

# Infant mortality in Arab countries: sociodemographic, perinatal and economic factors

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وفيات الرضع في البلدان العربية: العوامل الاجتماعية والديمغرافية والاقتصادية والرعاية في الفترة المحيطة بالولادة  
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خلاصة: تمت دراسة معدلات وفيات الرضع في الفترة بين 1978 و1998 في 16 بلداً عربياً من إقليم شرق المتوسط بعد استخلاص المعطيات من كل من منظمة الصحة العالمية واليونيسف ثم درس تأثير المؤشرات الديمغرافية والاجتماعية والاقتصادية والرعاية في الفترة المحيطة بالولادة على معدلات الوفيات عام 1998 وذلك باستخدام معامل الترتيب لسبيرمان لكشف أي ترابطات ذات أهمية. وقد اتضح لدى جميع البلدان (باستثناء العراق) انخفاض شديد في المعدلات في الفترة بين 1978 و1998، وبدا أن معدلات وفيات الرضع تتناسب تناسباً طردياً مع عدد السكان والمجموع السنوي للبلدان ونقص الوزن لدى الولادة ومعدلات الوفيات لدى الأمهات، وتتناسب ثانياً عكسياً مع كل من الإلمام بالقراءة والكتابة لدى الجنسين من ذكور وإناث والنتائج المحلي الإجمالي ونصيب كل فرد منه وإتاحة الماء المأمون للشرب ومرافق الإصحاح الكافي.

**ABSTRACT** The infant mortality rates for 1970 and 1990 of 10 Arab countries in the Eastern Mediterranean region were studied. The data were extracted from World Health Organization and United Nations Children's Fund sources. The impact of demographic, social, perinatal care and economic indicators on infant mortality rates in 1998 was studied using Spearman rank coefficient to detect significant correlations. All countries, except Iraq, showed a sharp decline in rates from 1978 to 1998. Infant mortality rates were directly related to population size, annual total births, low birth weight and maternal mortality ratios. Also, infant mortality rates were inversely related to literacy status of both sexes, annual gross national product per capita and access to safe drinking-water and adequate sanitation facilities.

## La mortalité infantile dans les pays arabes: facteurs socio-démographiques, économiques et périnataux

**RESUME** Les taux de mortalité infantile pour 1978 et 1998 dans 16 pays arabes de la Région de la Méditerranée orientale ont été étudiés. Les données étaient tirées de sources de l'Organisation mondiale de la Santé et du Fonds des Nations Unies pour l'Enfance. L'impact des indicateurs démographiques, sociaux, économiques et des soins périnataux sur les taux de mortalité infantile en 1998 a été étudié en utilisant le coefficient de corrélation des rangs de Spearman pour détecter les corrélations significatives. Tous les pays, sauf l'Iraq, affichaient une diminution importante des taux de 1978 à 1998. Les taux de mortalité infantile étaient en relation directe avec la taille de la population, le nombre total des naissances annuelles, le faible poids à la naissance et les ratios de mortalité maternelle. En outre, les taux de mortalité infantile étaient inversement liés à l'alphabétisation pour les deux sexes, au produit national brut annuel par habitant et à l'accès à l'eau de boisson saine et aux installations d'assainissement adéquates.

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## Introduction

The global well-being of nations is a complex process in which many factors are involved, the core components in the process being health, social factors and economic aspects that act together [1,2]. Socially and economically developed societies tend to produce healthy individuals. At the same time, health is the foundation of human development. Improvement of the population's health is the key to help nations achieve social and economic prosperity. Infant health is crucial to the health of future generations. The infant mortality rate is one of the indicators that provides a useful insight both on the health status of the population and on the effectiveness of the health services offered in the community. Despite the fact that infant mortality rates in Arab countries of Eastern Mediterranean are progressively declining, they still remain a public health concern in many countries as a good number of infants die in their first year of life [3-8]. Comparison of infant mortality rates among countries can give a great deal of information on the possible predictors of infant health, but such predictors may not be relevant to all countries or predictors specific to culture and traditions may be lacking in some areas. However, comparison of countries that share the same geographic location, culture and traditions provides a better understanding of the distribution and determinants of infant health in that region.

