http:// ijp.mums.ac.ir
Original Article (Pages: 493-499)

Impact of Socioeconomic and Health System Factors on Infant Mortality Rate in Organization of the Petroleum Exporting Countries (OPEC): Evidence from 2004 to 2013

Satar Rezaei[1], Khadije Jamshidi[2], *Khalil Moradi[3]

[1] Faculty of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran.
[2] Students Research Committee, Kermanshah University of Medical Sciences, Kermanshah, Iran.
[3] Faculty of Nursing and Midwifery, Kermanshah University of Medical Sciences, Kermanshah, Iran.

Abstract

Introduction

Infant Mortality Rate (IMR) is one of the main health indicators for assessing the health system's performance over the world. The aim of this study was examine to the socioeconomic and health system factors affecting on infant mortality in OPEC from 2004 to 2013.

Materials and Methods

A panel data model from OPEC between 2004 and 2013 was used to identifying the effects of some of the key explanatory factors (Total fertility rate per women, Gross Domestic Product (GDP) per capita [current US$], public health expenditure as % of total health expenditure and female labor force participation rate) on infant mortality rate. These data were obtained from World Bank and World Health Organization Data Bank.

Results

The results showed that total fertility rate had a positive and significant impact on infant mortality in the studied period ($P<0.05$). Also, there are negative significant associations between GDP per capita and public health expenditure with infant mortality ($P<0.05$). We did not observe any relationship between infant mortality and female labor force participation rate in the studied countries from 2004 to 2013 ($P>0.05$).

Conclusion

Total fertility rate, GDP per capita (current US$), public health expenditure as % of total health expenditure were identified as the main factors affecting on infant mortality in OPEC over the ten years (2004-2013). We hope the results of this study enables health policy-makers to better understand the factors affecting on infant mortality and thereby take necessary steps in managing and decreasing infant mortality rate in the studied countries.

Key Words: Health system, Infant mortality, OPEC, Socioeconomic factors.

***Corresponding Author*:**

Khalil Moradi, Faculty of Nursing and Midwifery, Kermanshah University of Medical Sciences, Kermanshah, Iran.

Email: moradi.khalil12@gmail.com

Received date: Feb 20, 2015 ; Accepted date: Mar 22, 2015

Introduction

Infant mortality is considered as deaths before reaching to the first year of life. The Infant mortality, one of the Millennium Development Goals (MDGs) goals, has got greater attention in the process and performance of development in a given country. Infant mortality rate (IMR) is one of the main indicators to evaluating the health status of a general population and is also closely associated with well-being in a given regions or country (1-4).

This is because the survival of infant, more than any other age-group of a population depends on the socioeconomic conditions of their environment (1). The previous studies have been demonstrated that the many factors may affect infant mortality in a country or region. These factors were the public health expenditures as % of total health expenditure, GDP per capita, female labor participation rate, total fertility rate and physician per capita (1, 5-8).

Rezaei et al. investigated the main factors affecting on infant mortality in ECO countries between 2005 and 2012. They concluded the GDP per capita, public expenditure as % of total health expenditure and total fertility rate were as the main determinant of infant mortality (9).

There is a high level of infant mortality in regions which have suffered from unsuitable live conditions, inappropriate socioeconomic status and inequalities of access to health services (10, 11). According to the report by United Nations (UN) in 2009, there is a high gap between developing and developed countries about infant mortality. This report also demonstrated the rate of infant mortality rate in developing countries was 51 per 1000 live births; while it was 5 in developed countries (12).

Therefore, it is important to understand the determinants of IMR in each of country. Therefore, the purpose of this paper is to identify the major social and economic factors affect infant mortality rate in OPEC during 2004 to 2013. We hope our study enable health policy makers to better understand of socio-economic, demographic, and health-related factors on IMR in studied countries and provide useful information that how the mortality of infants can be prevented.

Materials and Methods

This was a cross sectional descriptive study. A balanced panel data of OPEC (12 countries: Saudi Arabia, Ecuador, Iran, Iraq, United Arab Emirates, Qatar, Kuwait, Venezuela, Nigeria, Libya, Algeria and Angola) was used between 2004 and 2013. The reason why we used OPEC is that these countries are considered as Petroleum Exporting Countries.

The data on infant mortality rate per 1000 live births, total fertility rate per women, GDP per capita (current US$), public health expenditure as % of total health expenditure and female labor force participation rate (% of female population ages 15 and above) were obtained from World Bank and World Health Organization Data Bank.

