



Socio-Economic Status and Infant Mortality Rate

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Abstract

Background: For more than forty years medical sociology has explained numerous examples of the social patterning of disease. They have shown a strong association between health and socioeconomic status (SES). One of the most important indicators of development in each country is the infant mortality rate, and SES is main determinant for this indicator. This study has evaluated the impact of SES on infant mortality in Shahrud, 2017.

Methods: In This cross-sectional study, the information of 4242 children born in 2017 was extracted from the electronic health record with the help of the data collection form. In the first part, the information was about demographics and health care of the household. The second part was related to the household economic status, it was asked to the mothers by phone or in person, including questions about the equipment and tools used by the household. The PCA method (Principal component analysis) was used to determine the socio-economic status, and finally, the households were divided into two high and low socio-economic groups. Confounding factors such as mothers' gravidity, history of congenital anomalies in previous children, mother age, history of abortion, type of delivery, the interval of pregnancies, were also used in the study to investigate the effect of SES on infant mortality.

Results: Based on our findings, out of 4242 children born in 2017, a total of 21 children died before one year old. The chance of death in children of households belonging to the low SES was 2.93 times more than high SES (CI95%=1.14-7.54).

Conclusions: In general, improving households' socio-economic status can be very effective in reducing child mortality. Government, non-government, and NGO supports can help to improve the economic situation of households and they can help poor families to receive some expensive health services. It is also recommended to promote family health literacy.

Keywords: Socio-economic status, Principal component analysis, Infant, Mortality, Shahrud.

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movement. In 1986, the first Ottawa international health promotion conference identified eight key health prerequisites. These prerequisites included peace, shelter, education, healthy nutrition, income, a sustainable ecosystem, sustainable resources, social justice, and equality.²

Therefore, governments were gradually obliged to make basic plans for the provision, production, and distribution of health in society. Finally, it led to the formation of health systems in most countries in the world, including Iran, and in recent years, many efforts have been made to study the social factors that determine health. In other words, the role of these variables on health indicators has been studied and for this purpose, since 2005 Iran has been a member of the commission of social factors determining health and numerous plans have been made to improve economic, social, and demographic indicators.¹

Child mortality rate indicates the health status of society, which is related to various factors such as socioeconomic status, maternal health and quality, and access to health services.³ United Nations Children's Fund (UNICEF) believes that the infant mortality rate is one of the most indicators of development.⁴

According to statistics, out of the total annual births in the world, more than 14 million people die in the first year of life.⁵

Under the world health organization (W.H.O) proposed program, countries are committed to reducing infant mortality by two-thirds of what is available between 1990 and 2015. According to the Millennium development goals (2009) data, the infant mortality rate worldwide is 47 per thousand, which are reported 5 per thousand for developed countries and 51 per thousand live births for developing countries.^{6,7}

Recently, with the expansion of health care in the world, infant mortality rates have decreased, however, there is a huge inequality in infant mortality rates around the world, for example 1.9 per 1,000 live births in Iceland in 2008 and 165 per 1,000 live births in Afghanistan. This figure was higher for our country in 2010 compared to developed countries and about 21.8 per thousand live births.⁵ A study evaluating the indicators of achieving the millennium development goals of Iran in comparison with the rest of the world and the eastern Mediterranean region has shown that the ratio of infant mortality "less than 28 days" to the total mortality of children "under 5 years" is increasing in Iran, and it has been reported this index is more than the world and the eastern Mediterranean. This index has increased from 37 to 44 in 1990

Introduction

It is proven that social determinants of health such as income, education level, occupation, and social class are much more important than biological factors on disease. The statute of the world health organization, drafted in 1946, stated that the founders of this organization intended to pay special attention to the social roots of health problems in addition to meeting the challenges of medical care and effective treatments.¹

Since the mid-1980s, the social determinants of health have played a special role in the realization of the health promotion

compared to 2012 in the world, from 39 to 46 in the eastern Mediterranean region and from 46 to 61 percent in Iran.⁸

The role of socioeconomic factors in human health is more than 50% although some studies mention the role of social factors up to 70%.⁹ Worldwide, it has been found that there is a link between a higher prevalence of health problems, disease and death, and lower socioeconomic status.¹⁰

Studies conducted worldwide also show that child mortality in low socioeconomic groups is significantly higher than in others.¹¹

Parents also have a major role in children's health and a set of factors that affects the child's health which is related to environmental or physical living conditions, beliefs, financial and economic conditions of the family, literacy status, and education of parents as a more sustainable factor than income status, which can be unstable and change annually.¹²

In Iran, the health system tries to have some program to reduce child mortality. However, due to the various changes in society in the field of socioeconomic, attention to social factors to improve the quality of services and increase access to health services should be highlighted.¹³

In this study, the effect of socioeconomic status on the death of children less than one-year-old has been considered.