Therefore the aim of this study was to compare infant mortality rates among the Arab countries of the Eastern Mediterranean and to identify the possible determinants in order to understand what future efforts are required to make further progress in improving infant health in this part of the world.

## Methods

The data used in this study were those of the World Health Organization (WHO) published in 1999 [2] and the latest United Nations Children's Fund statistics available on the Internet that were updated on the first of December 1999 (<http://www.unicef.org/statis/>). In all, 16 Arab countries in the Eastern Mediterranean region were considered (Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates and Republic of Yemen). All definitions used were those of WHO and UNICEF. Infant mortality rates (IMR), defined as the probability of dying between birth and exactly 1 year of age expressed per 1000 live births, for the year 1998 [2] were compared for the different countries. The percentage decline in infant mortality rates between 1978 and 1998 was calculated as:

Percentage decline in IMR (1978-98)

$$= \frac{\text{IMR 1978} - \text{IMR 1998}}{\text{IMR 1978}} \times 100$$

The factors related to infant mortality were classified into demographic, social, perinatal care and economic. The demographic factors studied were: a) the total population size; b) the annual total births available from UNICEF statistics; c) the annual growth calculated as the average percentage change in population size between 1978 and 1998; and d) the total fertility rate calculated as the number of children born to a woman of reproductive age. The social factor considered was male and female adult literacy rates calculated as the percentage of people aged 15 years and over

who can read and write as reported in UNICEF statistics. A male/female literacy ratio was calculated to detect discrepancies in literacy status by sex. The perinatal care indicators taken from the UNICEF statistics included the percentage of low birth weights (< 2500 g at birth) and maternal mortality ratios (the annual number of deaths of women from pregnancy-related causes per 100 000 live births). The economic factors included the annual gross national product (GNP) per capita expressed in United States dollars and the proportion of the population with access to safe drinking-water and adequate sanitation facilities according to UNICEF statistics. Data analysis was performed using SPSS (version 9.0). Statistical analysis was carried out to detect the impact of the demographic, social, perinatal care and economic factors on infant mortality rates using the rank-order procedure. Countries were ranked in an ascending order for each variable and given a score. Scores were then compared to those attributed to the infant mortality rates in 1998. The Spearman rank coefficient was calculated to detect significant correlations between the rank order of each variable and that of infant mortality rates.

## Results

### Infant mortality rates

The infant mortality rates in 16 Arab countries of the Eastern Mediterranean during 1998 ranged from 12‰ to 95‰ (Table 1). The countries could be divided into the following three groups.

- The group of countries with the lowest rates ( $\leq 25\%$ ) included Kuwait (12‰), United Arab Emirates (16‰), Bahrain (17‰), Qatar (17‰), Saudi Arabia (23‰) and Oman (25‰).

- The group of countries with moderate rates ( $> 25\%$  to 50‰) included Jordan (26‰), Libyan Arab Jamahiriya (28‰), Lebanon (29‰), Tunisia (30‰) and Syrian Arab Republic (33‰).
- The group of countries with the highest rates ( $> 50\%$ ) included Egypt (51‰), Morocco (51‰), Sudan (71‰), Republic of Yemen (80‰) and Iraq (95‰).

However, a marked decline in infant mortality rates was reported in all countries

Table 1 Infant mortality rates (IMR) and the percentage decline from 1978 to 1998 in 16 Arab countries of the Eastern Mediterranean

Country	IMR 1978	IMR 1998	Decline in rate 1978-99
	‰	‰	%
Bahrain	43	17	60.5
Egypt	131	51	61.1
Iraq	84	95	-13.1
Jordan	65	26	60.0
Kuwait	34	12	64.7
Lebanon	48	29	39.6
Libyan Arab Jamahiriya	63	28	55.6
Morocco	110	51	53.6
Oman	95	25	73.7
Qatar	46	17	63.0
Saudi Arabia	75	23	69.3
Sudan	97	71	26.8
Syrian Arab Republic	67	33	50.7
Tunisia	88	30	65.9
United Arab Emirates	38	16	57.9
Republic of Yemen	158	80	49.4

from 1978 to 1998, except Iraq that showed a 13.1% increase in rate. The decline in infant mortality rates ranged from 26.8% to 73.7%. A sharp decline in rates was especially seen in the member countries of the Gulf Cooperation Council (GCC), Tunisia, Egypt and Jordan.