The primary model was used as:

$$IMR = F(gdp, tfr, pexp, flp)$$

These variables were extracted through literature review and their availability. Finally, we used log-log model (Cobb Douglas) to determine the main factors affecting on infant mortality in OPEC. In this model, the coefficient shows how percentages the infant mortality rate is changed by per 1 % changes in explanatory variables. So, the β_1 to β_4 indicate the elasticity of infant mortality rate with regarding to the explanatory variables.

$$Limr_{it} = \beta_0 + \beta_1 Ltfr_{it} + \beta_2 Lgdp_{it} + \beta_3 Lpexp_{it} + \beta_4 Lflp_{it} + \varepsilon_{it}$$

Where:

i indicates countries and **t** indicates time period;

Limr: the logarithm of infant mortality rate per 1000 live births;

Ltfr: the logarithm of total fertility rate per women;

Lgdp: the logarithm of GDP per capita based on current $ US;

Lpexp: the logarithm of public health expenditure as % of total health expenditure;

Lflp: the logarithm of the logarithm of female labor force Participation rate.

In addition, we used the F limer test (for choosing panel or pool data). If the null hypothesis is rejected, the panel data is preferred. In the panel data, we used Hausman test to determine that the random effects or fixed effects models can be used. In the Hausman test: H_0: random effects would be consistent and efficient, H_1: random effects would be inconsistent. If the null hypothesis is rejected, the fixed effect estimator is consistence. Also, the Modified Wald test for heteroscedasticity in panel data is performed. The data analysis was done by STATA: Version12.

Results

The overall average of infant mortality rate per 1000 live birth in OPEC during 2004 to 2013 was 31.07± 32.88 (ranged from 7 to 123). The descriptive statistics dependent and independent variables are presented in (Table.1).

The highest and lowest average of IMR in the study period belonged to the Angola (132.1) and United Arab Emirates (7.8), respectively.

Also, the overall average of total fertility rate, GDP per capita based on purchasing power parity (PPP), female participation labor and public health expenditure as % of total health expenditure was 3.24, 18211.08, 37.12 and 60.3, respectively.

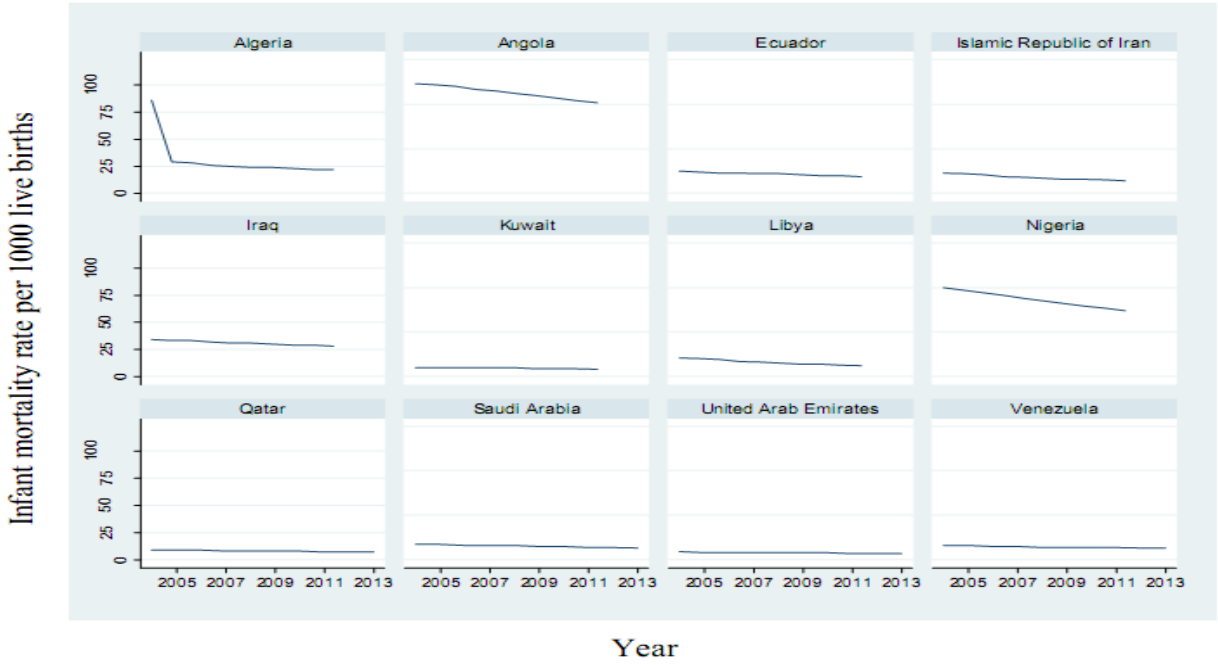
Table.1: Descriptive statistic of variables used in the study

