

Causes of infant mortality in Jordan

Sami A. Khoury, MD, MPH, Diana F. Mas'ad, MBBS, MHA.

ABSTRACT

Objectives: Jordan lacks accurate information on mortality and related indicators. Reporting of infant deaths is defective. Infant mortality rate based on registered deaths was 6/1000 live births, while estimates of this rate based on indirect methods varied between 29-70/1000 live births. Causes of death in general are grossly misrepresented in death certificates. The objective of this paper is to explore, in-depth, causes of infant mortality and related indicators.

Methods: An assessment of causes of death by verbal autopsy was carried out at the Department of Family and Community Medicine, University of Jordan, Amman, Jordan. This was applied between November 1995 through to October 1996, to a random sample of 200,000 persons living in 100 clusters representing the population and all geographic areas of Jordan. The verbal autopsy instrument was based on algorithms and filter questions to determine the underlying cause of death. In this sample there were 6028 infants among them 129 deaths were identified. Infant deaths were analyzed according to rates and causes

of death were classified according to International Classification of Diseases (10th revision).

Results: Age-specific death rate was 21.4/1000 infants and gender specific death rates were 22.6/1000 male infants for males and 20.1/1000 female infants for females. The 3 leading causes of infant death were conditions originating in the perinatal period, congenital malformations and diseases of the respiratory system. The leading cause of death in the neonatal period was conditions originating in the perinatal period, while in the post-neonatal period, it was congenital malformations. Prematurity was the leading contributory cause of infant death.

Conclusion: This study showed that causes of infant mortality in Jordan tend to be similar to those prevailing in developed countries.

Keywords: Infant mortality, causes, rates, verbal autopsy.

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Infant mortality is considered one of the most sensitive indicators of the health status of a community. Jordan lacks accurate information on mortality, causes of death and all related indicators. Mortality in general is under reported; the crude death rate for 1994 was estimated by the government Department of Statistics (DOS) at 6/1000 population whereas the registered deaths for that year yielded only a rate of 3/1000.¹ Infant mortality rate based on registered deaths was reported to be 6/1000 live births while estimates based on indirect methods, surveys and various samples yielded a rate varying between 29-70/1000 live births depending on different research designs and methodologies.^{2,3}

Causes of death in general and causes of infant deaths in particular are grossly misrepresented in death certificates, not only in Jordan but even in the United States of America (USA).^{4,5} Because of this defect in rates and causes related to mortality, the authors carried out an assessment of causes of death by verbal autopsy,⁶ based on a randomly selected sample of 200,000 people living in 100 clusters, representing the population and all geographic areas of Jordan. A special instrument was constructed using algorithms and filter questions to establish the specific underlying cause of death in this sample. Determination of cause of death was based on the underlying cause of death as defined in the

From the Department of Family and Community Medicine, University of Jordan, Amman, Jordan.

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Address correspondence and reprint request to: Dr. Sami A. Khoury, Department of Family and Community Medicine, University of Jordan, Amman, Jordan. Tel. +962 (6) 5355000 Ext. 2393. Fax. +962 (6) 5355111. E-mail: admin@ju.edu.jo

International Classification of Diseases, 10th revision (ICD-10).⁷ Contributory causes of death are those diseases, morbid conditions or injuries which, contributed to death through the underlying cause of death. Field workers reported a total of 965 death events in a population of 198,989 identified in the 100 clusters, yielding a crude death rate of 5/1000 which was close to the 6/1000 estimated by the DOS for the same year.⁸ Among the 965 deaths reported, there were 129 infant deaths (0-11/12 months).

The objective of this 2nd part of the initial survey is to study these infant deaths to determine death rates and related measures and causes of death and their related indicators.

Methods. Sample. The initial survey, Assessment of Causes of Death by Verbal Autopsy, included 6028 infants (less than one year), 3048 (52%) males and 2980 (47.8%) females, which were considered the populations at risk. In this group 129 deaths were identified. This study was carried out at the Department of Family and Community Medicine, University of Jordan, Amman, Jordan. This was applied between November 1995 through to October 1996

Operational definitions. For the purpose of this study the following definitions were adopted. 1. Death rates: Infant mortality rate could not be calculated due to the inavailability of the total number of live births in that period and for that sample. (a) Age specific death rate/1000 is defined as the number of death events in the age group less than one year divided by the total number of the population at risk (N=6028). (b) Percentage distribution of infant deaths by gender refers to the percentage of male or female deaths from the total number of infant deaths. (c) Gender-specific death rate/1000 is the number of death events in one gender, divided by the population at risk in that gender (males=3048, females=2980). 2. Causes of death: As mentioned earlier, the underlying cause of death is used as defined in the ICD-10. (a) Proportionate mortality ratio is the number of deaths from a given cause divided by the total deaths in the age group < one year in percent. (b) Cause-specific death rate/100.000 refers to the number of infant deaths from a stated cause divided by the population at risk and multiplied by 100,000. (c) Percentage distribution of causes of death by age group refers to the percentage of deaths in the neonatal (0-28 days) and post-neonatal (1/12-11/12 months) periods. (d) Contributory causes of death are as defined earlier.

Results. Percentage distribution of infant deaths by gender showed that out of a total of 129 deaths, 69 (53.5%) were males and 60 (46.5%) were females. Age-specific infant death rate for the time period 1995-1996 was found to be 21.4/1000 infants, while

Table 1 - Proportionate mortality ratio by major groups of causes according to the International Classification of Diseases, 10th revision and by order of magnitude.

