



Neonatal Mortality in the Eastern Mediterranean Region: Socio-Demographic, Economic and Perinatal Factors, 1990 - 2013

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Abstract

Background: The neonatal mortality rate (NMR) is considered amongst the most important socioeconomic and health indicators of a community development. Globally, it has been reported that the daily mortality rate during the neonatal period is much higher (30-fold) than the post-neonatal period. In the Eastern Mediterranean Region, about 40% of the under-5 mortality occurs in the neonatal period. This study aimed to explore the association between the socio-economic, demographic and perinatal care related factors, and the neonatal mortality in the Eastern Mediterranean Region.

Methods: The secondary data for the 1990 to 2013 on neonatal mortality rates, socio-demographic, socio-economic and health factors were extracted from official websites, including united nations children's fund (UNICEF), world health organization (WHO), and united nations educational, scientific and cultural organization (UNESCO). Data were collected using the following keywords: 'neonatal mortality', 'perinatal deaths', 'child health, education', 'expenditure on health', 'safe water', 'sanitation' and 'health indicators'. We used secondary data analysis to explore the relationship between the possible explanatory variables and neonatal mortality using correlation coefficient analysis.

Results: There was a noticeable decline in neonatal mortality rates (NMR) among the Eastern Mediterranean countries from 1990 to 2013. The neonatal mortality rate had a negative and significant association with literacy status of both sexes, annual growth rates, antenatal care coverage, birth attendance by skilled health personnel, Gross National Income (GNI), total health expenditure per capita, safe drinking water and adequate sanitation facilities. However, the neonatal mortality rate had significant and positive relationships with maternal mortality ratio, total fertility rate, population size, total births and low birth weight.

Conclusion: Despite the fall in the neonatal mortality rate, it remains high in the Eastern Mediterranean countries. Socioeconomic and other related factors appear to play a major role in determining neonatal mortality and there is an inverse relationship between socioeconomic status and the neonatal mortality rate. Neonatal health in Eastern Mediterranean countries needs a more effective and innovative approach to sustain the rapid progress in the overall reduction of child mortality.

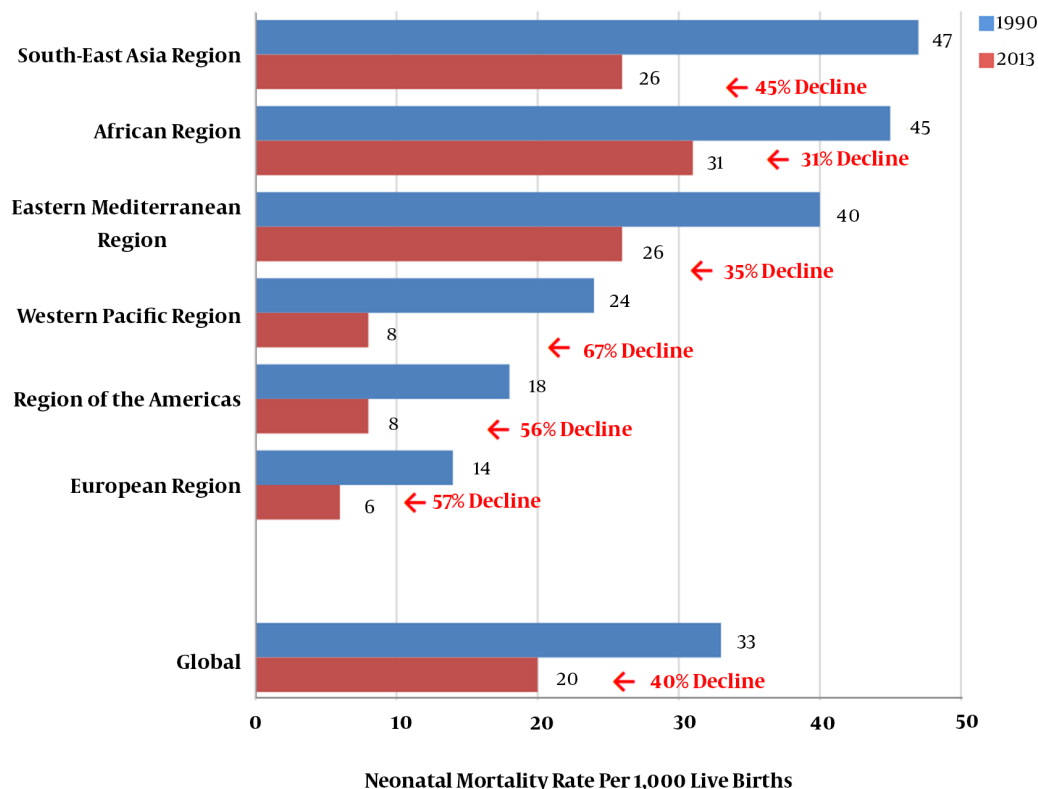
Keywords: Socioeconomic Factors, Neonatal Mortality, Eastern Mediterranean Region

1. Background

Neonatal mortality (NM) is a major public health problem that plays an important role in child mortality. The MDG Target 4.A is to reduce under-five mortality rate by two-thirds between 1990 and 2015 (1). Therefore, reducing NM becomes an important agenda for public health and international development agencies. Globally, it was estimated that the NMR decreased by 40% from 33 deaths/1,000 live births in 1990 to 20 in 2013. It has been reported that the NM alone accounts for more than half of infant deaths (2). However, if the MDG-4 is to be achieved,

a considerable decrease in NM must be achieved. This implies that current global NM level of 20/1,000 live births should be reduced to less than 10. If there is no serious action to address NM, achieving MDG-4 will likely only be achieved by 2035 (3). The Sustainable Development Goals (SDG) framework expanded to include NM with all countries aiming to reduce NM to at least 12/1000 live births (4). Regionally, the Eastern Mediterranean region (EMR) had the third highest NMR in 1990 after the Southeast Asian and African regions (Figure 1).

