

Mortality-related factors disparity among Iranian deceased children aged 1-59 months according to the medical activities in emergency units: National mortality surveillance system

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Background: To determine disparity in mortality-related factors in 1-59 months children across Iran using hospital records of emergency units. **Materials and Methods:** After designing and validating a national questionnaire for mortality data collection of children 1-59 months, all 40 medical universities has been asked to fill in the questionnaires and return to the main researcher in the Ministry of Health and Medical Education. Age and sex of deceased children, the type of health center, staying more than 2 h in emergency unit, the reason of prolonged stay in emergency, having emergency (risk) signs, vaccination, need to blood transfusion, need to electroshock and so on have also been collected across the country. There was also a comparison of children based on their BMI. Chi-square test has been applied for nominal and ordinal variables. ANOVA and *t*-student test have been used for measuring the difference of continuous variables among groups. **Results:** Mortality in 1-59 months children was unequally distributed across Iran. The average month of entrance to hospital was June, the average day was 16th of month, and the average hour of entrance to hospital was 14:00. The average of month, day and hour for discharge was July, 16, and 14:00, respectively. The hour of discharge was statistically significant between children with and without risk signs. More than half (54%) of patients had referred to educational hospital emergency units. There were no statistically significant differences between children with and without emergency signs. There were statistically significant differences between children with and without emergency signs in age less than 24 months (0.034), nutrition situation ($P = 0.031$), recommendation for referring ($P = 0.013$), access to electroshock facilities ($P = 0.026$), and having successful cardiopulmonary resuscitation ($P = 0.01$). **Conclusion:** This study is one of the first to show the distribution of the disparity of early childhood mortality-related factors within a developing country. Our results suggest that disparity in 1-59 months mortality based on hospital records in emergency units needs more attention by policy-makers. It is advisable to conduct provincially representative surveys to provide recent estimates of hospital access disparities in emergency units and to allow monitoring over time.

Key words: Children mortality, emergency units, Iran, national mortality registration system

INTRODUCTION

Some researchers have suggested that declines in child mortality can be at least partially attributed to the improved measurement of child mortality.^[1] Thus, increased policy discussion of investment in child health is leading to calls for more timely and more local measurements of child mortality.^[2] More than 8 million children die each year all over the world^[3] and child mortality has received

special attention as part of the United's Millennium Development Goals.^[4] In fact, over the past few decades, and particularly since the World Summit for Children in 1990,^[5] there has been growing interest in measuring child mortality, both as a health indicator and as a basic measure of human development.^[6] This interest has brought renewed attention to the challenge of improving child survival, including a focus on understanding why some populations are making progress and others are not.^[7-9] However, despite considerable efforts, our knowledge on the impact of intervention strategies for many countries is weak.^[6] A vital registration system that captures all births and deaths is the optimal way to monitor child mortality; however, very few developing countries have complete vital registration systems.^[10]

Child mortality is often used as an indicator of population health.^[11] Moreover, in developing countries,

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data on child mortality are comparatively reliable compared with other measures of population health.^[11] In fact, child mortality is a key health outcome in developing countries.^[12] In countries with complete vital registration systems that capture all births and deaths, child mortality can be directly calculated, considering that one of the most important indices of health in each age group is its own mortality rate. In the absence of a complete vital registration system, however, child mortality could only be estimated using live births, not age groups' own death.

Furthermore, with increasing concern about equity in child survival, it is arguably as important to be able to measure and monitor child mortality at the subnational level due to incompleteness of birth histories for this purpose. Health policy makers always need appropriate and up-to-date information about mortality, in order to evaluate the efficacy of current system and to design of suitable intervention studies. There is a special emphasis on the health of Iranian children and therefore many preventive activities are carrying out to improve their health. Therefore, in 1997, the study on the registration of death and its cause has been carried out in Bushehr Province as a pilot study. In 1999, Semnan, Eastern Azarbayejan and Chahar Mahal and Bakhtiary provinces were added to this project. Another six provinces in 2000 and rest of the provinces have been added in 2002. The primary results of the mentioned studies have revealed that despite favorable results of current activities of improvement of national health and declining mortality in children, the current information system needs revision.^[13]

The main aim of this study was to explore the current process of medical activities on mortality among 1-59 months children based on hospital records in emergency units across Iran in children deceased with and without emergency risk signs. There is also an assumption that there is a disparity of mortality-related factors among different universities, which are covering health of residents of different Iranian provinces.