Variables		Mean	SD	Min	Max	Observations
Imr	overall	31.07	32.88	7	123	N= 120
	between		33.55	7.8	113.2	n=12
	within		6.41	18.37	86.17	T=10
tfr	overall	3.24	1.45	1.8	6.7	N= 120
	between		1.5	1.9	6.35	n=12
	within		0.15	2.89	3.7	T=10
flp	overall	37.12	16.9	13	66	N= 120
	between		17.5	14.1	63	n=12
	within		1.7	30.22	41	T=10
gdp	overall	18211.08	22258.95	645.9	93714	N= 120
	between		22325.8	1662	72459	n=12
	within		5892.07	10196	39465	T=10
pexp	overall	60.3	18.11	26.3	85.7	N= 120
	between		18.22	31.95	82.23	n=12
	within		4.6	45.9	70	T=10

Trend of IMR between 2004 and 2013 in OPEC is shown in (Figure.1). As can be seen in the figure, the IMR decreased in all countries during the study period. For example, the IMR per 1000 live births in Iran was decreased from 23 in 2004 to 14

in 2013; or the IMR per 1000 live births in Angola decreased from 123 in 2004 to 102 in 2014. The average of IMR for all countries in 2004 was 39.4; while it was 26.6 in 2014.

Fig.1: Infant mortality rate per 1000 live births in OPEC, 2004-2013



The result of Hausman test indicates that the random effect is preferred ($P < 0.001$). Also, the result of modified Wald test indicates that there are heteroscedasticity among the residuals of the model ($P < 0.001$), so we employed the Generalized Least Squares (GLS) random effects model to estimate the coefficients of explanatory variables. The results of GLS-Random effects model are presented in (Table.2). Our results showed the total fertility rate had a positive and significant impact on infant mortality; while the impact of GDP per capita and public health expenditure as % of total health expenditure was negative and significant. Also, we did not observe any association between female Labor force participation rate and infant mortality rate between 2004 and 2013 in OPEC.

Table 2: Main determinant of infant mortality in OPEC between 2004 and 2013 by GLS- random effects model

Variables	Coefficients	SD	P_value	95% Conf. Interval	
				Lower limit	Upper limit
Ltfr	0.921	0.17	<0.001	0.5816	1.26
Llfp	-0.012	0.12	0.916	-0.25	0.22
Lgdp	-0.23	0.037	<0.001	-0.30	-0.16
Lpexp	-0.21	0.128	0.009	-0.46	0.035
C	5.03	0.77	<0.001	3.5	6.55
R-square	within = 0.27 between = 0.928 overall = 0.9				

Discussion

Infant mortality rate is one of the main indicators to assessing the level of the socioeconomic development in a given country and is generally used to evaluate the level of well-being of a population (1, 4, 13, 14). So, the current study aimed to evaluate the impact some of main socioeconomic and health system factors on infant mortality rate in OPEC between 2004 and 2013. We hope the results of this study enable health policy-makers to better understand the factors affecting infant mortality rate in OPEC and thereby take necessary steps in managing and decreasing the trend infant mortality rate.

Descriptive analysis of infant mortality per 1000 live births among selected countries shows that the highest and lowest infant mortality rate was belonged to the Angola (132.1) and United Arab Emirates (7.8), respectively. Infant mortality rate per 1,000 live births in Iran decreased from 23 in 2004 to 14 in 2013. Also, the overall average of IMR in Iran country from 2004 to 2013 was 18.1. Also, the overall average of IMR for OPEC during the studied period was 31.07 per 1,000 live births which are higher than throughout the world. Muldoon et al. study reported the infant mortality per 1,000 live births was 21.5 across of 136 countries included in their study (15). This finding indicates that the average of IMR in OPEC is higher compared to the average of all countries, so this is important the main determinant of IMR should be identified in order to the decline of IMR in these countries. The empirical analysis showed the total fertility had a positive and significant impact on infant mortality in the studied period. The coefficient of this variable was 0.92 and this indicates that 10 % increase in total fertility leads to increase in infant mortality by 9.2 %. This finding is consistence with results others studies conducted in Iran (5), Economic Cooperation Organization (ECO) countries (9), Italy (8). Generally the higher total fertility rate is associated with high level of infant mortality rate. For example, overall average of total fertility rate in Iran from 2004 to 2013 was 1.9; while it was 3.24 for the studied countries. Our results show that both average of infant mortality rate and total fertility rate in the studied period for Iran was lower than the OPEC.

Analysis of the data shows that infant mortality rate decreased as GDP per capita ($ US current) increased. This was in line with results of many other studies conducted across the world (14, 16). Sartorius et al. (14) investigate the determinants of IMR using data from 192 countries between 1990 and 2011. They concluded that increasing GDP per capita (US $) was associated with a significant lowering of IMR. Jiménez-Rubio in 2011, using a panel of 20 Organization for Economic Co-operation and Development (OECD) countries over a thirty year period (1970 to 2001), have shown that there is a negative and significant association between GDP per capita and infant mortality rate (17). The GDP per capita for Iran in 2004 was 2354 ($ US current); while it was 4763 in 2013 ($ US current). On average, overall, the GDP per capita for selected countries during the study period was 18211 ($ US current).