### Demographic factors

As shown in Table 2, the infant mortality rates in 1998 were seen to be directly correlated with the total population size ( $r_s = 0.82$ ,  $P = 0.000$ ) and the annual total births ( $r_s = 0.85$ ,  $P = 0.000$ ) but was not correlated with the annual growth rate or the total

fertility rate. The GCC countries, except Saudi Arabia, had low total population size and annual total births. Egypt had the highest total population and annual total births that were at least double other countries. Moreover, Egypt and Sudan, both of which were classified among those with highest infant mortality rates, population size and total annual births, still showed relatively high annual growth rates and fertility rates. The United Arab Emirates, Qatar, Saudi Arabia and Oman show high annual growth rates and fertility rates. The danger in future population growth in the Arabian Peninsula lies in these countries, but it is

Table 2 Demographic factors in 16 Arab countries of the Eastern Mediterranean

Country	Population size 1998 (000)	Total births 1998 (000)	Annual growth rate 1978-1998 %	Total fertility rate 1998 %
Bahrain	595	11	3.2	2.9
Egypt	65 978	1726	2.3	3.4
Iraq	21 800	792	3.0	5.3
Jordan	6 304	218	4.3	4.9
Kuwait	1 811	39	2.0	2.9
Lebanon	3 191	74	0.8	2.7
Libyan Arab Jamahiriya	5 339	156	3.3	3.8
Morocco	27 377	706	2.0	3.1
Oman	2 382	83	4.3	5.9
Qatar	579	10	5.4	3.7
Saudi Arabia	20 181	680	4.4	5.8
Sudan	28 292	932	2.4	4.6
Syrian Arab Republic	15 333	464	3.2	4.0
Tunisia	9 335	189	2.1	2.6
United Arab Emirates	2 353	43	5.6	3.4
Republic of Yemen	16 887	807	4.0	7.6
$r_s$	0.82	0.85	-0.38	0.30
$P$	0.000	0.000	0.144	0.265

particularly apparent in Saudi Arabia where all demographic factors were relatively elevated.

### Social factors

Literacy rates (Table 3) varied from 58% to 91% for males and from 18% to 80% for females. Infant mortality rates were inversely correlated with both male literacy

( $r_s = -0.57, P = 0.020$ ) and female literacy rates ( $r_s = -0.81, P = 0.000$ ). Also, infant mortality rates were directly correlated with the male/female literacy ratio ( $r_s = 0.89, P = 0.000$ ). Qatar, United Arab Emirates, Bahrain, Jordan and Lebanon were foremost in reducing gender distinction in education. However, in the Republic of Yemen, Morocco, Egypt, Sudan, Iraq and Syrian Arab Republic significant differences were seen between male and female chances of education.

Table 3 Male and female literacy status during 1998 in 16 Arab countries of the Eastern Mediterranean

Country	Male literacy rate %	Female literacy rate %	Male/female literacy ratio
Bahrain	89	79	1.1
Egypt	64	38	1.7
Iraq	71	45	1.6
Jordan	91	80	1.1
Kuwait	82	76	1.1
Lebanon	91	77	1.2
Libyan Arab Jamahiriya	87	60	1.5
Morocco	58	31	1.9
Oman	75	51	1.5
Qatar	79	80	1.0
Saudi Arabia	80	59	1.4
Sudan	63	38	1.7
Syrian Arab Republic	85	54	1.6
Tunisia	76	53	1.4
United Arab Emirates	79	80	1.0
Republic of Yemen	62	18	3.4
$r_s$	-0.57	-0.81	0.89
$P$	0.020	0.000	0.000

### Health factors

The proportion of low birth weights ranged from 6% to 19% and maternal mortality ratios ranged from 3 per 100 000 to 550 per 100 000 (Table 4). Still, infant mortality rates were highly correlated with the proportion of low birth weights ( $r_s = 0.81, P = 0.000$ ) and maternal mortality ratios ( $r_s = 0.96, P = 0.000$ ). Countries with the highest infant mortality rates had the poorest perinatal care indicators.