MATERIALS AND METHODS

Data

In a cross sectional study, birth history data and data on determinants of 1-59 months mortality were obtained from Iranian Demographic and Health Surveys (DHS) in 2007, which are nationally representative surveys among ever-married women aged 15-49 years.^[13,14]

It should be noted that since 1985, the responsibility of health in Iran has been delivered to Universities of Medical Sciences. In 2009, there were 40 medical universities (in 30 provinces) in Iran. In the primary

step, a national qualitative health survey (including new questionnaire for gathering better information) has been carried out among health experts of three selected medical universities: Shahid Beheshti, Semnan and Arak. Based on their comments, the primary designed quantitative questionnaires have been revised. Then, the revised questionnaires have been filled in Arak. Considering the potential solutions for observed problems in filling in questionnaires, the final and validated questionnaire has been prepared and was sent to 40 medical universities in order to be filled in all parts of Iran in 2009. The requested data on mortality and related factors of children 1-59 months in different parts of Iran have been collected and sent to the main researcher in the health ministry.

Using the designed questionnaire, in addition to age and sex of deceased children, some other information has also been collected across the country, based on hospital records. This information include the type of health center (educational hospital emergency, non-educational hospital emergency, private hospital emergency, health home, health center, and private section), staying more than 2 h in emergency, the reason of prolonged stay in emergency (waiting for reception answer, not available facilities for transfer, prolonged diagnosis and other reasons), having emergency (risk) signs (not inhalation, bleeding, shock, convulsion and coma), vaccination, need to blood transfusion, need to electroshock, revival (CPR), participation in CPR workshop by health workers, having successful CPR, the reason for no offer, using ambulance for transfer, discharge reason (advice of physician, parents' request, transfer to the ward, death, referring and others), and diagnosis (based on ICD-10 categories). Children have been considered in two groups: With and without risk signs. For some variables mean, standard deviation, median, mode, first quartile and third quartile have been calculated such as: Entrance (month, day, and hour), exit (month, day, and hour), Physician's order (month, day, and hour), hospitalization (month, day, and hour), weight (g), height (cm), and body mass index (BMI), breaths per minute, temperature (Celsius degree) and pulse rate per minute.

Statistical analysis

All questionnaires have been entered inside the pre-designed program (Microsoft Access 2007). The analysis was based on comparison of children with and without emergency signs. There was also a comparison of children based on their BMI. Chi-square test has been applied for nominal and ordinal variables. ANOVA and *t*-student test have been used for measuring the difference of continuous variables among groups. SPSS for Windows (version 19.0) has been used for the analysis.

RESULTS

The hospitalization characteristics of Iranian deceased children 1-59 months for both children with and without emergency signs have been shown in Table 1. The average month of entrance to hospital was June, the average day was 16th of month, and the average hour of entrance to hospital was

14:00. The average of month, day and hour for discharge was July, 16, and 14:00, respectively. The hour of discharge was statistically significant between children with and without risk signs. These results could help managers to manage the rush times of entrance and discharge among hospitals.

In Table 2, the distribution of measured characteristics of deceased children 1-59 months have been presented.

Table 1: Hospitalization characteristics of Iranian deceased children 1-59 months in 2009

Characteristic	With risk signs (N=1835)	Without risk signs (N=1019)	P value
Enter			0.122
Month	6.60	6.39	
Mean	3.40	3.31	
S.D.	4	4	
Q1*	9	6	
Median	10	9	
Q3 ^s	9	9	
Mode			
Day			0.121
Mean	15.98	15.43	
S.D.	8.73	8.84	
Q1*	8.25	8	
Median	16	16	
Q3 ^s	23.75	23	
Mode	15	4	
Hour			0.471
Mean	13.52	13.34	
S.D.	5.65	6.01	
Q1*	10	9.22	
Median	13	13	
Q3 ^s	18.12	18.15	
Mode	10	10	
Exit			0.318
Month	6.60	6.46	
Mean	3.41	3.32	
S.D.	4	4	
Q1*	7	7	
Median	10	9	
Q3 ^s	9	9	
Mode			
Day			0.06
Mean	16.01	15.32	
S.D.	8.75	8.83	
Q1*	8	8	
Median	16	15	
Q3 ^s	23	23	
Mode	14	4	
Hour			0.016
Mean	13.78	13.15	
S.D.	5.82	6.26	
Q1*	10	9	
Median	13.79	13	
Q3 ^s	18.30	18.30	
Mode	13.15	11	

