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The Mortality Rate in Children Aged 1-59 Months in Affiliated Healthcare Centers of Babol University of Medical Sciences Based on ICD10

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ABSTRACT

Background and Objective: The mortality in children aged 1-59 months is one of the important indicators in assessing the general health status of a community. The death control system for children aged 1-59 months is used to record and review this indicator in Iran. This study was performed to investigate the mortality rate in children aged 1-59 months in affiliated healthcare centers of Babol University of Medical Sciences based on ICD10.

Methods: In this cross-sectional study, all cases of death in children aged 1-59 months registered in affiliated healthcare centers of Babol University of Medical Sciences in 2009-2020 were collected by referring to the reports recorded in the death control system for children aged 1-59 months. Then, information about the cause of death and the trends of mortality during the years 2009-2020 were reviewed.

Findings: Out of a total of 303 cases of death in children aged 1-59 months, 179 cases (59.07%) were boys, the mean age of children was 13.08±15.12 months and with 175 cases (57.75%), the highest mortality rate was related to urban areas. The general trend of mortality was declining; from 41 cases in 2009 to 14 cases in 2020 ($p \leq 0.001$). Congenital and chromosomal abnormalities in 100 cases (34%), endocrine, nutritional and metabolic diseases in 56 cases (18.48%), nervous system diseases in 23 cases (7.59%) and cancers in 22 cases (7.26%) were respectively the most common causes of death.

Conclusion: The results show a declining trend in the mortality of children aged 1-59 months.

Keywords: *Children Aged 1-59 Months, Death Rate, The International Classification of Diseases (ICD).*

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Introduction

One of the most important indicators to assess the level of community health is the death of children aged 1-59 months (1). Health and indicators related to children's health have always been emphasized by global and local health organizations; the Sustainable Development Goals (SDGs) emphasize the health of children and issues such as nutrition, death and vaccination (2). Significant progress has been made in reducing child mortality since 2000, and mortality in children aged 1-59 months decreased by 49%, from 77 per 1,000 live births in 2000 to 39 per 1,000 live births in 2017. Nevertheless, 5.3 million cases of death in children aged 1-59 months occurred in 2018 in the world, about 15.6% of which occurred in the Eastern Mediterranean region, where Iran is also located. More than half of all deaths are due to diseases that can be prevented and treated with simple and cost-effective interventions (2, 3). Overall, the global under-five mortality rates have dropped by 53% within the last 25 years (4). Therefore, reducing child mortality as an important determinant of human health and development is one of the goals of the Millennium Declaration (5, 6), and in this regard, the poor quality of some preventive interventions should be corrected to reduce mortality at this age (7).

In recent years, the mortality rate in children aged 1-59 months has decreased in most countries of the world (8). According to statistics provided by the Centers for Disease Control and Prevention in the United States in 2010, the most common causes of death in children under one year of age were chromosomal abnormalities, and in children one to four years old, accidents the most common causes (9). In China, secondary causes of death in children under the age of five have declined overall, but remain high in rural areas compared to urban areas, which highlights the need for proper planning to correct the underlying risk factors (10). Many studies have been conducted in Iran regarding the number and causes of child death and the mortality rate in children aged 1-59 months has increased from 44 cases per 1000 live births in 2000 to 25 cases per 1000 live births in 2011 (11). A study by Moeni et al. showed that 17% of deaths were in the age group of 1-5 years and with increased maternal education, the cases of child death decreased (12). Congenital and chromosomal abnormalities are the most common cause of death in children aged 1-59 months in Iran (13).

Although the statistics show a declining trend in mortality rates in recent years, we are faced with lack of data regarding the trends and the factors affecting its occurrence and its relationship with some epidemiological, social and economic indicators as well as the analysis and diagnosis of diseases according to the international classification of diseases in Babol, northern Iran. Considering that child mortality is one of the important health indicators and a symbol of the development of various communities and plays an important role in evaluating health services, determining the level of community health and population growth (14, 15), being aware of the factors involved in the mortality of children aged 1-59 months can be effective in adopting efficient and quick preventive and therapeutic measures. Therefore, based on the reports of the death control system of children aged 1-59 months in medical universities of Iran, the mortality rate of children aged 1-59 months in affiliated healthcare centers of Babol University of Medical Sciences was assessed and analyzed to examine the relationship between the occurrence of death in this age group and factors such as gender, place of residence, clinical manifestations and causes of death according to the international classification of diseases.

