Original Article

Investigating the causes of mortality in children under the age of 5 years old referring to the hall of forensic medicine centers of Golestan, Mazandaran and Guilan provinces during 2013 and 2014

Masoud Ghadipasha[1*], Maryam Teimoory[2], Ali-Mohamad Alimohamadi[3], Hossein Zarei[4], Ali Abbasi[5], Mehdi Ghorbani-Samin[6], Mehdi Forouzesh[7]

[1]Forensic Medicine Specialist, Associate Professor at Research Center of the Legal Medicine Organization, Legal Medicine organization of Tehran Province, Iranian legal medicine organization, [2]Forensic Medicine Specialist, Forensic Medicine organization of Golestan Province, Iranian legal medicine organization, [3]Forensic Medicine Specialist, Legal Medicine organization of Tehran Province, Iranian legal medicine organization, [4]General physician, Legal Medicine organization of Golestan Province, Iranian legal medicine organization, [5]Pathologist, Legal Medicine organization of Mazandaran Province, Iranian legal medicine organization, [6]General physician, Legal Medicine organization of Guilan Province, Iranian legal medicine organization, [7]Forensic Medicine Specialist, Associate Professor at Research Center of the Iranian Legal Medicine Organization.

ABSTRACT

Problem statement: Death of children under the age of five is one of the important health indicators. Identifying the causes of child deaths can be very helpful in identifying and preventing thesimilar causes of death. Therefore, this study was designed at the Forensic Medicine Organization of Iran to investigate and prevent the death of children. Method of the study: The study was a retrospective descriptive study and the research variables from the files of died children under the age of referred to the forensic medical examination hall of Golestan, Mazandaran, Guilan provinces in 2012-2013 were entered into the checklist, coded and was analyzed using Spss software. Findings: 218 died children under the age of 5 including 88 girls and 130 boys were referred to forensic medicine centers in Golestan, Mazandaran and Guilan over two years. The most common causes of death were accidental driving (32.6%), death with unknown reason (16.5%), natural cause (12.4%), and the most common causes of skull fracture and intracranial hemorrhage (27.5%), unknown (17%), asphyxiation (15.1%). Death often occurred in the age range of 2-5 years (39.4%). Results: The most common type of death was traffic accidents (32.6%) that was not unexpected due to the tourist's availability of the three northern provinces of the country and its location on the route of the pilgrimage province of Khorasan Razavi. No cases of sexual abuse have been reported, which could be due to corruption, inadequate examination, and a judicial order to the issuance of a burial license and non-autopsy. Since the most common form of death was driving accidents so skull fracture and intracranial hemorrhage was announced as the most common cause of death.

Keywords: Causes of death, children under the age of 5, Golestan, Guilan, Mazandaran.

Introduction

Problem statement:

The mortality of children under 5 years of age is one of the health indicators of the community and its decline indicates an improvement in the community health. On the other hand, accidents and especially traffic accidents in the world are known as the main cause of mortality and disability and are one of the major health problems of communities (1.18). Given the importance of this important index, the United Nations adopted a resolution in 1980 that based on the aim should be reducing child mortality to less than 5 in 5,000 births to the end of the century [1]. Identifying the causes of child mortality will be of great help in solving and addressing the causes and preventing the occurrence of similar deaths in Iran.The forensic medicine organization of the country has also taken steps to determine the cause of the mortality of children referred to it.Therefore, this study was designed to use its results to increase the level of

Access this article online	
Website: www.japer.in	**E-ISSN:** 2249-3379

How to cite this article: Masoud Ghadipasha, Maryam Teimoory, Ali-Mohamad Alimohamadi, Hossein Zarei, Ali Abbasi, Mehdi Ghorbani-Samin, Mehdi Forouzesh. Investigating the causes of mortality in children under the age of 5 years old referring to the hall of forensic medicine centers of Golestan, Mazandaran and Guilan provinces during 2013 and 2014. J Adv Pharm Edu Res 2018;8(S2):71-80.
Source of Support: Nil, Conflict of Interest: None declared.

information and awareness about this important indicator, as well as to propose strategies for health promotion and prevention of child mortality.

The aims of the study:

The main aim of the project:

Determination of the causes of mortality in children under the age of 5 referred to the hall of forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014.