Previous studies have demonstrated the higher health spending is associated with the lower level of IMR. On the others hand, previous studies have reported health spending had a negative and significant impact affect infant mortality (5, 6, 14). This is in line with result of our study. Our study shows the coefficient of public health expenditure as % of total health expenditure for infant mortality was -0.21. In addition, a recent study have been examined the health system determinants of infant mortality and found also found out-of-pocket health expenditure to be a significant determinant (15). Also, results of our analyses show there is not

significantly association between infant mortality rate and female labor force participation rate in included countries during the studied period.

Limitations of this study

This study had a several limitation that should be considered when interpreting results. First, this study is a cross sectional analysis at the country level and each country was considered as a unit analysis; hence generalizability of the results within the country may be limit. Second, selected variables in the study based on data availability and therefore the some of important determinant such as density physician does not include in our study. Thirds, this study is an ecological study and ecological studies are known to be prone to bias (fallacy ecology).

Conclusion

This study aimed to investigate the main determinant of infant mortality in OPEC (12 countries) over a ten year period (2004 to 2013). In our study, the total fertility rate, GDP per capita and public health expenditure as % of total health expenditure were identified as key explanatory variables that are significantly associated with infant mortality. Our results provide a useful information for health policy-maker about variation and main factors affecting infant mortality in studies countries as well as is relevant in order to how infant mortality can be prevented.

Conflict of Interest: None.

Acknowledgment

The authors gratefully acknowledge the Research Council of Kermanshah University of Medical Sciences for the financial support. Ethics approval was not required because this study uses publicly available data.

References

1. Mustafa HE, Odimegwu C. Socioeconomic determinants of infant mortality in Kenya: analysis of Kenya DHS 2003. J Humanit Soc Sci 2008;2:1934-722.
2. Madise NJ, Banda EM, Benaya KW. Infant mortality in Zambia: socioeconomic and demographic correlates. Biodemography and Social Biology 2003;50(1-2):148-66.
3. Reidpath DD, Allotey P. Infant mortality rate as an indicator of population health. Journal of Epidemiology and Community Health 2003;57(5):344-6.
4. Zakir M, Wunnava PV. Factors affecting infant mortality rates: evidence from cross–sectional data. Applied Economics Letters 1999;6(5):271-3.
5. Rezaei S, Karami Matin B, Homaie Rad E. Socioeconomic Determinants of Infant Mortality in Iranian Children: A Longitudinal Econometrics Analysis. Int J Pediatr 2015;3(1.1):375-80.
6. Anil Shetty, Shetty S. The correlation of health spending and infant mortality rate in Asian countries Int J Contemp Pediatr 2014;1(2):100-5.
7. Ester PV, Torres A, Freire JM, Hernández V, Gil Á. Factors associated to infant mortality in Sub-Saharan Africa. Journal of Public Health in Africa 2011;2(2):e27.
8. Dallolio L, Gregori V, Lenzi J, Franchino G, Calugi S, Domenighetti G. Socio-economic factors associated with infant mortality in Italy: an ecological study. Int J Equity Health 2012;11(1):45.
9. Rezaei S, Moradi Kh, Karami Matin B. Macro Determinants of Infant Mortality in ECO Countries: Evidence from Panel Data Analysis. Int J Pediatr 2015;3(1.2):449-55.
10. Zatoński W, Mikucka M, La Vecchia C, Boyle P. Infant mortality in Central Europe: effects of transition. Gaceta Sanitaria 2006;20(1):63-6.
11. Sharifzadeh GhR, Namakin K, Mehrjoofard H. An Epidemiological Study on Infant Mortality and Factors Affecting it in Rural Areas of Birjand, Iran. ran J Pediatr 2008;18 (4):335-42.
12. UNICEF. The state of the world's children 2006: excluded and invisible: Unicef; 2005.
13. Mutunga CJ, editor Environmental determinants of child mortality in urban Kenya. Discussed in an informal workshop held at the Abdus Salam ICTP: Trieste, Italy; 2004.

14. Sartorius B , Sartorius K: Global infant mortality trends and attributable determinants – an ecological study using data from 192 countries for the period 1990–2011. Population Health Metrics 2014; 12:29.

15. Muldoon KA, Galway LP, Nakajima M, Kanters S, Hogg RS, Bendavid E, et al. Health system determinants of infant, child and maternal mortality: A cross-sectional study of UN member countries. Global Health. 2011;7:42.

16. Olson ME, Diekema D, Elliott BA, Renier CM. Impact of income and income inequality on infant health outcomes in the United States. Pediatrics 2010;126(6):1165-73.

17. Jiménez-Rubio D. The impact of fiscal decentralization on infant mortality rates: Evidence from OECD countries. Social Science & Medicine 2011;73(9):1401-7.