Methods

After obtaining permission from the ethics committee of Babol University of Medical Sciences with the code IR.MUBABOL.HRI.REC.1399.082, this retrospective cross-sectional study was conducted to

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investigate the mortality rate in children aged 1-59 months in affiliated healthcare centers of Babol University of Medical Sciences in 2009-2020 by referring to the reports recorded in the death registration system of the Ministry of Health and Medical Education. All cases of death in children aged 1-59 months recorded in Ayatollah Rouhani, Yahyanejad, Amirkola Children's Hospital, and Marzikola 17 Shahrivar hospitals and Babol Clinic and Mehregan private hospitals as well as urban and rural health centers, and health houses (both hospital and non-hospital centers) under the auspices of Babol University of Medical Sciences, which included 308 deaths, were examined in the above period. Five samples were excluded from the study due to illegibility of the data and failure to record the definitive cause of death.

In order to collect data, after obtaining permission from the Vice Chancellor for Research and Technology of the University and referring to the Vice Chancellor for Treatment of Babol University of Medical Sciences, the required data were extracted according to four standard ministry questionnaires (a- Questionnaire of mortality in children aged 1-59 months in the death registration system, b- Record of care [medical procedures] in the hospital unit for deceased children aged 1-59 months, c- Questionnaire of general review of records [medical procedures] of the deceased children aged 1-59 months and d- Questionnaire of Ministry of Health and Medical Education to investigate the causes of death in children aged 1-59 months) and recorded in a pre-prepared questionnaire for each child.

Numerous variables are mentioned in the death registration system, yet based on the objectives of the present study, only a few of them such as age, gender, place of residence, number of deaths and causes of death were used. Moreover, the cause of death of the child was recorded according to the International Classification of Diseases and data were entered in SPSS version 22 and analyzed using Chi-Square, independent t-test, Mann-Whitney and P-trend and $p \leq 0.05$ was considered significant.

Results

The mean age of the children was 13.08±15.12 months and the median and mid-quartile range were 6 months (3-19). Among 303 deceased children, 253 children (83.49%) died in hospital and 50 children (16.50%) died outside the hospital, and the highest number of recorded deaths was related to Amirkola Children's Hospital with 297 people (98%). Considering the division of age groups into two groups of 1-12 months and 13-59 months, the highest number of deaths related to in-hospital death was in the age group of 1-12 months with 168 people (55.44%), while it in the age group of 13-59 months, this was equal to 85 people (28.05%). Most of deceased children lived in urban areas (175 cases [57.8%]).

Regarding the level of education of mothers, the highest level of education of mothers was related to education up to high school diploma with 180 cases (59.40%). The mean age of deceased children in the city was 13.51±15.71 months and in the village was 12.50±15.12 months. There was no statistically significant relationship between gender and residence in children aged 1-59 months. Furthermore, there was no statistically significant difference between the mean age of the deceased children in terms of urban and rural areas. Considering the age groups, in the age group of children aged 1-12 months, no statistically significant difference was observed between the mean age of urban and rural residents. The mean age of urban and rural residents in the group of children aged 13-59 months also showed no statistically significant difference (Table 1).

According to the results of the present study, the most frequently mentioned clinical manifestations before hospitalization in the age group of 1-12 months were respiratory problems, fever and seizures with a frequency of 59.3%, 18.9% and 15.3%, respectively. These problems in the age group of 13-59 months included respiratory problems (47.2%), fever (30.3%) and drowsiness (24.7%), respectively. Although the frequency of respiratory problems in children aged 1-12 months was on average 10% higher than children

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aged 13-59 months, this difference was not statistically significant. The frequency of other reported clinical manifestations was higher among children aged 13-59 months compared to children aged 1-12 months, which was statistically significant between the two age groups in terms of drowsiness, bleeding and fever ($p<0.05$) (Table 2).