*Q1=1st quartile, ^sQ3=3rd quartile

Table 2: Measured characteristic distribution of Iranian deceased children 1-59 months in 2009

Characteristic	With risk signs (N=1835)	Without risk signs (N=1019)	P value
Breaths per minute			0.007
Mean	41.23	43.32	
S.D.	13.77	13.82	
Q1*	30	30	
Median	40	40	
Q3 ^s	52	55	
Mode	30	40	
Pulse rate per minute			0.02
Mean	120.28	122.84	
S.D.	19.29	21.44	
Q1*	109.5	110	
Median	120	120	
Q3 ^s	134	140	
Mode	120	120	
Temperature			0.004
Mean	37.46	37.29	
S.D.	0.984	1.30	
Q1*	36.80	36.5	
Median	37.10	37	
Q3 ^s	38	38	
Mode	37	37	
Weight (g)			0.80
Mean	6658.04	6708.69	
S.D.	4040.52	4031.95	
Q1*	3599	3700	
Median	5500	5800	
Q3 ^s	9000	9000	
Mode	10000	7000	
Height (cm)			0.175
Mean	64.90	66.57	
S.D.	15.81	17.62	
Q1*	53	53	
Median	62	62	
Q3 ^s	74	77	
Mode	50	60	
Body mass index (kg/m ²)			0.279
Mean	15.23	14.63	
S.D.	9.34	5.04	
Q1*	11.51	11.78	
Median	14.21	14.24	
Q3 ^s	16.66	16.83	
Mode	12	12	

*Q1=1st quartile, ^sQ3=3rd quartile

There were statistically significant differences between children with and without emergency signs in breaths per minute ($P = 0.007$), pulse rate per minute ($P = 0.02$), and temperature ($P = 0.004$).

Table 3 demonstrates hospital records characteristics of 1-59 months deaths of Iranian children based on BMI. More than half (54%) of patients had referred to educational hospital emergency units. There were no statistically significant differences between children with and without emergency signs ($P > 0.05$). There were statistically significant differences between children with and without emergency signs in age less than 24 months (0.034), nutrition situation (0.031), recommendation for referring (0.013), access to electroshock facilities (0.026), and having successful CPR (0.013).

DISCUSSION

This study is one of the first to show the distribution of the disparity of 1-59 months mortality-related factors within a developing country. Furthermore, it fills a gap concerning the lack of information on children mortality within a region. It shows that there is a lack of medical activities in emergency units related to children mortality-related factors across Iran.

Various major health programs and initiatives focus on children mortality; and most UN member states have agreed to the UN Millennium Goal (MDG) of reducing the under-five mortality by two-thirds between 1990 and 2015.^[8] Therefore, reducing regional disparities in mortality within countries is an important objective of national governments and international organizations.^[15,16] Although in the recent years, many studies have been conducted on disparity and spatial distribution of children mortality in developing countries;^[17-26] however, not much is known about how disparities change across Iranian provinces, and what the determinants of these changes are.

It should be noted that the objective of our study was to show the distribution mortality-related factors of children 1-59 months across Iran based on hospital records of emergency units which can help health planning and policy-making for promotion of health in Iranian hospitals, especially in emergency units.

