1991), there emerged an upward trend over that period; LBW incidence increased from 6.0% in 1987, to a maximum of 14.4% in 1990, at the time of the fierce fighting, and then declined to 7.6%, with the return of relative calm and security in 1991. Such an increase in LBW could be considered to indicate a deterioration in the national health status during the war in general, and in maternal and child health in particular. The sharp increase in the year 1990 in both groups (Table 1) could be ascribed to several factors, not the least of which were the tense social situation and fierce fighting that started in 1989; the deteriorating sociopolitical and socio-economic situations; the lack of adequate water and food supplies; and the less-than-usual prenatal medical follow-ups, which were accorded second priority after survival.

### Unfavourable birth weight or deficient weight births

Wide differences emerged in the distribution of birth weights of newborns weighing at least 2500 grams; these babies deserve a follow-up study through infancy. Infants born with deficient weights of 2500 to 2999 grams represent a sizable proportion (25.4%) of live births in Lebanon (Table 2) (for comparison, the rate in Sweden is 11.6% and in New York 12.1%). Babies in this category (2500–2999 grams) are highly vulnerable to the impact of environmental conditions and social factors and are at great risk for morbidity and mortality in infancy and early childhood [1,2].

### Normal birth weight

The mean birth weight of a normal-size baby was assessed in the three groups, and

in a previous study (Group 0) performed by the author on a sample of 2501 infants using charts of paediatric clinics between 1983 and 1986 [16]. As shown in Table 3, the means of normal birth weights were very close in Groups 0, 1 and 2, but significantly lower in Group 3 ( $p < 0.05$ ). In addition, when a test of significance was done comparing the values in Group 3 between

Table 1 Incidence of LBW in Lebanon

Period	Number of newborns	Number of LBW Infants	Percentage of LBW infants
<i>A. Cross-sectional studies</i>			
1986 (Group 1)	912	45	4.9
1990 (Group 2)	602	57	9.5
<i>B. Longitudinal study (Group 3)</i>			
1987	201	12	6.0
1988	195	17	8.7
1989	200	10	5.0
1990	174	25	14.4
1991	197	15	7.6

Table 2 Distribution of birth weights in Group 3 (1987–1991)

Birth weight in grams	Number of children	Percentage
Less than 2500	79	8.1
Less than 1000	1	0.1
1000–1499	6	0.6
1500–1999	10	1.0
2000–2499	62	6.4
2500–2999	246	25.5
3000–3500	402	41.6
More than 3500	240	24.8
TOTAL	967	100

**Table 3 Distribution of the mean ( $\pm$  standard deviation) birth weights in grams in all groups**

Group 0* (n = 2501)	Group 1 (n = 912)	Group 2 (n = 602)	Group 3 (n = 907)	Mean
3350	3354	3315	3272	3325
$\pm 490$	$\pm 375$	$\pm 438$	$\pm 367$	$\pm 342$

\* Group 0: A study performed by the author on a sample of 2501 infants between 1983 and 1986 [16]

1987–1988 and 1990–1991, a significant downward trend in birth weight over these years was obtained. In all groups, the average values were well below the value of 3000 grams. However, the lower values registered in Group 3 could be due to the same reasons mentioned above for LBW.

### Length of gestation

Of the infants weighing less than 2500 grams at birth, only 37.8% were preterm in Group 1 (1986), but the percentage increased to 57.9% in Group 2 (1990), and 50.6% in Group 3 (1987–91). It regressed to 44% in Group 3 (1990), whereby an increase in intrauterine growth retardation (IUGR) was noted. On the other hand, only 1.9% of singleton live births were preterm in Group 1, 5.5% in Group 2, 4.1% in Group 3 (1987–91) and 6.3% in Group 3 (1990).

In addition, 3.3% of LBW singleton live births in Group 1 were full-term, 4.2% in Group 2; and 4.8% in Group 3 (1987–91) and 9.8% in Group 3 (1990). Therefore, a significant ( $p < 0.05$ ) upward trend in IUGR was noted over the years of war, reaching a climax in 1990, when the civil strife was at a peak.

### Parity and LBW

Primiparity has been considered by some authors [8] as an important determining fac-

tor in LBW incidence and in IUGR in particular. In our study similar results were encountered. In the longitudinal study, primiparity was consistently an important risk factor, and the occurrence of LBW was significantly higher ( $p < 0.05$ ) than in the secondiparity as shown in Table 4.

The difference was statistically significant. It is believed that the uterus develops its vascularization and becomes more vascularized with pregnancy. A uterus is better vascularized with the second pregnancy than with the first, which facilitates the passage of more nutrients through the placenta. However with more numerous pregnancies the situation might not be the same.

### Age of the mother at conception

Classical studies of neonatal and infant mortality in the USA show that the age of

**Table 4 Percentage of LBW in relation to parity**

Year	Primiparity (%)	Secondiparity (%)
1987	66.7	16.7
1988	53.3	20.0
1989	50.0	10.0
1990	56.0	24.0
1991	40.0	33.3

the mother at conception is an important determining factor of birth weight [15,17]. The incidence of LBW and infant mortality rates were high for babies of young mothers. These rates were lowest for mothers between 25 and 29 years of age.

In the two cross-sectional studies, in Groups 1 and 2, the incidence of LBW was highest in mothers less than 20 years of age (57.9% and 54.4%, respectively), while in Group 3 (1987-91) a very small percentage (3.3%) of babies were born to young mothers (less than 20 years) and there was a 6.25% rate of LBW; no such correlation was noted in Group 3.