Cause	Frequency	(%)†
<i>Conditions originating in the perinatal period</i>	70	(54.7)
Respiratory distress syndrome	38	(54.3)†
Sepsis of the newborn	19	(27.1)†
Intrauterine hypoxia	8	(11.4)†
Intrauterine growth retardation	2	(2.9)†
Intrapulmonary hemorrhage	2	(2.9)†
Pneumothorax	1	(1.4)†
Congenital malformations	28	(21.9)
Diseases of respiratory system	10	(7.8)
Infectious diseases	6	(4.9)
Accidents	5	(3.9)
Sudden infant death syndrome	4	(3.1)
Diseases of circulatory system	3	(2.3)
Diseases of nervous system	2	(1.6)
Total	128*	(100)
* - one missing case due to inavailability of a cause of death † - figures in parentheses are percentages from cause one		

gender-specific death rate for the same period was 22.6/1000 male infants for males and 20.1/1000 female infants for females. Proportionate mortality ratio classified by major groups of causes according to ICD-10 is shown in **Table 1**. Causes of infant death classified by neonatal and post-neonatal period are shown in **Table 2**. Cause-specific death rates for infants, classified by major groups of causes and their codes according to ICD-10 are shown in **Table 3**.

Contributory causes of infant deaths. In 63 death events (49.2%), no contributory cause of death was found, while 49 events (38.3%) showed prematurity as a contributory cause of death. Other determined contributory causes were aspiration of amniotic fluid in 2%, Down's syndrome in 2.3%, congenital heart disease in 2%, pneumonia in 2% and maternal eclampsia in 0.8%.

Discussion. The results of this study, showed that 73% of infant deaths occurred in the neonatal period while 27% occurred in the post-neonatal period. Gender-specific death rate showed a higher mortality in males than in females, which reflects the general pattern of infant mortality.^{4,9,10} However, some researchers¹¹⁻¹³ found an excess of female infant mortality, which was attributed to gender preference. The 2 leading causes of infant mortality were

Table 2 - Cause of death by age group: Neonatal and post-neonatal according to International Classification of Diseases, 10th revision.

Cause of death	Neonatal (0-28 days)			Post-neonatal (1/12-11/12)		
	Rank	N	(%)	Rank	N	(%)
Conditions originating in the perinatal period	1	67	(72)	3	3	(8.6)
Congenital malformations	2	13	(13.9)	1	15	(42.9)
Diseases of respiratory system	3	6	(6.5)	2	4	(11.4)
Infectious diseases	4	2	(2.2)	2	4	(11.4)
Accidents and adverse effects	5	1	(1.1)	2	4	(11.4)
Sudden infant death syndrome	5	1	(1.1)	3	3	(8.6)
Diseases of circulatory system	4	2	(2.2)	4	1	(2.9)
Diseases of the nervous system	5	1	(1.1)	4	1	(2.9)
Total*	-	93	(72.7)	-	35	(27.3)

* - 1 missing care

conditions originating in the perinatal period and congenital malformations. Causes of infant deaths in this study, strictly followed the ICD-10 classification, therefore, comparison with other published studies on causes of infant mortality, which either used an earlier edition of ICD or did not use ICD classification at all, becomes very difficult. In Jordan, very few sources dealing with infant mortality were found. A hospital based study involving 12 hospitals¹⁴ showed that the 3 leading causes of

neonatal death were in descending order: respiratory distress syndrome, sepsis of the newborn and asphyxia. Even though the classification of these causes of death was not based on any one of the ICD classifications, it is noted that the 3 leading causes of neonatal death found in that study replicate the same causes and in the same order found in our study. Dolfus et al¹⁵ analyzing the leading causes of infant deaths in the USA, grouped the following conditions under "prematurity and related conditions"; extreme immaturity and other pre-term infants, intra cranial hemorrhage, respiratory problems, necrotizing enterocolitis and other specified perinatal conditions. It is noteworthy, that in ICD-10, prematurity is not a separate entity, but underlying causes of infant deaths related to prematurity are grouped under " conditions originating in the perinatal period " while prematurity itself may have been considered a contributory cause of death. Taking this into consideration, the results of the present study showed that in 38% of all infant deaths, prematurity was found to be a contributory cause. In the USA and according to the modified Dolfus¹⁶ classification of infant deaths for the years 1985, 1991 and 1996, prematurity and related causes and congenital anomalies ranked first and 2nd, while other infections ranked as the 4th cause. The figures cited for "other infections" were close to the 4.7% of infant death from infectious disease found in the present study (**Table 1**) which was also ranked as the 4th cause of death. Prematurity and congenital malformations remain the 2 leading causes of infant death cited by most investigators^{10,16-18} which corroborate the findings of this study. In developing countries, the pattern of causes of infant deaths reflects the prevalence of infectious disease and malnutrition.^{19,20} In Jordan, the causes of infant deaths

Table 3 - Cause - specific death rate for infants classified by major groups of causes according to International Classification of Diseases - 10th revision and by order of magnitude.

Cause	Frequency	Rate/100,000	ICD-10 codes
Conditions originating in the perinatal period	70	1161.2	P22.9, P36.9, P20.9, P05.9, P26.9, P25.1
Congenital malformations	28	464.5	Q28, Q07, Q45, Q64, Q82, E90
Diseases of respiratory system	10	165.9	J18, J21
Infectious diseases	6	99.5	A09, B19
Accidents	5	82.9	T17, T50
Sudden infant death syndrome	4	66.4	R95
Diseases of circulatory system	3	49.8	I61
Diseases of nervous system	2	33.2	G03

as demonstrated in this study, showed a pattern similar to that of developed countries.

Finally, it is worth noting that the percentages of some causes of infant deaths were computed from a small number of death events, which may have been due to the size of the original sample. Nevertheless, the 3 leading causes of infant deaths; (a) conditions originating in the perinatal period, (b) congenital malformations and (c) diseases of the respiratory system were based on a sufficient number of cases and their ranking was similar to other studies with a larger number of death events.

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