There is great disparity in the NM levels between and within countries of the region, ranging from 2/in Bahrain

Figure 1. Neonatal Mortality Rates and % Declines by Region 1990 - 2013

Source: estimates developed by the UN inter-agency group for child mortality estimation, report 2014.

to 46/per 1,000 live births in Somalia. Somalia and Pakistan rank third and seventh among the 10 countries accounting for 67% of the global NM (5, 6). In the EMR, around 40% of under-five mortality take place in the neonatal period (Figure 2) which is clearly linked to poor status of maternal health among poorest sections of the population (7).

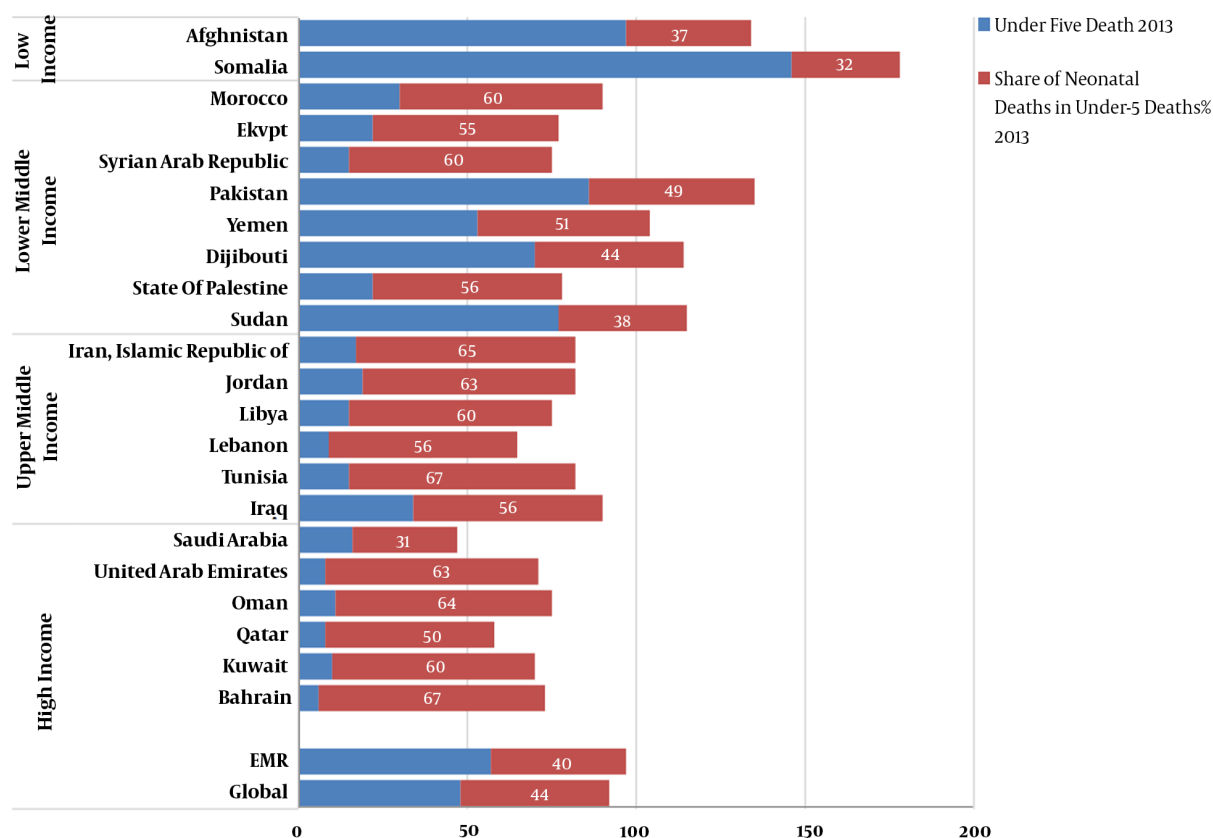
In EMR context neonates have unique needs that currently fall between maternal and child health care services, to which need to be given special attention.

The progress in child survival in EMR remains disparate. Between 1990 and 2013, eleven countries (Egypt, Bahrain, Lebanon, Oman, Tunisia, Iran, Saudi Arabia, Libya, Morocco, Qatar and Syria) reduced their under-five mortality rates by more than two thirds to achieve the MDG-4. However, large discrepancy in NMR is noted between the EMR counties e.g. Bahrain reached NMR of 2/1,000. As economic status and development of health services are closely related, it is noted that countries in the region classified as middle and high income showed the greatest reduction in NMR during the last 22 years (Figure 3). Other

countries still show high NMR, such as Somalia and Pakistan, where NMR equals 46 and 42 per 1,000, respectively (3). Poverty, lack of resources, political conflict and war are some of variables that lead to this high rate of mortality.