### Economic factors

The three economic factors studied varied markedly within the region (Table 5). The annual GNP per capita in 1998 ranged from US\$ 270 to US\$ 20 190 per capita. Highest GNP per capita was mainly found in the GCC countries. The annual GNP per capita was inversely correlated to the infant mortality rates ( $r_s = -0.96, P = 0.000$ ). The proportion of the population that had access to safe drinking-water ranged from 61% to 98% while access to adequate sanitation facilities ranged from 51% to 99%. Still, infant mortality rates were inversely correlated with the percentages of population with access to safe drinking-water ( $r_s = -0.67, P = 0.009$ ) and adequate sanitation facilities ( $r_s = -0.66, P = 0.007$ ).

**Table 4 Low birth weight and maternal mortality during 1998 in 16 Arab countries of the Eastern Mediterranean**

Country	Low birth weight %	Maternal mortality ratio per 100 000 live births
Bahrain	6	46
Egypt	10	170
Iraq	15	-
Jordan	10	41
Kuwait	7	5
Lebanon	10	100
Libyan Arab Jamahiriya	7	75
Morocco	9	230
Oman	8	19
Qatar	-	10
Saudi Arabia	7	-
Sudan	15	550
Syrian Arab Republic	7	110
Tunisia	8	70
United Arab Emirates	6	3
Republic of Yemen	19	350
$r_s$	0.81	0.96
$P$	0.000	0.000

## Discussion

The comparison of infant mortality rates among countries is valuable for the purpose of health evaluation and planning. Mortality rates provide reliable means of comparison, especially among countries that have different registration systems and health policies, as death is a finite event, which, unlike illness, can be recorded with equal certainty in different parts of the world [9].

The results of our study illustrate the differences in infant mortality rates in the Eastern Mediterranean region. Despite the fact that Arab countries in this area share many cultural practices, such as marriage at a young age, multiparity and consanguinity [10-15], all of which affect infant health, infant mortality rates still vary markedly between the countries. Our results show that Arab countries in the Eastern Mediterranean can be classified into three groups with respect to infant mortality rates: the GCC countries constitute the first group with the lowest rates ( $\leq 25\%$ ); the second group with rates from  $>25\%$  to  $50\%$  include Jordan, Libyan Arab Jamahiriya, Lebanon, Tunisia and Syrian Arab Republic, the third group with the highest rates exceeding  $50\%$  comprise Egypt, Morocco, Sudan, Republic of Yemen and Iraq. However, despite this, there was clearly a remarkable decline in infant mortality rates between 1978 and 1998 in all countries, except Iraq, reflecting the huge efforts made to improve health care services and facilities. Iraq is a unique situation with high infant mortality rates that have shown an upward trend in the past 20 years. The situation in Iraq clearly illustrates the impact of man-made disasters on humanity and emphasizes the need to rescue Iraqi infants from the consequences of war and sanctions [16-19].

Our results also draw attention to the impact of the demographic, social, perinatal care and economic factors on infant health [1,2,20-23]. The main demographic determinants that appeared directly linked to infant mortality rate were the population size and the annual total births. No correlation between infant mortality rates and annual growth rates and total fertility rates were detected except in Egypt and Sudan. Countries like Egypt and Sudan with the greatest population size and annual total

Table 5 Annual gross national product (GNP) per capita in US dollars and percentage of the population with access to safe drinking-water and adequate sanitation facilities during 1998 in 16 Arab countries of the Eastern Mediterranean

Country	GNP per capita US\$	Safe drinking-water %	Adequate sanitation %
Bahrain	8 640	94	97
Egypt	1 200	87	88
Iraq	—	81	75
Jordan	1 520	97	99
Kuwait	20 190	—	—
Lebanon	3 350	94	63
Libyan Arab Jamahiriya	5 540	97	98
Morocco	1 260	65	58
Oman	4 940	85	78
Qatar	11 340	—	97
Saudi Arabia	7 150	95	86
Sudan	290	73	51
Syrian Arab Republic	1 120	86	67
Tunisia	2 110	98	80
United Arab Emirates	18 240	97	92
Republic of Yemen	270	61	66
$r_s$	-0.96	-0.67	-0.66
$P$	0.000	0.009	0.007

births still suffer from relatively high fertility rates and annual growth rates demanding continuous efforts in this regard. The GCC countries have undergone rapid development in the past few decades, which is clearly reflected in the infant mortality rates. However, an alarm is sounding in the Arabian Peninsula as fertility rates and annual growth rates in Saudi Arabia are among the highest, coupled with an already relatively high population size and annual total births.

