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Correlation between socioeconomic differences and infant mortality in the Arab World (1990-2009)

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The infant mortality rate (IMR) is one of the most important indicators of the socioeconomic and of the health status of a community and is considered as an index of differentials in health and socioeconomic condition in a community. This article was aimed to determine the relationship between socio -economic differences (literacy rate, unemployment, poverty, Gross Domestic Product (GDP), early marriage, consanguineous marriage) and infant mortality in the Arab World during the last two decades Statistical analysis was performed on data extracted from the United Nations children's fund (UNICEF) and world health organization (WHO). The results of this study showed a decline in infant mortality rate (IMR) among Arab countries. There was an inverse association between infant mortality and literacy. Poverty, GDP and early marriage had a significant relationship with infant mortality. Despite the falling in infant mortality rate, the rate of infant mortality is still high in the Arab World.

Key words: Socioeconomic differences, infant mortality, Arab World.

INTRODUCTION

This paper focuses on socioeconomic differences in infant mortality in the Arab countries during the last two decades. Many research studies have been done on the association between infant mortality and socioeconomic differences in the last two decades all over the world, but till now all research studies done in the Arab World focused on medical causes for infant mortality. We also tried to show the effect of most social and economic factors together on infant mortality in all Arab countries. Many research studies have worked on the postnatal period (>27 days-one year), where deaths are more likely to result from environmental factors rather than the neonatal period (Kiryskos, 1982). The social and economic factors played an important role in determining child survival all over the world (Shawky, 2001). Education has an implicit effect on the health of children, where health is interpreted in its broadest sense as complete physical, psychological, social, emotional, developmental and environmental well-being (Arab Regional Conference, 2004). Unemployment is an

important measure of the economy's strength, in addition to GDP per capita and level of poverty (Bildirici et al., 2009). Early marriage and consanguineous marriage are considered as intermediate factors, which affect both the socioeconomic condition and infant mortality (Bildirici et al., 2009; Othman and Saadat, 2009; Weinreb, 2008). Previous research studies indicated also the high percentage of early teenage marriages among Arab countries.

Most of young mothers were illiterate, housewives and grand 'multipara' (Hussain, 1999). Consanguineous marriage, particularly first cousin couples, has higher rates of stillbirths and more deaths in infancy (Cherkaoui et al., 2009; Kerkini et al., 2007). There are also other factors affecting the survival of children, such as maternal birthplace, marital status, tobacco and etc. (El-Sayed and Galea, 2009). Many studies have been performed in the Arab region emphasizing the need for continuing efforts to improve infant health and reduce infant mortality (Shawky, 2001). This study aims to identify the association of socio-economic-differences and infant mortality in the Arab World and assesses the magnitude of changes which occurred during the last two decades (1990-2009).

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Table 1. Infant mortality rates in the Arab world.

Arab countries	IMR 1990	IMR 2009	Dropping in IMR 1990-2009
Algeria	52.00	36.00	30.70
Bahrain	14.00	10.00	28.60
Comoros	90.00	75.00	16.70
Djibouti	95.00	67.00	29.50
Egypt	66.00	20.00	66.70
Eritrea	92.00	41.00	55.40
IRA	42.00	36.00	14.30
Jordan	31.00	17.00	45.20
Kuwait	13.00	9.00	30.80
Lebanon	33.00	12.00	33.30
Libya	33.00	15.00	54.50
Mauritania	81.00	75.00	7.40
Morocco	68.00	32.00	53.00
Oman	23.00	10.00	56.50
Palestine	33.00	20.00	39.40
Qatar	17.00	9.00	47.00
Saudi Arabia	35.00	18.00	48.60
Somalia	133.0	109.0	18.00
Sudan	78.00	70.00	10.20
Syria	30.00	14.00	53.30
Tunisia	40.00	18.00	55.00
UAE	15.00	7.00	53.30
Yemen	90.00	53.00	41.00

Source: World Health Organization Report 2010, 1991. Health statistics and health information systems and own calculation.