Table 1. Mean age of death in children aged 1-59 months by gender and place of residence in affiliated healthcare centers of Babol University of Medical Sciences

Gender and Place of Residence	Number(%)	Age (Months) Mean±SD
Boy		
City	104(58.1)	12.14±56.35
Village	75(41.9)	13.15±37.62
Girl		
City	71(57.3)	14.17±89.52
Village	53(42.7)	11.12±27.25
Total		
City	175(57.8)	13.15±51.71
Village	128(42.2)	12.15±50.12

Table 2. Frequency of clinical manifestations before hospitalization in children aged 1-59 months based on age group

Clinical Manifestations	Age Group of 1-12 Months Number(%)	Age Group of 13-59 Months Number(%)	Total (Patients)	P-value
Respiratory problems	112(59.3)	42(47.2)	154	0.059
Seizures	29(15.3)	20(22.5)	49	0.140
nausea and vomiting	23(12.2)	17(19.1)	40	0.124
Drowsiness	27(14.2)	22(24.7)	49	0.032
Bleeding	8(4.2)	12(13.5)	20	0.005
Abdominal pain	2(1.1)	2(2.2)	4	0.434
Dysentery	0(0)	2(2.2)	2	0.101
fever	36(18.9)	27(30.3)	63	0.034
Total (Patients)	237	144	-	-

The number of deaths in children aged 1-59 months in the studied period has slightly increased or decreased each year, but in general, the mortality rate in these children showed a declining trend; it decreased to 13 and 14 deaths in 2019 and 2020, respectively (Figure 1). Moreover, the results of Cochran-Armitage trend test showed that the mentioned declining trend is statistically significant ($p\leq0.001$). In terms of gender, the mortality rate in children aged 1-59 months was declining in both genders (Figure 2), being statistically significant in both boys ($p<0.001$) and girls ($p=0.006$). In terms of the place of residence in the study period, the mortality rate of children aged 1-59 months was declining for both urban and rural groups (Figure 3) and this declining trend was statistically significant in both urban residents ($p<0.001$) and rural residents ($p=0.007$).

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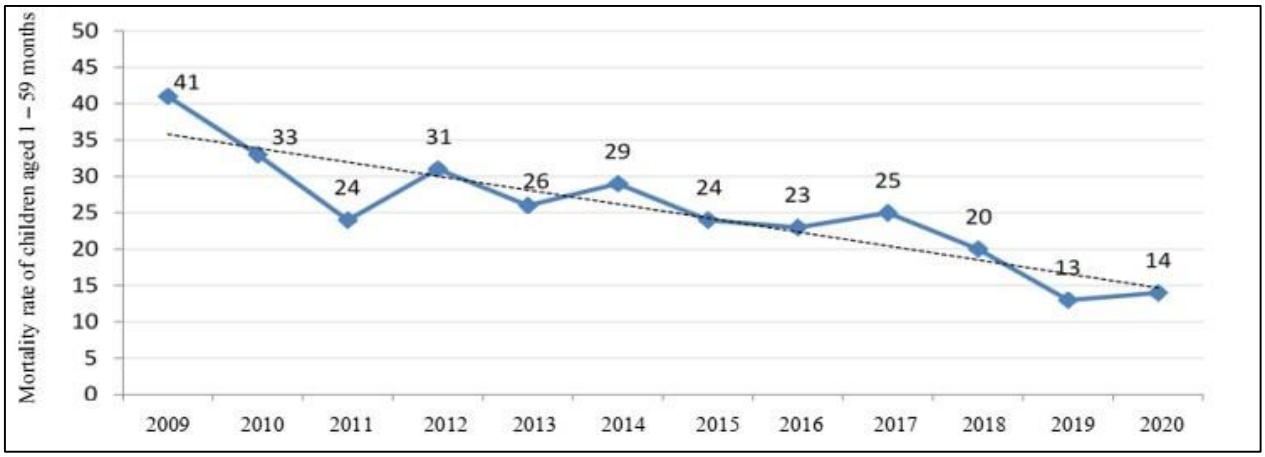