The main leading cause of NM in the EMR in 2013 was prematurity (33.8%) and congenital abnormalities in countries with low NMR ($\leq 20/1,000$ live births) (4), whereas in countries with high NMR ($> 20/1,000$ live births), it was acute respiratory infection, diarrhoea, asphyxia, neonatal sepsis and measles (8) (Figure 4).

In this study, since the countries in EMR are comparable to each other, taking in consideration the similarities in the culture, tradition, and geographical location, it is possible to obtain a real picture of the epidemiological profile of distribution and determinants of NM in the region. Thus, this study aimed primarily to describe and compare the NM rate among the EMR countries, to recognize the possible determinants the NMR and to obtain sufficient knowledge and understanding concerning what future efforts are required to make significant improvements to im-

Figure 2. The Share of Neonatal Deaths Percentage Among Under-Five in EMR Countries, 2013

Source: UNICEF, report 2014.

prove the health of neonates in the countries of the region.

2. Methods

Data that were attributed to NM were collected and categorized into demographic, social, economic and perinatal health care. The data used in this study were obtained from the official websites of the WHO; UNICEF, united nations children's fund; regional health observatory data repository available (9); as well as UNESCO. The data were identified using the following keywords: NM, perinatal deaths, child health, education, health expenditure, safe water/sanitation, health indicators and causes of child deaths for all 22 countries in the EMR. Any data before 1990 were excluded.

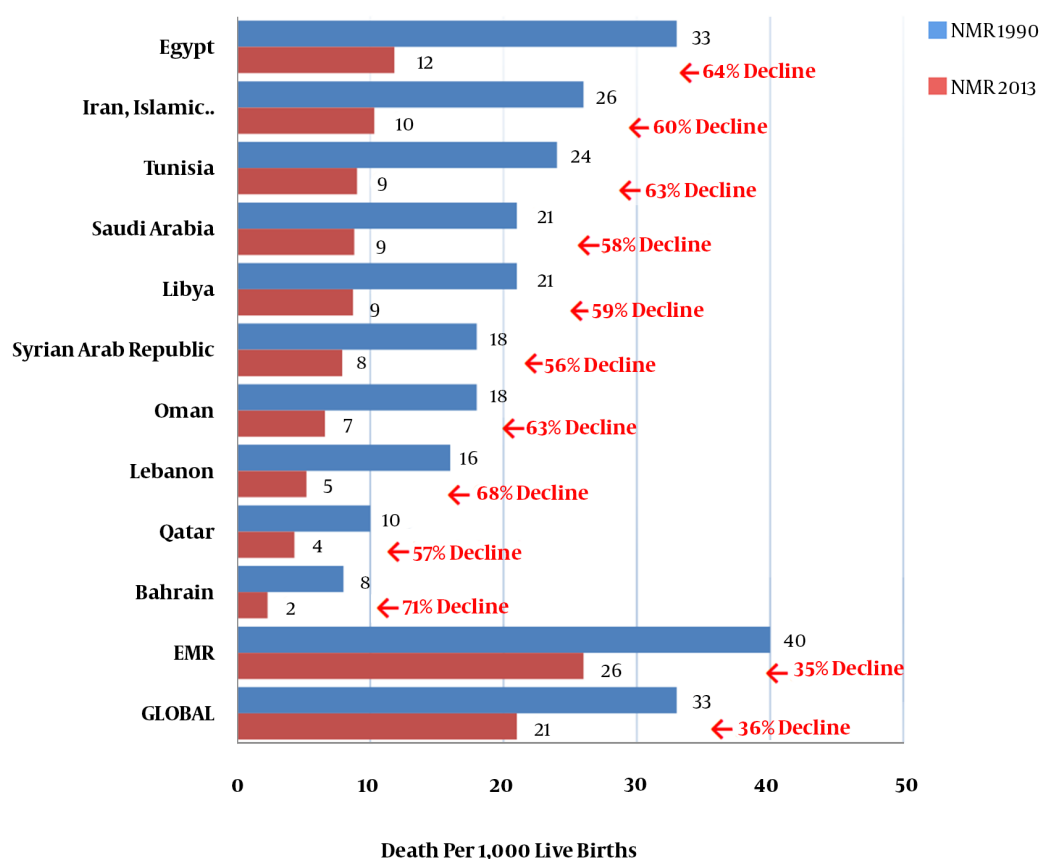
The WHO defined the NMR as the death of children in the first month of life in a given year divided by the total number of live births in the same year (10). The NMR is

expressed per 1000 live births and compared for the EMR countries for 2013.

The decline in NMR between 1990 and 2013 was calculated as follows:

$$\text{Percentage decline in NMR (1990 - 2013)} = \frac{(\text{NMR 1990} - \text{NMR 2013})}{\text{NMR 1990}} \times 100$$

The Independent factors related to neonatal mortality were classified into demographic, social, perinatal care and economic and were considered quantitative variables. The demographic factors studies were: a, the total population size; b, the annual total births; c, the annual growth calculated as the average percentage change in population size between 1990 and 2013; and d, the total fertility rate calculated as the number of children born to a woman of reproductive age. The social factors considered was male and female adult literacy rates calculated as the percentage of people aged 15 - 24 years who can read and write. The intrauterine fetal period (≥ 28 weeks gestation), in com-

Figure 3. Ten Countries in the EMR with the Highest Percentage Decline in Neonatal Mortality Rate, 1990 and 2013 and % Decline

Source: united nation, Inter-agency group for child mortality estimation (UN IGME), 2014.