METHODS

Data were collected on socio-economical indicators and infant mortality in the Arab World between 1990 and 2009. The data used in this study are those of the United Nations children's fund, world health organization, published in 2010 and the United Nations Development Program Report, 2009. The collected indicators are referring to: 1990 and 2000. The country sample consists of all member states of the League of Arab States. 23 countries were considered: Algeria, Bahrain, Comoros, Djibouti, Egypt, Eretria, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirate and Yemen. The definitions used are those of UNICEF and WHO. The infant mortality rate (IMR) is defined as the deaths of children less than one year of age in a given year to the total number of live births in the same year. The rate is expressed per 1000 live births. The changing in infant mortality is expressed as a percentage decline in infant mortality rates between 1990 and 2009 and calculated as follows:

(IMR 1990 – IMR 2009/ IMR 1990) * 100

The socioeconomic factors were classified into two categories. The first is a social and behavioral category (literacy rate, early marriage, consanguineous marriage). The second category is economic (unemployment, poverty, Gross Domestic Product per capita (GDP)). The literacy rate was 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 economic factors

included the GDP per capita expressed in United States dollars, unemployment and being below the poverty line according to UNICEF statistics. The below poverty line was defined as an economic benchmark and poverty threshold. Definitions of poverty vary considerably among nations. For example, rich nations generally employ more generous standards of poverty than poor nations.

The national estimates of the percentage of the population lying below the poverty line are based on surveys of sub-groups, with the results weighted by the number of people in each group (Weinerb, 2008). Unemployment described the state of a worker who is able and willing to take work but cannot find it. Unemployment did not include full -time students, the retired, children, or those not actively looking for a paying job.

The consanguineous marriage was defined as state of being related by blood or descended from a common ancestor.

The data analysis was performed using SPSS (version 17). Statistical analysis was carried out to detect the socioeconomic differences in infant mortality and changes occurring during the last two decades. Linear regression and Pearson correlation was calculated to detect the direction of relationship and significance between each variable and infant mortality.

RESULTS

The findings showed declining in infant mortality (38.6%) and rising in literacy rate (33%) and GDP (106%) during the last two decades.

Table 2. Literacy rate during 1990 and 2009 in the Arab World.

Arab countries	Literacy rate in1990	M/F literacy	Literacy rate 2009	M/F literacy 1990
	%	Ratio	%	Ratio
Algeria	52.90	1.52	69.90	1.32
Bahrain	82.10	1.16	86.50	1.10
Comoros	54.00	1.73	75.00	1.42
Djibouti	53.00	1.63	70.00	1.34
Egypt	47.10	1.80	71.40	1.40
Eritrea	36.00	1.96	59.00	1.46
Iraq	35.70	2.65	74.10	1.31
Jordan	81.50	1.25	89.90	1.12
Kuwait	76.70	1.09	93.30	1.04
Lebanon	80.30	1.21	87.40	1.13
Libya	68.10	1.62	82.60	1.28
Mauritania	34.80	1.98	51.20	1.37
Morocco	38.70	2.16	52.30	1.66
Oman	54.70	1.71	81.40	1.18
Palestine	84.00	1.02	93.80	1.01
Qatar	77.00	1.09	89.00	1.07
Saudi Arabia	66.00	1.52	78.80	1.20
Somalia	24.00	2.57	37.80	1.93
Sudan	45.80	1.51	61.10	1.42
Syria	64.80	1.20	79.60	1.17
Tunisia	59.10	1.54	74.30	1.28
UAE	71.00	1.01	77.90	.87
Yemen	32.00	4.28	50.20	2.35

Source: United Nations Statistics Division, 1990, 2009, United Nations Children's Fund Report,1991, 2010.

Infant mortality rates

Table 1 summarized the rate of infant mortality in 1990 and 2009 and the change that occurred during these decades. In 2009, the infant mortality rate in the Arab World ranged from 7/1000 to 109/1000 live birth. In 1990, it ranged from 13/1000 to 133/1000 live birth. There was a dropping of the infant mortality rate in all countries. The dropping of the infant mortality rate during the period 1990 to 2009 ranged from 7.40 to 66.70%. The greatest decrease of IMR was found in Egypt, while the lowest decrease was found in Mauritania.