Figure 1. The mortality rate of children aged 1-59 months in affiliated healthcare centers of Babol University of Medical Sciences, 2009-2020

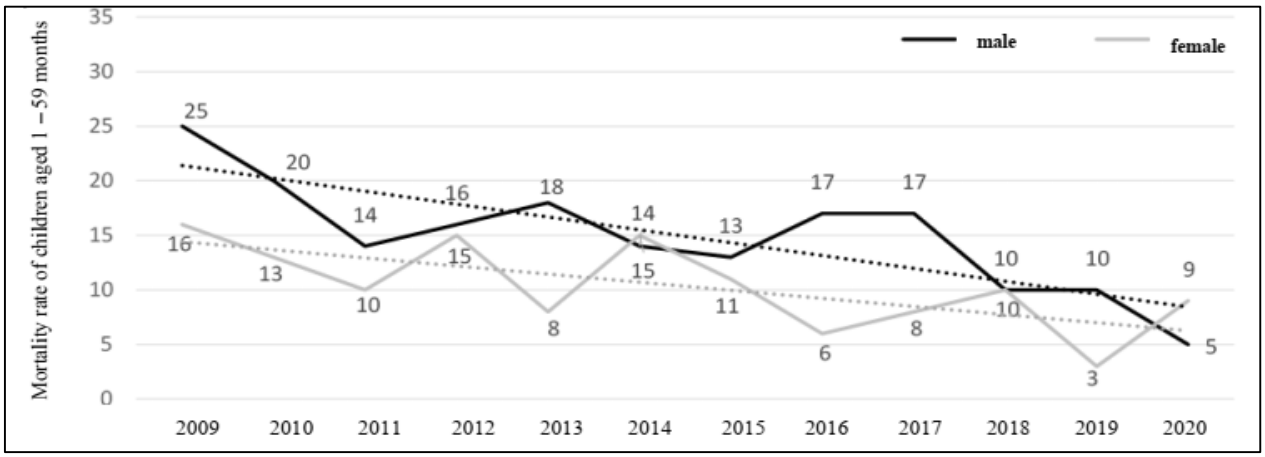


Figure 2. The mortality rate of children aged 1-59 months in affiliated healthcare centers of Babol University of Medical Sciences based on gender, 2009-2020

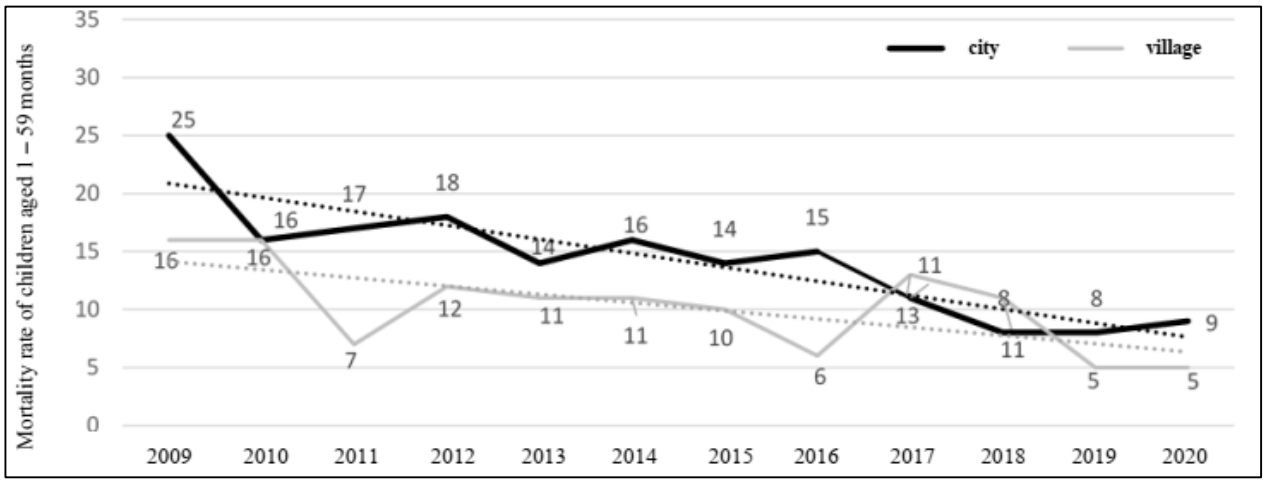


Figure 3. The mortality rate of children aged 1-59 months in affiliated healthcare centers of Babol University of Medical Sciences based on place of residence, 2009-2020