There are some explanations for the observed disparity. For instance, the large number of death in children of some hospitals (in different provinces) might largely be explained by differences in access to first care facilities, the distance from hospital, the available facilities to on time transfer of patients to the emergency units. Furthermore, in some provinces (smaller provinces), the emergency units do not have enough standards of bigger provinces. These changes were paralleled by different patterns of children mortality

Table 3: Hospital records characteristics of Iranian deceased children 1-59 months by body mass index average in 2009

Characteristic	Yes	No	P value
Having emergency signs	14.63±5.05*	15.23±9.34	0.279
Convulsion	14.26±4.53	14.96±7.39	0.421
Bleeding	16.36±4.83	14.85±7.23	0.299
Pulmonary	14.60±5.17	15.13±8.45	0.301
Shock	14.88±6.00	14.89±7.20	0.992
Coma	15.43±4.88	14.85±7.31	0.569
Elementary CPR	14.58±4.94	14.80±4.85	0.677
Having vital signs	14.68±5.37	15.63±13.11	0.182
Vaccination	15.07±7.87	13.99±7.10	0.623
Age less than 24 months	14.65±7.60	16.03±5.35	0.034
Nutrition	13.68±4.09	15.19±9.72	0.031
Recommendation for referring	13.94±3.92	15.36±8.28	0.013
Referred children	13.95±3.68	14.41±4.42	0.362
Using ambulance	14.49±3.63	13.77±3.73	0.258
Educational workshop participation	14.90±8.86	15.05±5.60	0.790
Staying in emergency >2 hours	14.74±11.00	15.00±5.26	0.667
Need to blood transfusion	14.00±5.81	14.92±4.99	0.254
Access to blood products	13.83±5.55	14.11±2.38	0.859
Access to CPR	14.75±5.12	14.68±2.44	0.972
Access to electroshock	15.93±4.37	14.39±5.12	0.026
Successful CPR	14.05±4.85	15.50±5.20	0.013
Type of center			0.548
Educational hospital emergency	14.64±6.03		
Non-educational hospital emergency	15.03±4.97		
Private hospital emergency	14.07±4.66		
Health home	14.86±2.91		
Health center	14.67±3.13		
Private section	16.45±17.74		
The reason of long stay in emergency			0.967
Waiting for reception answer	14.26±4.04		
Not available facilities for transfer	14.30±5.59		
Prolonged diagnosis/treatment	15.03±16.19		
Others	14.60±4.52		
Vaccination			0.639
Complete	15.04±7.32		
Incomplete	13.76±5.48		
No vaccination	13.11±4.37		
Unknown	15.29±6.29		
Referring			0.229
Appropriate	14.44±3.64		
Inappropriate	13.70±3.60		
Discharge by			0.825
Advice of physician	14.99±12.71		
Parents' request	13.82±2.80		
Transfer to the ward	14.81±5.92		
Death	15.16±5.54		
Referring	15.68±2.80		
Diagnosis			0.706
Accident	16.44±4.73		
Congenital	15.53±15.12		
Pulmonary	14.10±5.34		
Cardiovascular	15.37±5.63		

Contd...

Table 3: Contd...

Characteristic	Yes	No	P value
Infectious-parasite	15.13±4.55		
Gastroenteritis	13.70±6.96		
Metabolic	13.44±4.51		
Blood	13.99±4.31		
Cancer	15.89±5.05		
Urinary	13.10±2.84		
Mental-behavioral	13.52±1.49		
Around birth	7.84±2.42		
Others	15.76±4.90		

*Mean±standard deviation

in different provinces. Moreover, during recent years, the Iranian population in some provinces has better access to better and more facilitated hospitals with more medical experts and more skilled physicians compared to other provinces.

This study indicates the necessity of better defining the determinants of both disparity and levels of children mortality as well as the contribution of each factor to different provinces focusing on hospital records. Furthermore, based on the published report of Iranian ministry of health, more than 80% of mortality in age group of 1-59 months take place in hospitals.^[13,27] Therefore, the further focus must be on the determination of disparity in hospitals. To do this, we should have standardized questionnaires to compare different hospital records.

CONCLUSION

Our results suggest that disparity in 1-59 months mortality-related factors based on hospital records in emergency units needs more attention by policy-makers. Investigating why mortality disparity among hospitals is higher in some provinces deserves special attention. In addition, it is advisable to conduct provincially representative surveys to provide recent estimates of hospital access disparities in emergency units and to allow monitoring over time.

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