In 2009, the Arab countries were divided into the following four categories according to the infant mortality rate; because we found the countries scattered adjacent to each other in four groups, when we did scatter plot analysis to assess the change that occurred between the rate of infant mortality and socio-economic factors at notably literacy rate during the last two decades:

1. Category one included the countries with an infant mortality rate less than 16/1000 live birth: United Arab Emirates (7/1000), Kuwait (9/1000), Qatar (9/1000), Bahrain (10/1000), Oman (10/1000), Lebanon (12/1000),

Syria (14/1000) and Libya (15/1000).

2. Category two included the countries with an infant mortality rate ranging from 16 to 30/1000 live birth: Jordan (17/1000), Tunisia (18/1000), Saudi Arabia (18/1000), Egypt (20/1000) and Palestine (20/1000).

3. Category three included the countries with an infant mortality rate ranging from 31 to 50/1000: Morocco (32/1000), Algeria (36/1000), Iraq (36/1000) and Eritrea (41/1000).

4. Category four included the countries with an infant mortality rate over 50/1000 live birth: Yemen (53/1000), Djibouti (67/1000), Sudan (70/1000), Comoros (75/1000), Mauritania (75/1000) and Somalia (109).

Table 2 showed the literacy rates in 1990, 2009 and disparity between male and female.The literacy rate in 1990 varied from 24 to 84%. Looking at gender differences, the rate varied from 36 to 90% for males and from 13 to 77% for females. The ratio of male/female literacy varied from 1.01 to 4.28. The literacy rates during 2009 varied from 37 to 93%. The literacy rate concerning gender varied from 49.7 to 96.7% males and from 25 to 91% for female. The ratio of male/female literacy varied from 0.87 to 2.35.

Table 3. Changes of literacy rate during the two decades (1990-2009) in Arab World.

Arab countries	Change in literacy rate 1990-2009	Change in literacy among male 1990-2009	Change in literacy among female 1990-2009
	%	%	%
Algeria	32.00	23.70	42.50
Bahrain	5.30	5.50	12.20
Comoros	38.90	16.60	50.00
Djibouti	32.00	16.40	42.40
Egypt	51.60	37.50	76.50
Eritrea	64.00	49.00	226.00
Iraq	107.50	60.80	17.50
Jordan	10.30	5.70	59.00
Kuwait	21.60	19.00	25.30
Lebanon	8.90	5.40	12.30
Libya	21.00	11.60	41.00
Mauritania	47.00	22.70	3.60
Morocco	35.00	22.30	85.70
Oman	49.00	29.00	87.00
Palestine	11.70	15.00	16.70
Qatar	15.60	15.00	17.50
Saudi Arabia	20.00	11.00	41.00
Somalia	57.50	38.00	82.00
Sudan	14.60	28.20	37.30
Syria	22.80	19.40	22.70
Tunisia	25.70	16.50	19.00
UAE	10.00	.00	15.60
Yemen	57.00	28.00	130.00

Source: own calculation based on the percentage of change during the two decades.

Changes of literacy rate during 1990 to 2009

Table 3 showed that the growth rate of the literacy rate in the Arab world increased from 5.30 to 107.5%. The growth rate of the literacy rate of the male population increased from 0.00 to 60.8% during the last two decades. The growth rate of the literacy rate of the female population increased from 3.5 to 226%. Marked change in the growth rate of the literacy rate happened in Iraq (107.5%), Eritrea (64%), Somalia (57.5%), Egypt (51%) and Oman (49%). There is also a marked reduction in gender distinction in education during the last two decades. The average of the growth rate of the literacy rate for females increased more than the literacy rate for males with 50.5% for the female population versus 21.5% for the male population.

In Table 4, the prevalence of consanguineous marriage varied from 15 to 65%. The prevalence of early marriage varied from 1 to 48.5%.