Both the male and female literacy rates were inversely proportional to the infant

mortality rates demonstrating the importance of social development and its impact on infant health as previously reported [6,21,22]. Our results clearly reveal the gender bias still existing in the region with regard to male and female education chances, a feature that was directly related to infant mortality rates.

Confirming previous studies [22-24], low birth weights and maternal mortality, which are used as indicators for perinatal care offered in a society, appeared to account for some of the differences in infant mortality rates among the countries. This

reflects the importance of the perinatal care coverage and services offered in the community.

There is marked variation in the economic situation in the countries of the region and this was inversely related to the infant mortality rates emphasizing the importance of economic development and its impact on health [6,20–22].

The results of the study show that continuing efforts are required in the region to improve infant health and reduce infant mortality. These efforts should give priority to three main areas. The first is the social development of the community through active campaigns to promote education, augment health awareness and encourage hygiene measures. These campaigns must be directed at women and men simultaneously, as both sexes live together and should agree on the principles of their life. Efforts directed at women only are not sufficient as both men and women need to agree on their rights and accept each other in society as active partners. The second is the development of health services, both preventive and curative, to achieve a better quality of life. This requires continuous education and training of health professionals, development of services provided in terms of quality and not only quantity, organization of the health care system, establishment of a health consumer–provider relationship, and satisfaction for both health consumers and providers. The third is the development of research methods to establish a system capable of continuously monitoring and evaluating the health status and health services. This can be best achieved by population-based studies making use of the existing birth and death records. The

use of such vital statistics has existed in industrialized countries since the 19th century [25–27] and proved to be the main impetus for research development and the health revolution during the 20th century. Birth and death certificates are an important source of epidemiological data that can prove very useful [25–29] as they relate to a geographically defined population, are an enormous data bank readily available for population-based research, ensure complete coverage of all declarable events at the national level, offer the possibility of producing specific indicators for monitoring health, overcome the bias related to sampling and data collection techniques and enable one to make international comparison. In Arab countries, birth and death certificates exist but the information included is limited and does not allow for their active use in health research. The use of such vital statistics in the health domain requires altering and extending their content and creating a suitable computer system covering all health events from birth to death. It also necessitates the use of standard definitions and techniques for data collection and analysis. Training of public health workers to run this system and assure quality of collected data is crucial to allow for complete coverage of all health events and make use of important health indicators.

In conclusion, social and health care development can counter potential threats to health and advance improvement in the quality of life. Improved health status in turn can foster development because healthy educated individuals are more productive and capable of increasing their resources and using them to improve their lives.