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The most common causes of death were congenital and chromosomal abnormalities, endocrine and nutritional and metabolic diseases, diseases of the nervous system and cancers with frequencies of 33%, 18.48%, 7.59% and 7.26%, respectively (Table 3).

Among 303 deceased children, 100 children died due to congenital malformations with a mean age of 8.32±10.36, while the mean age of children without congenital malformations was 15.43±16.50 months and this difference was statistically significant (p=0.001).

Table 3. Total number of deaths in very year based on the cause of death in children aged 1-59 months in affiliated healthcare centers of Babol University of Medical Sciences

Year / Cause of death	ICD-10	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total(%)
Congenital anomalies	Q00-Q99	19	14	5	13	11	4	14	8	5	5	1	1	100(33)
Metabolic disorders	E00-E90	7	11	4	4	2	6	2	4	8	5	1	2	56(18.48)
Neurological disorders	G00-G99	0	2	2	5	3	2	1	0	5	2	0	1	23(7.59)
Cancer	C00-D48	5	2	0	0	0	4	2	1	3	2	3	0	22(7.26)
Respiratory problems	J00-J99	1	2	2	1	3	3	1	1	0	3	1	1	19(6.27)
Accidents	S00-T98	0	1	2	1	3	0	0	2	0	0	5	4	18(5.94)
Infection	A00-B99	0	1	2	2	2	1	0	4	2	0	0	2	16(5.28)
Cardiac disorders	I00-I99	3	0	1	1	0	4	1	2	1	0	0	1	14(4.62)
Digestive problems	K00-K93	1	0	4	0	0	4	1	0	1	3	0	0	14(4.62)
Urinary problems	N00-N99	1	0	1	3	2	1	0	0	0	0	0	1	9(2.97)
disorders of blood and the immune system	D50-D89	3	0	1	1	0	0	2	0	0	0	0	0	7(2.31)
Birth defects	O00-O99	1	0	0	0	0	0	0	0	0	0	2	1	4(1.32)
Behavioral problems	F00-F99	0	0	0	0	0	0	0	1	0	0	0	0	1(0.33)
Total		41	33	24	31	26	29	24	23	25	20	13	14	303

Discussion

The results of the present study showed that regarding the two conditions of living in urban and rural areas, most of the deceased children lived in the city. The most common clinical manifestations before hospitalization for children aged 1-59 months were respiratory problems, fever and drowsiness, and a history of seizures, respectively. The mortality rate of children aged 1-59 months during the studied years showed a significantly declining trend. Regarding the ranking of causes of death according to ICD-10, in general, the highest frequencies were related to congenital and chromosomal abnormalities, endocrine and nutritional and metabolic diseases, diseases of the nervous system and cancers, respectively.

In the studies conducted by Izadi et al. (1) in Kermanshah province, Ahmadi et al. (16) in Fars province and Deihim et al. (17) in Dezful city, this trend has been declining. However, the results of studies conducted by Ataey et al. (18) in Ardabil province showed an increasing trend in mortality rate during the years 2011-

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2015. In addition, in a study conducted by Soori et al. (19) to compare the mortality rate of children aged 1-59 months in Iran and other parts of the world in the years 2012-2016, the mortality rate of children aged 1-59 months showed a declining trend in general, but the average mortality rate of children aged 1-59 months in Iran was reported to be slightly higher than the global average, which is probably due to the increase in families' attention to the child's symptoms, better familiarity with the child's health care and overall increase in paying attention to issues related to children's health.

