

NEONATAL MORTALITY IN RELATION TO BIRTH WEIGHT*

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ABSTRACT

730 low birth weight (LBW) neonates and 1460 controls were selected from 13,123 neonates born from October 1988 to June 1989 in 17 hospitals and maternity units in Tehran, and were compared for mortality in the first seven and up to 28 days of life (early neonatal period).

In this study all low birth weight newborns are divided according to four sub-groups of birth weight, and the mortality within the first seven (early neonatal mortality) and up to twenty eight days of life (neonatal mortality) is examined in both groups. Part of the results are as follows:

- 1- low infants comprise 5.6% of total newborns,
- 2- 14.3% of LBW neonates die within the first seven days of life,
- 3- 75% of very LBW neonates (less than 1500 g) die within the first seven days of life,
- 4- low birth weight neonates have a mortality rate twenty four times that of normal birth weight infants in the first and fourth weeks of life,
- 5- neonatal mortality rate in this study was 18 per thousand.

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INTRODUCTION

Infant mortality rate (IMR), one of the most important health indices, has declined and is further declining in the developed countries, reaching figures of 7-25 per thousand newborn infants,⁴ according to the status of health attained by these countries.

In the developing world because of enormous differences in the socio-economic status of these countries, IMR is represented by vastly different figures. According to W.H.O. this rate is quoted between 26-200 (for 1000 live born) infants.⁴

In Iran, the IMR is generally on the decline and a recent survey conducted on 1% of total population of Iran in 1988, shows this figure to be 45.⁸ With this decline in the I.M.R. the following questions become

relevant:

- 1- What percentage of LBW infants are included in this rate? i.e., what is the contribution of LBW to infant mortality?
- 2- Has the decline in neonatal mortality rate been parallel to that of IMR?
- 3- What are the differences between mortality of LBW and normal infants?
- 4- What further measures can be included in planning and implementing programmes towards improvement to this problem?

In order to examine the above questions, a survey was designed and carried out to examine different variables; the results of this survey will be published gradually.

The present article includes the results of the first data analysis which comprises the number of LBW infants and their mortality within the first and up to twenty-eighth day of life.

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Neonatal Mortality

MATERIALS AND METHODS

17 hospitals and maternity units were selected by random sampling from all hospitals and maternity units presently functioning in Tehran. In each hospital all women who had referred for delivery between October 1988 and June 1989 were interviewed and a questionnaire designed to include multiple variables was completed. For all infants who weighed less than 2500g at birth a further questionnaire which included more detailed information on the mother and her neonates was completed and recorded.

At this stage for every LBW infant, two normal birth weight infants were randomly selected for control and the same detailed questionnaire was filled and recorded for each of them.

For follow up and further information on survival or death of the above infants in the first seven up to twenty eighth days of life the following methods were employed:

1- Within the hospital inpatient period, these infants were looked after by highly trained nurses and any events pertaining to that period was recorded by this trained staff.

2- The day the mothers were discharged they were provided with two forms and two stamped envelopes to be filled by the parents, one to include the relevant details regarding the newborn's first week of life, and the other to be completed by the end of the twenty eighth day of the newborn's life and they were requested to post these completed forms. Death of the infants was requested to be reported as well. As the mothers began to answer and send these completed forms, this information was recorded on the original special questionnaire.

3- Those mothers who had not answered within the requested time were sent a further set of forms, or contacted by telephone (for those who had given a telephone number) and were further requested to inform us as to the state of the infant.

4- Those who still did not reply were followed up by a home visit to the given address. Though a lot of these addresses were not easily identified, every effort was made to locate these mothers and make a home visit.

Although all efforts were made for the follow up, nevertheless by the end of the study 8% of the neonates for the first eight days of life and 14% who had reached 28 days could not be located, mainly due to migration, wrong address, or change of address and therefore could not be included in this study.

RESULTS

Out of 13,123 newborn infants, 730 or 6% were LBW infants. 1457 infants with normal birth weight

Table I. Frequency distribution and percentage of LBW newborns according to birth weight (1988-89, Tehran)

Weight (g)	Frequency	No.	%
<1000 gm		18	2.5
1000-1499		52	7.1
1500-1999		130	17.8
2000-2499		530	72.6
Total		730	100

Table II. Comparison of neonatal mortality of case and control newborns (1988-89, Tehran)

Weight	>2500			>2500		
	No.	%	Cumulative	No.	%	Cumulative
Outcome						
Death first day	43	6.4	6.4	2	.1	.1
Death 2nd day	23	3.4	9.8	3	.2	.3
Death 3rd day	15	2.2	12.1	.	.	.3
Death 4th day	8	1.2	13.4	.	.	.3
Death 5th day	2	.3	13.6	1	.1	.4
Death 6th day	3	.4	14	1	.1	.5
Death 7th day	2	.3	14.3	1	.1	.6
alive after seven days	574	85.7	100	1327	99.4	100
TOTAL	670	100	--	1335	100	--

Table III. Comparison of neonatal mortality of case and control in the first seven and twenty eight days of life (1988-89 Tehran)

Death	Case			Control		
	No. Followed Up	No. of Death	% of Death	No. Followed Up	NO. of Death	% of Death
Days						
1-7	670	96	14.3	1335	8	.6
1-28	629	115	18.3	1251	10	.8

were selected for control by random sampling, and the mothers of the two groups were interviewed whilst in hospital. A special questionnaire was filled and completed by a trained interviewer.