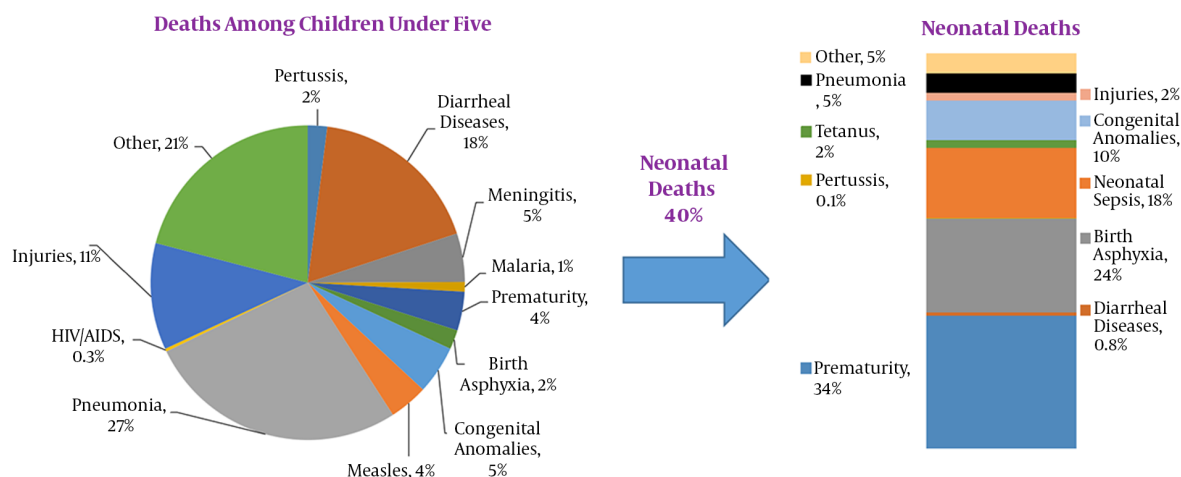
bination with early neonatal period (0 - 6 days after birth) is called perinatal period. The Health factors included the percentage of low birth weights (< 2500 g at birth), maternal mortality ratios (the annual number of deaths of women from pregnancy-related causes per 100,000 live births), antenatal care coverage, the percent of women aged 15 to 49 with a live birth within a given time period who attended at least one visit and the percent of births attended by skilled health personnel was calculated as the total of births attended by skilled personnel during the reference period over the total of live births occurring within the reference period. The economic factors included the annual gross national product (GNP) per capita expressed in United States Dollars, the total expenditure on health per capita and the proportion of the population with access to safe drinking-water and adequate sanitation facilities (11, 12).

The secondary data were collected, entered and ana-

lyzed using SPSS package (Version 22). Spearman rank coefficient analysis was implemented for the purpose of identifying relationship between NM and the independent variables such as demographic, socio-economic and perinatal. The data in 1990 were only used to identify the percentage of the decline in NM from 1990 to 2013. After that we arranged the variables for the countries of the region in ascending order.

3. Results

The NMR in the EMR countries in 2013 ranged from 2 to 46 deaths per 1000 live births (Table 1). The EMR countries were classified into three categories as follows: first category included the countries with lowest rates of NM (≤ 10 deaths per 1000 live births); these included Bahrain (2/1000), Qatar (4/1000), Kuwait (5/1000), United Arab Emirates (5/1000), Lebanon (5/1000), Oman (7/1000),

Figure 4. Major Causes of Death in Neonates and Children Under Five in Eastern Mediterranean Region, 2013

Source: WHO, global health observatory data repository, 2013.

Syrian Arab Republic (8/1000), Libya (9/1000), Saudi Arabia (9/1000), Tunisia (9/1000) and Iran (10/1000). The second category included countries with moderate rates (> 10 to 25/1000 live births); this category included Jordan (11/1000), Egypt (12/1000), the State of Palestine (12/1000), Morocco (18/1000) and Iraq (19/1000).

The third category included countries with highest rates (> 25 deaths per 1000 live births); this category included Yemen (26/1000), Sudan (30/1000), Djibouti (31/1000), Afghanistan (36/1000), Pakistan (42/1000), and Somalia (46/1000). Therefore, a decline in NM rate was found in all EMR countries from 1990 to 2013, while lowest decrease was found in the State of Palestine and Somalia, which showed a 5% and 8% decrease in rate, respectively. The data analysis showed that there is a noticeable reduction in the NMR ranging from 5% in Palestine to 75% in Bahrain. A visible falling in the rate was observed more in Lebanon, Egypt and Tunisia.

3.1. Demographic Factors

As illustrated in Table 2, the NMR in 2013 was viewed to be significantly positive and strongly correlated with the total fertility rate (TFR) ($r = 0.82, P < 0.001$), and moderately and positively correlated with the total population size ($r = 0.54, P = 0.001$) and total birth ($r = 0.48, P = 0.025$). The EMR was negatively correlated with the annual growth rate but the P value was borderline ($P = 0.050$). The GCC countries had a low annual growth rate except for Kuwait, Qatar and Bahrain compared with Pakistan and Egypt, which had the largest total population and the highest annual

total births; however Somalia and Pakistan were classified among those with the highest NMR. On the other hand, in terms of annual growth rate, Kuwait, Bahrain and Qatar were the highest among the countries.