Materials and Methods

This cross-sectional study has been done by a mixed method of retrospective and survey documents. Also, the electronic health record of all children born in 2017, covered by Shahroud university of medical sciences has been reviewed.

About 93% of those born in 2017 were entered into the study (4242 newborn), the total number of live births was 4566. Other children were not included in the study for various reasons, such as family migration or the family's unwillingness to participate in this study.

A data collection form was used to record the required information, the first part of which was information about the household demographic characteristics as well as the history of maternal care during pregnancy. This part of the information was completed with the help of data available in the electronic health record or (known as SIB in Health System), and the second part of this form was the registration of household economic characteristics, which was asked of the mother by phone or in person. All of the above information was provided by thirty health interviewers.

Since the most important purpose of this study was to show the effect of SES on infant mortality, P.C.A (principal component analysis) was used to make this variable. So at first, we make SES that can divide households into two distinct high and low classes.

In this study, the P.C.A method was used to construct an SES variable. Various studies have shown that the issue of socioeconomic status is very complex and has wide dimensions. Also, there is no standard and golden method for measuring it and because measuring variables related to some

of these dimensions such as income, occupation, and household expenditure is simply not possible or reliable, therefore researchers have to use other proxies as alternatives and reduce the number of variables in a set of data to smaller dimensions. The P.C.A is a statistical technique that was first used in the psychological sciences in the early twentieth century and gradually spread to other fields of natural sciences, medicine, economics, and social sciences. This method is used to reduce the number of variables in a data set without losing much information. Variables that all or none of the people in the study have will weigh zero in the PCA, for example, a variable such as having a TV that is present in almost all households will weigh zero. But having a microwave and a washing-machine will weigh more, and of course, it should be noted that this method of grouping the socio-economic situation is used only for comparison between individuals and households and does not indicate the level of absolute poverty.¹⁴

It can simply be said that finally, the researcher creates a new variable called SES, using the P.C.A, with a combination of variables, and this new variable is used in research.

Finally, in this study 14 factors (including 10 effective economic factors of household assets and 4 social factors) were used as the best influential factors, and a new socioeconomic variable was created after weighing them. The economic was the type of heating and cooling device, kitchen (household's cooking place), bathroom (access or lack of private bathroom), number of rooms of residential house, vehicle (vehicle with a price above 500 million Rials in 2017), having microwave, having computer and internet access, history of a mother's foreign tourist trip, and the 4 social factors used to construct the SES were father's education, father's job, the number of family members and the mother's education.

In this study, based on the model's coefficients for the first combination with the highest eigenvalue, the variable of SES was constructed (Table 1).

Table 1. Coefficients of variables entered the model to determine the SES

Variables	Variables model's coefficients
Father's education	0.37
Father's occupation	0.34
Computer	0.34
Cooling system	0.34
Mother's education	0.33
Heater system	0.30
Microwave	0.30
Car	0.27
Internet	0.24
Rooms	0.22
History of mother's foreign travel	0.17
Numbers of children	-0.11
Kitchen	0.08
Bathroom	0.05

After making the SES, based on the middle of this new variable, households were divided into two groups with high and low socioeconomic status (table 2).

Table 2. Situation household's socio-economic status in two groups

Household	number	percent
High socioeconomic group	117	9.9
Low socioeconomic group	125	0.1

The collected data entered into SPSS software (version 23), we used STATA14 for the analysis too. The association between SES and infant mortality was investigated by a multivariate logistic regression model. In the multivariate logistic regression model, the effect of variables such as urban or rural household location, history of abortion, maternal age, history of congenital anomalies, the interval between pregnancies, parental relationship, sex of births, high-risk pregnancy, body mass index, and frequency of prenatal care was included in the model as confounders and their effects were controlled in the model.