The highest frequency of deaths in the present study was related to the age group of 1-12 months (67.3%). Studies conducted by Tajedini et al. (20) with a frequency of 57.81% in affiliated health centers of Shahid Beheshti University of Medical Sciences, Shahraki et al. (21) with a frequency of 68% in Zabol city, Ataey et al. (18) with a frequency of 57.12% in Ardabil province, Rahbar et al. (13) with a frequency of 63.21% in Iran, Aguilera et al. (22) with a frequency of 50.62%, Koffi et al. (7) with a frequency of 88.88% in Tanzania, Eshete et al. (23) with a frequency of 98% in Ethiopia, Moeni et al. (12) with a frequency of 83% in Parsabad, and Namakin et al. (24) with a frequency of 79.71% in Birjand show a higher share of deaths in the age group of children aged 1-12 months among children aged 1-59 months. In a study conducted by Xiang et al. in China, the highest mortality rate was related to the age group of children aged 12-59 months with a frequency of 65.7% (10). In general, it seems that among children aged 1-59 months, the highest frequency of death is related to the group of children aged 1-12 months, which can be due to the higher rate of hereditary disorders and infectious factors in this age group (25, 26).

The results showed that in children aged 1-59 months, regardless of other variables, the most frequent cause of death was related to congenital and chromosomal abnormalities with a frequency of 33%. Referring to other studies, accidents and respiratory diseases with a frequency of 63.51% in the study of Izadi et al. (1), congenital disorders with a frequency of 54% in the study of Deihim et al. (17), congenital and chromosomal disorders with a frequency of 17.51% in the study of Tajedini et al. (20), accidents with a frequency of 27% in the study of Shahraki et al. (21), (18) congenital and chromosomal abnormalities with a frequency of 21% in the study of Ataey et al., with a frequency of 23% in the study of Soori et al. (19), chromosomal abnormalities with a frequency of 23.41% in the study of Rahbar et al. (13), with a frequency of 41.71% in the study of Hajian et al. (27), congenital disorders with a frequency of 23% in the study of Aguilera et al. (22), with a frequency of 42% in the study of Koffi et al. (7), suffocation with a frequency of 34.31% in the study of Xiang et al. (10), with a frequency of 20.92% in the study of Amiri et al. (28), with a frequency of 27% in the study of Poyekar et al. (25), with a frequency of 41% in the study of Eshete et al. (23), sepsis with a frequency of 35.54% in the study of Andegiorgish et al. (26) and hereditary disorders with a frequency of 54.31% in the study of Namakin et al. (24) were introduced as the most common causes of death among children aged 1-59 months. Overall, the results indicate that the highest cause of death in the age group of 1-59 months, regardless of other variables, is related to hereditary disorders and chromosomal defects and infectious causes. Given that prenatal screening programs as well as premarital genetic counseling are performed in Iran, it seems that the quality of these measures should be evaluated so that we can improve this type of intervention and reduce deaths from inherited disorders and chromosomal defects in the future. It is also important to pay attention to infectious causes and plan to improve health interventions that lead to a reduction in infectious diseases.

Considering the presence of congenital and chromosomal abnormalities as the most common cause of death in children in this study, a significant relationship was observed between the presence of congenital and chromosomal abnormalities and the age of death in children, so that the mean age of death in children with congenital anomalies was 8.32 months and in children without congenital anomalies was 15.43 months. In a study conducted by Amini Nasab et al. in Birjand, 118 out of 22076 children were born with congenital

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anomalies, and they reported a significant relationship between the mean age of death in children with congenital anomalies and the type of anomaly (29).

Regarding the limitations of this study, it can be stated that although the number of deaths and its trend can show death status in health centers of Babol, but it cannot be compared with other studies in terms of death status. In calculating the mortality rate of children, the number of live births is taken into account in the denominator. Since the data related to the death of children were collected from the health centers of Babol, the live births in the surrounding cities are not available, so the numerator will not represent the total death of the children in the city due to the visits from the surrounding cities.