3.2. Social Factors

The literacy rate (Table 3) ranges from 41% to 99% for males and 17% to 99% for females. Kuwait, Qatar, United Arab Emirates, Lebanon and the State of Palestine seem to be able to reduce gender distinction in education. However, with respect to chances of education in Afghanistan, Somalia, Morocco and Yemen, significant differences were seen between the males and females.

The NMR was negatively and significantly correlated with both male ($r = -0.78, P = 0.001$) and female literacy rates ($r = -0.82, P = 0.001$). In addition, the NMR was positively and significantly correlated with the male/female literacy ratio ($r = 0.83, P = 0.001$).

3.3. Health Factors

As shown in Table 4, the percentage of low birth weight ranged from 2% to 32%, maternal mortality extended from 6 to 850 deaths per 100,000 live births, antenatal care coverage with at least one visit ranged from 40% to 100%, and birth attended by skilled personnel ranged from 33% to 100% (Table 4). The NMR was positively and significantly correlated with the maternal mortality ratio ($r = 0.90, P < 0.001$), and negatively correlated with antenatal coverage

Table 1. Neonatal Mortality Rates (NMR) in the Countries of the Eastern Mediterranean Region^a

Country	NMR	NMR	Drop in NMR
	(per 1000)	(per 1000)	(%)
	1990	2013	1990-2013
EMR	33	21	36
Bahrain	8	2	75
Lebanon	16	5	68
Egypt	33	12	64
Tunisia	24	9	63
Oman	18	7	63
Iran, Islamic Republic of	26	10	60
Libya	21	9	59
Saudi Arabia	21	9	58
Qatar	10	4	57
Syrian Arab Republic	18	8	56
United Arab Emirates	10	5	50
Morocco	35	18	49
Kuwait	9	5	48
Jordan	19	11	41
Yemen	42	26	38
Afghanistan	50	36	28
Iraq	26	19	28
Pakistan	56	42	25
Sudan	40	30	25
Djibouti	40	31	22
Somalia	50	46	8
State of Palestine	13	12	5

^aSources: United Nations Children's Fund (UNICEF), September 2014.

($r = -0.80$, $P = 0.001$), and birth attended by a skilled personnel ($r = -0.78$, $P = 0.001$). There was a weak positive correlation between NM and birth weight but the P-value was not significant. Somalia, Afghanistan, Sudan, Djibouti and Yemen had the lowest perinatal care indicators; therefore, these countries had the worst perinatal care indicators.

3.4. Economic Factors

The results analysis showed that the economic factors vary markedly within the EMR (Table 5). The annual gross national product (GNP) per capita in 2013 ranged from US\$ 284 to US\$ 92,789 while the total expenditure on health per capita ranged from US\$ 17 to US\$ 2,029. The highest GNP and total expenditure on health per capita were mainly reported in the GCC countries followed by Lebanon. The an-

nual GNP per capita and the total expenditure on health were negatively correlated with the NMR ($r = -0.90$, $P < 0.001$; $r = -0.89$, $P < 0.001$), respectively. The populations with access to safe drinking water ranged from 29% to 100% compared with those who had access to adequate sanitation facilities ranged from 23% to 100%. Nevertheless, the NMR had significantly negative correlation with those having access to safe drinking water ($r = -0.83$, $P < 0.001$) and adequate sanitation facilities ($r = -0.88$, $P < 0.001$).

4. Discussion

The comparison that we made to the NMR among the EMR countries with a utility value was for the purpose of evaluation of the current situation and inputs for future planning improvement. The analysis of the mortality rate provides a real means for comparison, particularly in countries with different health status and health system policies. The results of this study illustrated that there are substantial differences in the NMR among the countries of the region despite the fact that these countries share many common culture and traits, including early marriage, frequency of marriage and inbreeding (13, 14). All of these factors combined, affect health of neonates. It is noted that differences still exist in NM between the countries of the region. Our findings showed that the EMR can be grouped under three categories regarding the NMR; The GCC countries that form the first category with the lowest rates (≤ 10 deaths per 1000 live births); the second category with rates from > 10 to 25 deaths per 1000 live births include Jordan, Egypt, the State of Palestine, Morocco, Iraq; and the third category with the highest rates exceeding 25 deaths per 1000 live births comprise Yemen, Sudan, Djibouti, Afghanistan, Pakistan and Somalia. However, there was a clearly noticeable decline in the NMR between 1990 and 2013 in all the countries, except for Somalia and the State of Palestine, which indicates that great efforts have been exerted to improve the health care services quality and facilities availability. In this time period, Somalia and the State of Palestine are unique in sense that their situation reflects impact of war on humanity and highlights the need to rescue neonates in these countries from the consequences of poverty, lack of resources, political conflict and sanctions that contribute to this high rate of mortality. At the same time and in the following years prevailed the same extreme conditions in Afghanistan, Syria, Iraq, and much harder in Yemen.