The relationship between independent and dependent variables in the logistic regression model was based on the calculation of the odds ratio (Odds Ratio-OR) and the significant level in this study was set at 0.05.

Results

In this study, 75.5% of households were in the city and 24.5% were in the rural area. 19.4% of mothers were in the high-risk age group under 18 or over 35 years old. Regarding parental literacy, the highest frequency was related to high school and diploma with 46.3% in mothers and 38.4% in fathers, and illiteracy in parents was approximately 0.6% (table 3).

Table 3. Parent's education level, Shahroud 2017

Education	Mother		Father	
	Percentage	Number	Percentage	Number
Illiterate	0.6	24	0.6	27
Elementary	9.7	415	12.7	537
Middle	11.3	480	16.6	705
High school and diploma	46.3	1966	38.4	1626
Associate	8.3	349	10	425
B.A	20.1	854	16.8	713
M.A	3.3	141	4.2	179
Doctorate	0.4	16	0.7	30

From 4242 newborn, 21 of them died before 1 year old. Based on results, low SES, having a history of congenital anomalies in previous children, and the number of maternal pregnancies were the major variables affecting mortality in 2017 (table 4).

Table 4. Factors affecting infant mortality in terms of multivariate regression, Shahroud 2017

Variables	OR	95% CI	Pvalue
SES			
High	1		
Low	2.93	1.14-7.54	0.025
Number of mother's gravidity			
First pregnancy	1		
Second pregnancy	2.74	12.03-0.62	0.181
Third pregnancy	11.25	83.26-1.52	0.018
Fourth and more Pregnancies	25	355.83-1.82	0.016
Congenital anomalies in previous children			
No	1		
Yes	11.81	65.56-2.12	0.005

The results of this study showed that low SES increases the chance of infant death by 2.93 times (CI95%=1.14-7.54) and positive history of congenital anomalies in previous children have increased the chance of infant death by 11.8 times (CI95%=2.12-65.56) and the high number of maternal pregnancies, especially in the fourth and more pregnancies, has

increased the chances of childhood mortality by 25 times (CI95%=1.82-355.83).

Other variables such as maternal age, history of abortion, delivery type, the interval of pregnancies, and maternal body mass index had no significant relationship with infant mortality in 2017.

Discussion

Based on our study the chance of infant mortality in low SES was 2.93 times more than high SES. Mostafavi's study on the relationship between household's socio-economic status and child death in Iran also shows the important effect of the wealth index on child death.¹⁵

Sepehr Doost's study on the effect of the human development index on less than five years old mortality in Iran also shows that the improving human development indicators such as education and income are associated with a reduction in child mortality, which is consistent with the results of our study.¹⁶ The results of Farhi's study in Ahvaz also showed that there is a significant relationship between father education and family size and the infant mortality rate.¹⁷ Researchers pointed to the impact of parents' education on children mortality like the study of the infant mortality rate in Yazd.¹⁸ In 2003, Jeffrey et al. found that child mortality was significantly associated with the SES of the household.¹⁹ According to Lavin and Sharifzadeh study, the father's level of education did not affect the death of children.^{20,21} In 2016, a study in the United States found that households with low SES had higher infant mortality rates and that black mothers were more likely than white mothers to experience infant mortality.²²

The biomedical approach was raised in the 18th century and it was also a way of providing material explanations for the diseases that afflict mankind. Gradually, health policymakers, international organizations and sociologists, and even physicians have been highly criticized for the biomedical model of disease and health. All of these criticisms were that the biomedical model ignored the important role of social and environmental variables on health and disease patterns. This study also shows the impact of socioeconomic factors on one of the most important indicators of development (infant mortality rate). We need a strong and responsible health system to follow poor people who need more attention. As a result, the health system must be designed to help reduce the effects of poverty on children's health or death. Some factors that can help in this regard include strengthening support programs, empowering people with self-care programs, and attracting the support of healthy donors, and seeking support from non-governmental organizations (NGOs).

In this year we face to the Covid-19 pandemic and it serious damages to jobs, it seems that the economic and living conditions of the people will be affected more than before and more severely. In recent years, Iran ministry of health has started to have social department at medical universities to work with health volunteers and NGOs. These types of programs must be extended in our country more serious and powerful.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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