The results of this study show a declining trend in the death of children aged 1-59 months in the period of 2009 to 2020 and the age group of 1-12 months had the highest number of deaths and the most important cause of death was congenital disorders and chromosomal defects. Therefore, it seems that we still need to improve genetic screening programs and premarital counseling. The results of this study can be used to improve the policies or adopt new ones in genetic screening programs and premarital counseling with the aim of further reducing the death of children aged 1-59 months due to congenital disorders and chromosomal defects and also to advise health planners and policy makers to improve the knowledge of families in controlling the accidents. It is also possible to adjust the existing health measures to improve the health status of children under five years of age in such a way that more attention is paid to the age group of 1-12 months to accelerate the reduction of death in this age group.

Conflict of interest: The authors declare that they have no conflict of interest.

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[DOI: 10.22088/jbums.24.1.56]

References

1.Izadi N, Shetabi HR, Bakhtiari S, Janatalmakan M, Parabi M, Ahmadi K. The rate and causes of infant mortaliry in the hospitals of Kermanshah province during 2011-2014. J Rafsanjan Univ Med Sci. 2016;15(2):129-38. [In Persian]

2.World Health Organization. World health statistics 2019: monitoring health for the SDGs, sustainable development goals. 2019. Available from: https://apps.who. int/bitstreams/1237162/retrieve

3.Unicef, World Health Organization, World Bank Group. Levels and trends in child malnutrition. 2018. Available from: https://www.who.int/nutgrowthdb/2018-jme-brochure.pdf

4.You D, Hug L, Ejdemyr S, Idele P, Hogan D, Mathers C, et al. Global, regional, and national levels and trends in under-5 mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the UN Inter-agency Group for Child Mortality Estimation. Lancet. 2015;386(10010):2275-86.

5.Chaman R, Alami A, Emamian MH, Naieni KH, Mirmohammadkhani M, Ahmadnezhad E, et al. Important risk factors of mortality among children aged 1-59 months in rural areas of Shahroud, Iran: A Community-based Nested Case-Control Study. Int J Prev Med. 2012;3(12):875-9.

6.Chaman R, Naieni KH, Golestan B, Nabavizadeh H, Yunesian M. Neonatal mortality risk factors in a rural part of Iran: a nested case-control study. Iran J Public Health. 2009;38(1):48-52.

7.Koffi AK, Kalter HD, Kamwe MA, Black RE. Verbal/social autopsy analysis of causes and determinants of under-5 mortality in Tanzania from 2010 to 2016. J Glob Health. 2020;10(2):020901.

8.Rajaratnam JK, Marcus JR, Flaxman AD, Wang H, Levin-Rector A, Dwyer L, et al. Neonatal, postneonatal, childhood, and under-5 mortality for 187 countries, 1970–2010: a systematic analysis of progress towards Millennium Development Goal 4. Lancet. 2010;375(9730):1988-2008.

9.National Center for Injury Prevention and Control, Centers for Disease Control and Prevention. 10 Leading causes of death by age group, United States-2014. Available from: https://www.cdc.gov/injury/wisqars/pdf/leading_causes_of_death_by_age_group_2014-a.pdf

10.Xiang L, Wang K, Miao L, Kang L, Li X, Zhu J, et al. Injury-related mortality among children younger than 5 years in China during 2009-2016: an analysis from national surveillance system. Inj Prev. 2019;25(1):60-6.

11.AbouZahr C, Boerma T, Hogan D. Global estimates of country health indicators: useful, unnecessary, inevitable?. Glob Health Action. 2017;10(sup1):1290370.

12.Moeni SA, Tamjidzad Z. Child mortality rate and its causes in rural areas of Ardabil Province with emphasis on Pars Abad City. J Health. 2010;1(2):52-8. [In Persian]

13.Rahbar M, Ahmadi M, Lornejad HR, Habibelahi A, Sanaei-Shoar T, Mesdeaghinia AR. Mortality causes in children 1-59 Months in Iran. Iran J Public Health. 2013;42(Supple1):93-7.