Our data analysis also demonstrated the impact of the demographic, social, economic and perinatal care factors on neonatal mortality (15, 16). The main demographic determinant was TFR that appeared very strongly associated

Table 2. Demographic Factors in the Eastern Mediterranean Region Countries, 2013

Country	Population Size 2013 (× 1000)	Total Births 2013	Annual Growth Rate 2013 %	Total Fertility Rate 2013 %	NMR 2013 per 1000
Somalia	10195	265070	2.6	6.7	46
Pakistan	184350	5667980	2	3.8	42
Afghanistan	28100	562000	2	5.1	36
Djibouti	860	12900	1.5	3.5	31
Sudan	36163	1331930	2.5	3.9	30
Yemen	25235	757050	3	4.4	26
Iraq	35095	1077645	3.2	4.1	19
Morocco	32950	664350	1	2.6	18
Egypt	84628	2489802	2	3	12
State of Palestine	4485	130065	2.9	4.4	12
Jordan	6530	150190	2.3	3.3	11
Iran, Islamic Republic of	76942	923304	1.2	1.9	10
Libya	6028	168784	2.8	2.4	9
Saudi Arabia	29994	809838	2.7	2.7	9
Tunisia	10778	140114	1.3	2	9
Syrian Arab Republic	21639	540975	2.5	3	8
Oman	3855	119505	3.1	2.9	7
Kuwait	3806	536646	14.1	2.6	5
Lebanon	4168	66688	1.6	1.5	5
United Arab Emirates	9206	285386	3.1	1.8	5
Qatar	2003	116174	5.8	2	4
Bahrain	1200	69600	5.8	2.1	2
r_s^a	0.54	0.48	-0.42	0.82	
P value ^b	0.01	0.025	0.05	< 0.001	

^ars: Spearman Rank-order Coefficient.

^bP value: Significance level, 95%.

to the NMR, while the total birth rate and the total population were weakly correlated with the NMR. There was a negative correlation between the NMR and the annual growth rate where the reason may be due to increase in population density from country to others. Pakistan and Egypt had the highest total population size with annual total births amongst the relatively high fertility rates and annual growth rates. In addition, Somalia and Pakistan were categorized among those countries with the highest neonatal mortality rate.

The rapid progress of the Arabian Peninsula countries over the last two decades clearly reflected the remarkable decline in the neonatal deaths rate due to the different health care for neonates, which could be explained by the circumstances and problems of each individual country.

However, it is of some concern that the Arabian Peninsula countries had the highest annual growth rate and fertility rate, especially in Kuwait, as evidenced by the relative rise in population and the total number of annual births. The literacy rate among males and females showed an inverse relationship to the NMR. This reflects the paramount role of socio-economic development and its impact on improving the health status of neonates, and also explains previous reports (17, 18). This factor was found as well in previous study carried out by Abuqamar et al. on the impact of parental education on infant mortality in the Gaza strip. They found a significant inverse correlation between parental education and the survival of infants, where families with low educational levels attainment had a much higher risk of infant mortality (19). Positive relationship

Table 3. Literacy status among male and female during 2013 in the Eastern Mediterranean Region countries

Country	Male Literacy Rate, %	Female Literacy Rate, %	M/F Literacy Ratio	NMR 2013, per 1000
Somalia	50	26	1.9	46
Pakistan	70	47	1.5	42
Afghanistan	45	17	2.6	36
Djibouti	78	58	1.3	31
Sudan	58	42	1.4	30
Yemen	41	26	1.6	26
Iraq	84	64	1.3	19
Morocco	69	44	1.6	18
Egypt	78	65	1.2	12
State of Palestine	99	96	1	12
Jordan	96	90	1.1	11
Iran, Islamic Republic of	87	79	1.1	10
Libya	94	83	1.1	9
Saudi Arabia	91	83	1.1	9
Tunisia	98	96	1	9
Syrian Arab Republic	91	80	1.1	8
Oman	92	83	1.1	7
Kuwait	96	94	1	5
Lebanon	99	99	1	5
United Arab Emirates	92	93	1	5
Qatar	97	96	1	4
Bahrain	97	90	1.1	2
r_s^a	-0.78	-0.82	0.83	
P value ^b	0.001	0.001	0.001	

^a r_s : Spearman Rank-order Coefficient.

^bP value: Significance level, 95%.

with male to female literacy ratio found in this study suggest that the role of literacy and education among mothers is an important factor for improving NMR. This also can be seen with the stronger inverse relationship with NMR for female literacy as compared to male literacy. A high association exists between the education of the female or literacy level and use of the reproductive, maternal and child health services. The NM levels are significantly higher in countries with a high rate of female illiteracy, which is evident in the region (10).

The findings of our study also demonstrated a clear gap between men and women in terms of education opportunities in the countries of the region, which, in turn, indicated the existence of a direct relationship with NMR. In this study, our findings on health factors are in alignment with previous studies in both developing and developed

countries, in that they showed the real effects of antenatal care and the birth attendance by skilled health personnel on perinatal outcomes. These included the reduced rates of maternal deaths and low birth weight that are used as quality performance indicators for the perinatal care offered in a society (20), and hence explain some of the differences in NMR among the EMR countries. This indicates the great importance of improving access and quality of the perinatal care coverage and health services offered in the community to reduce mother and child deaths.