All social factors were found to be statistically significant and had good correlation to infant mortality in 1990 and 2009. There is an inverse association between literacy rate in 1990 and infant mortality (R = -0.811, P-value = 0.000). The male and female literacy rates were significant determinants of infant mortality (for male, R = -0.788, P-value = 0.000; for female, R = -0.791, P-value = 0.000). In 2009, the literacy rate was inversely correlated to infant mortality (R = - 0.782, P-value = 0.000). The male and female literacy rates were significant determinants of infant mortality (for male, R = -0.749, P-value = 0.000; for female, R = -0.791, P-value = 0.000).

The infant mortality rate was significantly associated with consanguineous marriage (R = 0.461, P-value = 0.047). The early marriage was a significant determinant of infant mortality. This factor was highly correlated with infant mortality (R = 0.752, P-value = 0.000).

Economic factors

The results showed a marked variation within the Arab World. In Table 5, the gross domestic product per capita (GDP/capita) in 1990 varied from 230 to 29925 US$. In 2009, the GDP per capita ranged from 600 to 86500 US$. The change of GDP per capita ranged during the

last two decades from 20 to 270%. The unemployment rate ranged from 4 to 92%. The poverty line varied from 7.4 to 60%.

Table 4. Consanguinity and early marriage 2009 in the Arab World.

Arab countries	Consanguineous marriage %	Early marriage %
Algeria	34.00	4.00
Bahrain	29.90	7.00
Comoros	N/A	N/A
Djibouti	N/A	43.00
Egypt	40.00	15.00
Eritrea	N/A	47.00
Iraq	46.00	21.00
Jordan	25.60	8.00
Kuwait	42.10	5.00
Lebanon	25.00	4.00
Libya	46.50	1.00
Mauritania	60.10	28.00
Morocco	15.25	13.00
Oman	33.00	16.00
Palestine	44.30	24.00
Qatar	54.00	4.00
Saudi Arabia	52.00	7.00
Somalia	N/A	N/A
Sudan	65.00	40.00
Syria	32.00	25.00
Tunisia	24.81	1.00
UAE	50.50	8.00
Yemen	44.70	48.40

Source: United Nations Development Programme Report, 2009 .

The economic factors were found to be statistically significant except unemployment. The GDP per capita in 1990 and 2009 showed an inverse correlation with infant mortality. The GDP per capita was a significant factor of infant mortality in 1990 and 2009 (R= 0.65, P-value =0.000, R= 0.50, P-value = 0.008). The poverty was a significant factor and had a good correlation with infant mortality (R= 0.627, P-value = 0.002).

Unemployment had no significant association with infant mortality (R=0.052, P-value = 0.812).

DISCUSSION

While infant mortality can be viewed as an important public health problem in our society, it must be viewed as one that has strong socioeconomic determinants (Schell et al., 2003; Aly, 1990).

The results of our study were consistent with the previous studies that reported the relationship between socioeconomic condition and infant mortality and indicated that GDP/capita, young female illiteracy, and income inequality predicted 92% of the variation in national IMR (Hobcraft, 2004; Schell et al., 2003; Kerkeni et al., 2007).

The results showed an inverse association between low socioeconomic status and a high infant mortality rate during the last two decades in the Arab World.

Our study reports a marked variation in both social and economic aspects within the Arab World. The marked differences in the infant mortality rate have been influenced by the socioeconomic differences within the Arab region.

The positive change in socioeconomic indicators reflects the efforts made to improve social and economic life. There was also a marked reduction in gender distinction in education during the last two decades. The average of the literacy rate for the female population increased more than the rate for the male population (50.5 - 21.5%). Although progress has been made during the last two decades towards bringing all girls into schools, in the Arab World girls still attend school less commonly than boys (Arab Regional Conference, 2004).

Many research studies report that behavior and the culture of society (early marriage and consanguineous marriage) have an important influence on the infant

mortality rate. A cultural practice governed by consanguinity values and norms increases a couple's risk of enduring the death of one or more of their children (Khayat and Saxena, 2007; Hammami et al., 2005). Many

Table 5. Economic indicators in the Arab World.