LBW infants are divided into 4 sub-groups (Table I). About 10% of LBW infants comprise very low birth weight (VLBW, less than 1500g) and 90% are between

Table IV. Frequency distribution and death of LBW neonates in first seven days of life according to birth subgroups (1988-89, Tehran)

Weight (g) \ Death	No Newborn	No Death	% Death
<1000 g	18	16	90
1000-1499	46	32	70
1500-1999	124	26	20
2000-2499	482	22	5
Total	670	96	14

Table V. Frequency distribution of neonatal death in first 28 days of life according to birth subgroups (1988-89, Tehran)

Weight (g) \ Death	No. Newborn	No. Death	% Death
<1000	18	16	90
1000-1499	46	34	75
1500-1999	114	35	30
2000-2499	451	30	7
Total	629	115	18

Table VI. Calculation of probability of neonatal mortality rate (1988-89, Tehran)

Case and control \ No. of Death	Ratio at birth	No. Newborn	No. of death	Death ratio in 28 days	Probability of neonatal mortality rate
Case	.056	629	115	.183	.010248
Control	.944	1251	10	.008	.007552
Total	1	1980	125	--	.0178

1500-2499 g, moderate LBW. Figures for developed countries indicate that 1% of total newborn is within the category of LBW,² matching our figures in this study, which demonstrates that VLBW in this study comprises less than 1% of total births.

A total of 670 LBW neonates have been followed for the first seven days of life. Within this period, 96 deaths have been reported in the first seven days, which is further subdivided from day one to day seven (Table II).

From data presented in Table II, we see that:

- 1- 14.3% of LBW infants die within the first week of life.
- 2- The number dying within the first 24 hours is twice that of the second day, three times that of the 3rd day,

five times that of the 4th day and 20 times the 5th, 6th and 7th days. In other words 45% of deaths in the first week of life of LBW infants occurs within the first twenty four hours of birth, and the danger of death decreases as the infants progress towards the end of their first week of life.

3- A comparison of figures of death among LBWs to those of normal birth weight show that although this figure among the latter group is 6%, this figure is 14.3% for LBWs. In other words, the probability of dying is 24 times higher for LBW infants compared to that of normal birth weight infants.

Table III shows that death rate of L.B.W infants is 24 times that of normal birth weight within first seven days of life and also the % of death of these infant within first 28 days of life is about 23 times that of normal birth weight infants.

According to Table IV 90% of those weighing less than 1000g die within the first week of life.⁷ This figure decrease to 70% for those weighing between 1000-1500 gm and for those less than 1500g it is 75% whilst those weighing between 1500-2499g only 5% die in the first week of life.

In other words as birth weight increases so does the chance of survival.^{5,7}

From Table V we can conclude that:

- 1- 18% of neonates weighing less than 2500 g die within the first 28 days of life,
- 2- VLBW infants (birth weight less than 1500 g) are in extreme danger.

According to the results of this study, the probability of neonatal mortality rate can be calculated, as shown in Table VI, to be 18 per thousand.

DISCUSSION

In the present study percentage of LBWs (less than 2500 g) born in statistically selected hospitals and maternity units in Tehran comprise 6% of total births. This figure compares favourably with a study carried out a year ago in Tehran.¹ With regard to the fact that 20% of the total population of Iran live in Tehran and 85-95% of total births occur in hospitals,⁸ this figure becomes very important when compared to LBWs given for the total births in the country, which is in the range of 10-14%.⁹ Our figure in Tehran compares favourably with those of developed countries and is quite different from those of other developing countries,⁴ (which is similar to those of our national figure). This discrepancy could be explained as LBW was defined as follows:

- a- In this study, less than 2500 g, while in other studies they might have included 2500 g in the LBW range,
- b- The majority of pregnant women were house-

wives and were not engaged in heavy labour,

c- The pregnant woman in our culture has a special place in the family, and every family member tries to balance any deficiency. Early neonatal and neonatal mortality of LBWs is respectively 24 and 23 times that of normal births. IMR of urban population carried out on 1% of population⁸ is 31 per thousand for total urban areas, and as the probability of neonatal mortality rate for our study is 18 per thousand, therefore by inference from this figure, we can assume that about 58% of total IMR occurs within this neonatal period which includes the majority of LBWs. This figure parallels that of developing countries^{9,12} Considering the trend of reduction of IMR in both rural and urban areas and the fact that 58% of total IMR is neonatal mortality, therefore more preventive efforts should be directed for reduction of neonatal mortality. This could be achieved by adopting the following strategies:

1- Expansion of mother and child health for providing prenatal services, accompanied by education of mothers towards changes in the fertility behaviour and attitude of the mothers, and

2- Improvement of services within hospitals and maternity units for provision of intensive care units for premature infants.

In conclusion, our recommendation is for provision of the first line of approach through the second line, i.e. special intensive care is of primary importance for helping the survival of premature infants.

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