As shown in Figure 5, in many countries of the EMR region, there is a marked variation in the economic situation, which is inversely correlated with the NMR. A large variation in total expenditure on health per capita and neonatal mortality is also observed within different SE status of the countries of the EMR, in which the correlation between NM

Table 4. Health Factors in the Eastern Mediterranean Region Countries, 2013

Country	Low Birth Weight, %	Maternal Mortality Ratio, per 100,000	Antenatal care Coverage at Least One Visit	Births Attended by Skilled Health Personnel	NMR 2013
Live births	%	%	per 1000		
Somalia	5	850	40	33	46
Pakistan	25	170	61	87	42
Afghanistan	6	400	60	34	36
Djibouti	20	230	73	56	31
Sudan	31	360	74	73	30
Yemen	32	270	60	45	26
Iraq	13	67	51	87	19
Morocco	8	120	77	74	18
Egypt	6	45	57	95	12
Occupied Palestinian Territory	9	47	100	100	12
Jordan	7	50	99	100	11
Iran, Islamic Republic of	8	23	97	95	10
Libya	4	15	93	100	9
Saudi Arabia	9	16	98	97	9
Tunisia	7	46	96	99	9
Syrian Arab Republic	10	49	88	96	8
Oman	10	11	99	99	7
Kuwait	8	14	100	100	5
Lebanon	8	16	96	96	5
United Arab Emirates	3	8	100	100	5
Qatar	5	6	100	100	4
Bahrain	2	22	100	99	2
r_s^a	0.44	0.9	-0.8	-0.78	
P value	0.42	0.001	0.001	0.001	

^a r_s : Spearman Rank-order Coefficient.

^bP value: Significance level, 95%.

and the expenditure on health per capita is inverse.

This study found that economic factors were strongly associated with inverse NMR. The impact of economic development, maternal education improvement and perinatal health care services through the low-cost, community-based interventions, are evidenced by the success of Qatar, where, over a period of more than 35 years, these developments have had a strong impact on maternal, neonatal, and perinatal survival (15). However, poverty is not just a problem in poor countries; it can also result in disparities between the richest and poorest of the populations of the same country. Therefore, there is a need to focus on drawing attention to the important role of securing sustain-

able economic growth and its impact on the availability of health services. Through the analysis of health accounts in the countries of the EMR region for the middle and low income, most countries showed that the percentage of total expenditure on health of gross domestic product (GDP) has decreased over time. This leads to a deterioration in the health and equity in the financing of health care (21). The result of the study enhances the imperative need for action for continuing efforts in the EMR region to improve neonatal health and reduce neonatal mortality, and for intensive and accelerated action to empower every woman by giving the best opportunity for getting safe and clean birth delivery so that every child has the best possible start in quality

Table 5. Economic Factors in the Eastern Mediterranean Region Countries in 2013

Country	GNP per Capita	The Total Expenditure on Health per Capita	Safe Drinking Water	Adequate Sanitation Facilities	NMR 2013
	US\$	US\$	%	%	Per 1000
Somalia	284	17	29	23	46
Pakistan	1184	34	91	48	42
Afghanistan	584	52	64	29	36
Djibouti	1337	129	92	61	31
Sudan	1235	115	61	27	30
Yemen	1817	71	55	53	26
Iraq	3993	226	85	85	19
Morocco	3082	190	84	75	18
Egypt	2801	152	99	96	12
State of Palestine	1697	282	92	99	12
Jordan	4655	389	96	98	11
Iran, Islamic Republic of	5819	490	96	89	10
Libya	9064	579	98	97	9
Saudi Arabia	20540	795	97	100	9
Tunisia	4331	297	97	90	9
Syrian Arab Republic	2702	105	90	96	8
Oman	25538	690	93	97	7
Kuwait	56425	1428	99	100	5
Lebanon	9904	650	100	100	5
United Arab Emirates	49005	1343	100	100	5
Qatar	92789	2029	100	100	4
Bahrain	19512	895	100	99	2
r_s^a	-0.9	-0.89	-0.83	-0.88	
P value ^b	< 0.001	< 0.001	< 0.001	< 0.001	

^a r_s : Spearman Rank-order Coefficient.

^bP value: Significance level, 95%.

of life (22).

To scale up efforts to improve the health status of maternal and child health in the EMR Region, the initiative "Saving the lives of mothers and children" was jointly launched by WHO, UNFPA and UNICEF with Member States in a high-level meeting held in Dubai, United Arab Emirates, in January 2013. The meeting concluded with the Dubai Declaration, which was endorsed by the 60th session of the regional committee for the Eastern Mediterranean in October 2013. The main goal of the meeting was to scale up efforts to improve the health status of maternal and child health in the region, and for the high burden countries to commit to developing, launching and implementing maternal and child health acceleration plans

to move forward the MDG agenda. In this sense, there is a need to coordinate efforts and direct them according to four priorities: the first is to encourage communities through the work of campaigns and activities of the awareness of the importance of education for members of the community and the positive relationship with children's lives through the reduction of early marriage and child-bearing; in addition, to reduce the number of children and take advantage of the care services in the different stages of pregnancy in the community to increase awareness of the health and hygiene promotion standards. The second priority is the position of neonatal health in the health policies and strategies for all countries of the region, and to recognise it as an important stage of the child. NM rep-