14.Nayeri F, Amini E, Oloomi Yazdi Z, Dehghan Naieri A. Evaluation of the cause and predisposing factors in neonatal mortality by using international coding diseases version 10 in Valiasr Hospital. Iran J Pediatr. 2007;17(Supple 1):21-6. [In Persian]

15.Mohseni RA, Pakzad H. Effect of sociol-economical conditions on mortality rate of under 5 years children, Khuzestan- Iran (2009). J Gorgan Uni Med Sci. 2012;14(3):120-7. [In Persian]

16.Ahmadi A, Javadi A. Trends and determinants of infant mortality rate in Fars province during 2001-2011. J RafsanjanUniv Med Sci. 2015;14(1):37-46. [In Persian]

[DOR: 20.1001.1.15614107.1401.24.1.8.4]
[DOI: 10.22088/jbums.24.1.56]

17.Deihim Z, Aghababaeian H. Evaluation of Factors Associated with Mortality in Neonate's and Children Aged 1-59 Months in Dezful City (2009-2014). J Pediatr Nurs. 2015;2(1):61-9. [In Persian]
18.Ataey A, Alipour A, Khodakarim S, Khosravi A. Epidemiology of Under-5 Mortality Rate in Ardabil Province, Iran 2011-2015. J Mazandaran Univ Med Sci. 2019;28(168):160-5. [In Persian]
19.Soori H, Rafiei E, Entezami N, Hasani J, Hossaini SM. A comparison study on rate and causes of under 5 years old deaths in Iran, eastern Mediterranean region and the world. J Safe Promote Inj Prev. 2016;4(1):1-8. [In Persian]
20.Tajedini F, Delbarpoor Ahmadi S, Ehdaievand F, Moghimi dehkordi B, Torkaman nejad S, Farsar A. Epidemiological features of children mortality in the area covered by Shahid Beheshti university of medical sciences in 2012. J Clin Nurs Midwifery. 2014;3(1):62-71. [In Persian]
21.Shahraki A, Mardani M, Arab M, Firouzkouhi Z. Infant under 1-59 month mortality causes in Zabol. Iran J Nurs Res. 2010;5(17):6-13. [In Persian]
22.Aguilera X, Delgado I, Icaza G, Apablaza M, Villanueva L, Castillo-Laborde C. Under five and infant mortality in Chile (1990-2016): Trends, disparities, and causes of death. PLoS One. 2020;15(9):e0239974.
23.Eshete A, Abiy S. When Do Newborns Die? Timing and Cause-Specific Neonatal Death in Neonatal Intensive Care Unit at Referral Hospital in Gedeo Zone: A Prospective Cohort Study. Int J Pediatr. 2020;2020:8707652.
24.Namakin K, Sharifzadeh GR. The evaluation of infants mortality causes and its related factors in Birjand. J Isfahan Med School. 2009;27(95):275-82. [In Persian]
25.Poyekar SS, Ambike DA, Kalyanaraman R, Bhogshetti RK. A retrospective study on neonatal mortality over 6 years in a rural teaching hospital. Indian J Child Health. 2020;7(10):404-7.
26.Andegiorgish AK, Andemariam M, Temesghen S, Ogbai L, Ogbe Z, Zeng L. Neonatal mortality and associated factors in the specialized neonatal care unit Asmara, Eritrea. BMC public health. 2020;20:10.
27.Hajian K, Svadkohi R, Hamedi M, Moshtaghian S. A Study of the Cause of Death Among Children Under 5 Years in Babol Amirkola Children Hospital During 1993-1997. Res Med. 2000;24(3):199-204. [In Persian]
28.Amiri M, Lornejad HR, Barakati SH, Esmaeil Motlagh M, Kelishadi R, Poursafa P. Mortality inequality in 1-59 months children across Iranian provinces: referring system and determinants of death based on hospital records. Int J Prev Med. 2013;4(3):265-70.
29.Amini Nasab Z, Aminshokravi F, Moodi M, Eghbali B, Fatemimogadam F. Demographical condition of neonates with congenital abnormalities under Birjand city health centers during 2007-2012. J Birjand Univ Med Sci. 2014;21(1):96-103. [In Persian]

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