Arab countries	GDP per capita 1990	GDP per capita 2009	GDP change per capita 1990-2009	Unemployment 2009	Below poverty 2009
	US$	US$	%	%	%
Algeria	3796	6600	73.00	12.50	23.00
Bahrain	14226	33300	134.00	15.00	9.30
Comoros	832	1000	20.00	20.00	60.00
Djibouti	2183	3700	69.50	59.00	42.00
Egypt	2561	4900	91.00	84.00	20.00
Eritrea	534	738	38.00	18.00	50.00
Iraq	943	3500	270.00	18.20	23.00
Jordan	2321	4800	106.00	12.60	14.20
Kuwait	18752	54300	189.00	22.00	N/A
Lebanon	4047	10300	154.00	92.00	28.00
Libya	9563	13300	39.00	30.00	7.40
Mauritania	1138	2100	84.50	30.00	40.00
Morocco	2053	3800	85.00	10.00	15.00
Oman	11975	19200	60.00	15.00	32.00
Palestine	899	2900	223.00	24.00	60.00
Qatar	29925	85600	186.00	4.00	N/A
Saudi Arabia	14488	19800	36.50	11.80	17.00
Somalia	230	600	161.00	47.00	43.00
Sudan	929	1900	104.50	18.70	40.00
Syria	2315	4700	103.00	86.00	11.90
Tunisia	2874	7200	105.00	14.10	7.40
UAE	24459	37400	53.00	24.00	19.50
Yemen	1406	2400	70.70	35.00	45.20

Source: United Nations Development Programme Report, 2009.

research studies showed the effect of consanguineous marriage on infant mortality (UNDP, 2009; Weinreb, 2008; Krekeni et al., 2007; Rozzet and Prem, 2003; Hussain, 1999; Bittles et al., 1991).

In our study, our findings were consistent with previous studies, when they showed the significant relationship between consanguineous marriage and infant mortality.

The early marriage had a significant association with the infant mortality rate. Parents choose to marry off their daughters early for a number of reasons. Poor families may regard a young girl as an economic burden and her marriage as a necessary survival strategy for her family. They may think also that early marriage offers protection for their daughter from the dangers of sexual assault. But, early marriage can have serious harmful consequences for girls, including deepening psychosocial and emotional consequences and denial of education. Once married, girls tend not to go to school (Shawky and Milaat, 2000; Bittles et al., 1991).

Poverty was associated with an increased risk of infant death; there is an inverse relation between infant

mortality and income level. Lots of research studies proved the affects of economic factors on infant mortality (Jahan, 2008; Schell et al., 2007; Kiryskos, 1982).

Our study showed a marked variation in the economic situation within the Arab World. The GPD per capita and below poverty line showed a significant relationship with infant mortality during the last two decades. The unemployment rate was relatively high within the Arab region, but there was no significant relationship with infant mortality. This is probably due to the rather small differences in the unemployment rate among those countries. The unemployment does not reflect the actual condition for economic status in the Arab countries, because employment does not mean a good economic condition there. The average of salaries in Arab countries is low. So we found that a high percentage of employment was classified under below poverty.

Finally, our study showed the relationship between the socioeconomic factors and infant mortality at two cut points of time: 1990 to 2009.

CONCLUSION

There is an inverse relationship between the improvement of the economic and social situation and the infant mortality rate. Impoverished countries have higher infant

mortality rates. Families who live in poorer areas may more often be exposed to adverse socioeconomic conditions.

Education is the biggest factor having an impact on infant mortality. Despite the significant progress that was made in adult education, the Arab region is still below the required level. There is a great awareness in the Arab countries at the governmental and organizational levels of the seriousness of the situation. Several measures were taken, including the establishment of national councils and commissions, setting up policies and strategies, holding national and regional conferences to coordinate the efforts to combat illiteracy with direct technical support from national and international organi-zations. An important policy conclusion is the need of a vigorous educational campaign indicating the positive effects of education on child survival by making women more likely to marry and enter motherhood later, have fewer children, and utilize prenatal care. Arabian govern-ments will have to focus on the improvement of the social and economic condition of the people, if they really want a decline in infant mortality rate.

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