### Twinning

As expected, twinning came up to be an important factor in determining birth weight. In Group 1, four sets of twins (i.e. eight babies) were encountered in the sample of 912 infants, giving an occurrence of 1 in 227 pregnancies. Two out of the four sets were of LBW, creating a 50% risk. In Group 2, there were 11 sets of twins (i.e. 22 babies) out of 602 newborn babies, giving an occurrence of twinning of 1:54 pregnancies. This occurrence seemed to have increased about fourfold in four years, and was relatively high when compared to the internationally reported 1:80 to 1:100 ratios [8]. Besides, 12 of the 22 babies in Group 2 were LBW, a percentage of 54.5%. In Group 3, there was a total of 18 sets of twins of whom 10 (i.e. 55%) were LBW.

Therefore, it is important to note that twinning in all these studies, as expected, was a significant predisposing factor to LBW and contributed about 50 to 55% of risk of having a LBW infant.

### Sex of the infant

In conformity with relevant literature, the occurrence of LBW was consistently higher

in female infants. In Group 1, the ratio of female to male LBW was 2.37, and in Group 2 it was 1.15, despite the fact that in both studies the sex ratio of total births favoured males in both 1986 and 1990. The incidence of LBW increased from 7.6% in 1986 to 10.2% in 1990 in females, and from 3.2% to 8.9% in males. On the other hand, the ratio of LBW females to males in the longitudinal study was 1.0 while the overall sex ratio was 110 M:100 F.

### Residence

In all three groups the numbers of LBW infants were significantly ( $p < 0.05$ ) higher in the cities; 4.6 times in the first group, 1.5 times in the second group and 1.9 in the third. Although better medical care was available in the cities, the stress of city dwelling on people, being directly involved in the fighting, could have been an important factor in affecting LBW.

### Discussion

The discrepancy between the two 1990 LBW prevalence rates (9.5% and 14.4%) could be in part due to the nature of the two groups: Group 2 was a cross-sectional study, including data collected from areas not directly involved in the rounds of violence in 1989-90, while Group 3 was a longitudinal study performed in one hospital close to the demarcation line in 1989. An average of the two values could probably be a fair estimate.

If one considered the overall average of LBW in the three groups from 1986 to 1991 (7.3%), and the overall average of the year 1990 in Groups 2 and 3 (11.6%), one would easily notice an increase in 1990. However, despite the tragic national situation and the devastating war, the incidence of LBW in

Lebanon, although it showed an upward trend, and an average peak of 11.6%, was far below the reported world average of 16% in general, and the 19.7% average reported for Asia in particular [1,3].

Such a rising trend in LBW, during the war, took Lebanon out of the league of countries with minor LBW rates like the European countries (6.5%), USA (6.8%) or Japan (5.2%) [3]. However, Lebanon was still better off than many places such as Asia (19.7%), Oceania (11.6%), Africa (14%) or Latin America (10.1%), and close to the rate in Brazil and the former Soviet Union (8%) [2].

In general, the data imply that between 1986 and 1990, the health of both mother and child deteriorated. Actually, between 1989 and 1990, Lebanon witnessed the worst period of the civil war, the overall socioeconomic status of the country worsened and this was reflected on patterns of reproduction. Mothers were more likely to be young (less than 20 years), poorly educated and relatively insecure, receiving some welfare support, homeless or often living with two or more other families. Also, there was limited accessibility and sometimes availability of quality health care at an affordable cost. Pregnant women visited the prenatal clinic less often, either because of the fighting, particularly during 1989–1990, or because they had to move to some remote area, away from the centres of violence, where availability and accessibility to health care were seriously hampered.

This situation probably reflected on the incidence of LBW, which increased sharply, as appears in both groups for the year 1990 (9.5%, and 14.4%, respectively).

In addition, the prevalence of deficient birth weight (2500 to 2999 grams) represented 25.4%, a sizable proportion of the total of LBW. It was double that of Sweden

(11.6%) or New York (12.1%). This group of infants is known to be highly vulnerable to the impact of environmental conditions and social factors [2,15,17].

On the other hand, the mean weight of a normal baby was close in all groups (3325 grams), except for Group 3 which showed a significant downward trend ( $p < 0.005$ ) reaching a mean of 3272 grams.

An increase in IUGR was noted in the second and third groups. The figures 57.9% in Group 2 and 50.6% in Group 3 were close to some figures encountered in other studies. The increase in the occurrence of IUGR between 1986 and 1990 and the increase in the incidence of LBW of preterm and term babies, coupled with a general trend toward a decrease in the average birth weight, clearly reflected the deteriorating condition of the maternal and child health status during those periods.

As expected, twinning was also a relatively important risk factor in determining birth weight. It, in effect, ranked second after the gestational period (preterm) and it was consistently between 50 and 55%. The impact of certain diseases varied, but diabetes proved to be a leading risk factor. Finally, residence in the cities, where the fighting occurred, seemed to favour significantly the incidence of LBW.

It is necessary to obtain more information regarding birth weights at the country level. However, this would require the design of new procedures to eliminate the problems presented by non-hospital births, and to improve the quality of registration of vital events and of prenatal records. These records, which were used primarily for the management of patients, serve today four additional major functions in the fields of communication, quality assurance, compensation, and documentation for legal purposes [8–20].

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