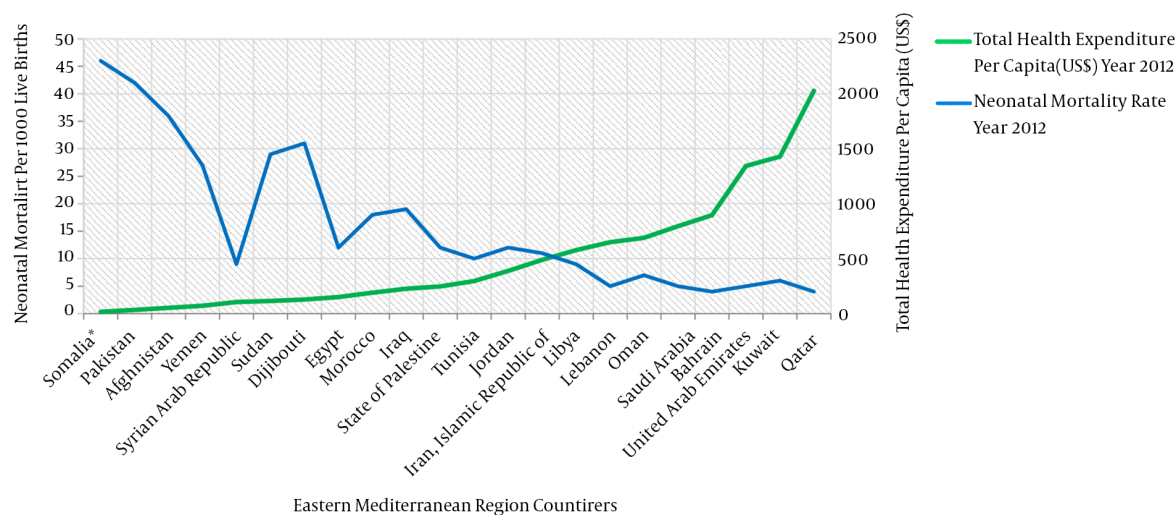


Figure 5. Distribution Neonatal Mortality Rate and Total Health Expenditure Per Capita (US\$) by EMR Countries, 2012

resents almost 40% of all under-five deaths, possibly because the health of babies has a close relationship with the mother's health. An appropriate maternal health care in pregnancy and the post-natal stage leads to a reduction of mortality and morbidity among neonates. However, the care needs of neonates are of a different kind. At the moment, the health care for mothers and children in the region, must address this issue and select appropriate and effective interventions according to the differences within the country, ensure access for the neediest and provide high quality service for antenatal, newborn and postnatal care, as well as continuous education and the training of health professionals who can reach the marginalized and poorest sectors of the population. Monitoring mechanisms should be in place to ensure the implementation of the policies and measure the achievement of the set national goals. Countdown for 2015 is one such initiative that could be used at the country level to assess progress and coverage (23). In addition, there is a need for the establishment of a consumer-provider relationship, as well as a need to focus on the delivery strategies and mechanism for scaling up coverage in the short term. These include innovations for demand creation and service delivery, as well as the removal of financial barriers (24).

The third is to strengthen the health system, in particular the health information system, to be able to track neonatal indicators, which are crucial for sound planning, successful implementation of interventions and monitoring of achievements as well as to reinforce the vital registration system (birth and death certificates) to assist in validating the data available on maternal and neonatal mor-

tality. Two studies conducted in 10 governorates in Yemen in 2005, showed that the availability of basic emergency obstetric care services are extremely limited and maternal newborn health (MNH) services are underutilized in the assessed governorates: (skilled birth attendance around 20%; cesarean proportion less than 1%; and the case fatality rate for obstetric complications > 1%). Both studies revealed a very poor level of data quality: "All the registers available in each of these assessed facilities were accessible but most of them are of poor quality; either the register was not up to date or/and filled out incompletely. This negligence of data use contributes to poor quality of registers and records available (25, 26).

The fourth is the importance of integrating research into the maternal, neonatal and child health acceleration plans and beyond, with a focus on operational or implementation research designed to overcome local barriers and ensure the implementation of strategies that are known to be effective. Capacity building in research methods was identified as a need to be addressed, including through collaboration with local and regional research institutions.

A common motif running through all the presentations was the need for technical support and capacity development in both the technical aspects of maternal, neonatal and child health as well as in the strengthening, research and monitoring, and evaluation efforts of health systems. It was also suggested that small-scale surveys could be implemented in the target areas in order to generate data on service utilization (27).

Conclusion: Despite the fall in the neonatal mortality

rate, it remains high in the EMR countries compared to developed countries. It has been shown that the (GNP, total expenditure on health, safe water/ sanitation, and female literacy were negatively correlated with the neonatal mortality rate. On the other hand, the maternal mortality ratio, male/female literacy ratio and TFR were positively correlated with the neonatal mortality rate. Therefore, neonatal health needs to be addressed with a more effective and innovative approach that target support and capacity development of maternal, neonatal and child health services in order to continue and sustain the rapid progress made in reducing the overall reduction of child mortality.

4.1. Recommendation

The Eastern Mediterranean Region countries needs to focus on the improvement of the total of expenditure on health services of GDP, adequate allocation of financial resources to child health, sufficient qualified human resources and high turnover of qualified staff at all levels and addressing disparities within the EMR countries. Reduction in poverty improvement in social and living conditions e.g. adequate sanitation and clean drinking water is prerequisite. Establishing and adoption of the strategy to accelerate the reduction of maternal and neonatal morbidity and mortality through improvement of the availability, accessibility and utilization of essential maternal and neonatal health services and improvement in its quality, as well as enhancement of educational awareness on child survival by delaying marriage, avoid early childbearing, using family planning strategies to reduce the number of children and make practical and effective use of prenatal care services are recommended. Monitoring mechanisms should be in place to ensure the implementation of the policies and measure achievement of the set national goals.

Results of this manuscript may serve as an important source of information to guide the public health policy makers and health care providers to design interventions to reduce child mortality.

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