### References

1. *The World Health Report 2000. Health systems: improving performance.* Geneva, World Health Organization, 2000
2. *The World Health Report 1999. Making a difference.* Geneva, World Health Organization, 2000.
3. Tabutin D. Comparative evolution in mortality in North Africa from 1960 until today. *Social science and medicine*, 1993; 36(10):1257-65.
4. Barnard H. Veranderingen binnen de gezondheidszorg in de regio Midden-Oosten en Noord-Afrika. [Changes in health care in the Middle East and North African regions.] *Nederlands tijdschrift geneeskunde*, 1997, 141(35):1701-3.
5. Yassin KM. Indices and sociodemographic determinants of child mortality in rural Upper Egypt. *Social science and medicine*, 2000, 51(2):185-97.
6. Al-Nahedh N. Infant mortality in rural Riyadh region of Saudi Arabia. *Journal of the Royal Society of Health*, 1997, 117(2):106-9.
7. Dawodu AH, Al-Umran K, Al-Faraidy A. Neonatal vital statistics: a 5-year review in Saudi Arabia. *Annals of tropical paediatrics*, 1988, 8(3):187-92.
8. Milaat WA, Florey CD. Perinatal mortality in Jeddah, Saudi Arabia. *International journal of epidemiology*, 1992, 21(1): 82-90.
9. Williams RL et al. Monitoring perinatal mortality rates: California, 1970 to 1976. *American journal of obstetrics and gynecology*, 1980, 136(5):559-68.
10. Shawky S, Milaat W. Early teenage marriage and subsequent pregnancy outcomes. *Eastern Mediterranean health journal*, 2000, 6(1):65-73.
11. El-Hamamsy L. *Early marriage and reproduction in two Egyptian villages.* Occasional paper. Cairo, Egypt, The Population Council, 1994.
12. Harfouche JK, Verhoestrade LJ. *The state of child health in the Eastern Mediterranean Region.* Alexandria, World Health Organization, 1983 (EMRO Technical Publication, No. 9):131-63.
13. Al-Salem M, Rawashdeh N. Consanguinity in north Jordan: prevalence and pattern. *Journal of biosocial science*, 1993, 25:553-6.
14. Hamamy HA, Al-Bayat N, Al-Qubaisy W. Consanguineous matings in the Iraq urban population and the effect of pregnancy outcome on infant mortality. *Iraq medical journal*, 1986, 34:65-80.
15. Saha N, Hammad RE, Mahmoud S. Inbreeding effects on reproductive outcome in a Sudanese population. *Human hereditary*, 1990, 40:208-12.
16. Ali MM, Shah IH. Sanctions and childhood mortality in Iraq. *Lancet*, 2000, 355(9218):1851-7.
17. Ascherio A et al. Effect of Gulf war on infant and child mortality in Iraq. *New England journal of medicine*, 1992, 327 (13):931-6.
18. Bierman A. The Gulf war and infant and child mortality in Iraq. *New England journal of medicine*, 1993, 328(18):1358.
19. Gathergood K, Rolstone D. Helping children in Iraq. *Lancet*, 2000, 356(9223): 78.
20. Aly HY. Demographic and socioeconomic factors affecting infant mortality in Egypt. *Journal of biosocial science*, 1990, 22(4):447-51.

21. Casterline JB, Cooksey EC, Ismail AF. Infant and child mortality in rural Egypt. *Journal of biosocial science*, 1992, 24 (2):245–60.
22. Hertz E, Hebert JR, Landon J. Social and environmental factors and life expectancy, mortality, and maternal mortality rates: results of a cross-national comparison. *Social science and medicine*, 1994, 39(1):105–14.
23. Sedaghatian MR, Noor AM. Maternal-child health system and perinatal mortality in United Arab Emirates. *Journal of perinatology*, 1997, 17(2):161–3.
24. Bagenholm GC, Nasher AA. Mortality among children in rural areas of the People's Democratic Republic of Yemen. *Annals of tropical paediatrics*, 1989, 9(2):75–81.
25. Shawky S. *The impact of neonatal intensive care on the total infant loss in Belgium for the period 1983–87* [Thesis]. Brussels, Belgium, Catholic University of Louvain, 1992.
26. Masuy-Stroobant G. *Santé de l'enfant et inégalités sociales. Une enquête dans le Hainaut sur le comportement préventif des mères.* [Child health and social inequalities. A study in Hainaut on the preventive behaviour of mothers.] Rapport POLIWA 3, Louvain-La-Neuve, Institut de Démographie, 1988.
27. Buekens P, Derom R, De Wale P. Perinatal health in Belgium: an introduction. *Biology of the neonate*, 1989, 55:6–9.
28. Murphy MFG, Botting BG, Gedalla B. Analysis of perinatal and infant mortality adjusted by exclusion of deaths from congenital malformations. *Community medicine*, 1987, 9(2):129–40.
29. Vandebussche P, Dujardin B, Marcelis CH. *Atlas de la santé périnatale et infantile en Belgique.* [Atlas of perinatal and infant health in Belgium.] Bruxelles, Société Royale de Gynécologie et Obstétrique, 1987.