Sub goals of the project:

Determination of the causes of mortality in children under the age of 5 referred to the hall of forensic medicine centers of Golestan province during the years 2013-2014.

Determination of the causes of mortality in children under the age of 5 referred to the hall of forensic medicine centers of Guilanprovince during the years 2013-2014.

Determination of the causes of mortality in children under the age of 5 referred to the hall of forensic medicine centers of Mazandaran province during the years 2013-2014.

Applied purposes of the project:

Determining the role of traffic accidents in mortality of children under the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014.

Determining the role of child abuse in mortalityof children under the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014.

Determining the role of poisoning in mortalityof children under the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014.

Determination of congenital abnormalities mortalityof children under the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014.

Determination of the unknown cause of deathin children under the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014.

Determine the percentage of autopsy performed in bodies of the childrenunder the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014.

Determining the percentage of toxicology and pathology samples taken from the of the cornea in children under under the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014.

Determining the percentage of non-determinable cause of death due to corneal erosion in children under the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014.

Determining the percentage of body anonymity in childrenunder the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014.

Hypothesises or research questions (according to the objectives of the project):

1. Which age group has the highest rate of mortality in childrenunder the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014?
2. What is the most common cause of death in childrenunder the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014?
3. Mortality in childrenunder the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014 in what age is more common?
4. Mortality in childrenunder the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014 in which gender is more common?
5. Unknown cause of death in childrenunder the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014 in which genderis more common?
6. Unknown cause of death in childrenunder the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014 in what age is more common?
7. Child abuse in childrenunder the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014 in what age is more common?
8. Child abuse in childrenunder the age of five referred to the hall of the forensic medicine centers of Golestan, Mazandaran and Guilan provinces during the years 2013-2014 in which gender is more common?

History of the Research and Literature Review

Reducing the mortality rate for children under age of years five (U5mr) is indicative of improving the community health [2]. In the 1980s, the United Nations passed a resolution stating that all countries should aim to reduce their child mortality by less than 5 in 5,000 births to the end of the century [1]. Every day, 30,000 children and every minute 20 children lose their lives which occur mainly in low-income countries (Sahara in Africa and south Asia) [3]. According to a study that was conducted by Noralei et al. in town of kalaleh in 2004-2006, 612 deaths of under 5 years old, 63.4% of which were related to neonatal

death. 82.7% of neonates were below 2500 g. (60%) of mortality due to prematuritywas in first gravid mothers. 74.74% of neonatal mortality was occurred in the first week and 58.9% in the first 24 hours [2].

In another study conducted by Hosseini et al., in North Khorasan, during the years 2005-2010, the mortality rate of children under the age of five was 20.7 in 1000 birth and the most common causes were: :24% congenital anomalies, 19.6% premature infant, 8% of accidents, poisoning and burn [4]. Kiassari et al. (2006) reported 71 perinatal deaths in which the most common causes were multiple pregnancy (27.3%) and unspecified cause (28.6%) [5]. In another study by Dr. Namakin and his colleagues which was performed in Birjand duringthe 2002-2003 for one year, the total number of deaths was 118 cases, 79.7% of the cases were death of children less than 1 years old in the first month of life and 42.3% was between 1 month to 1 years old. The most common causes of death were prematurity and lack of weight (54.2%) and congenital anomalies (43.3%), respectively. Factors including Father's literacy, birth gap with previous child, neonatal status, type of delivery and high risk pregnancy have a significant relationship with infant mortality [6]. Amani et al. (2001-2002) reported 160 mortality cases of neonates in Ardebil in 2003-2004 that boys were 1.3 times more than girls. The most common cause of death was premature infants (55.1%). 45.7%of infants had a weight below 2500 g. Significant risk factors in this study included birth weight and lack of vehicle in the mother's place of residence, being a rural mother [7]. In another study by Homairand et al., during the 32 years from 1980 to 2010, it was found that there is an inverse relationship between increased child mortality and increased per capita income, increased staffing of healthcare professionals, increase in the female economy and increased female education [1]. Khoddami et al. recorded 60 dead babies in Tajrish health care hospital, 55% were male and 44% were female, 95% had birth weight less than 2500 g during the years 2004-2007 [8]. In a study conducted by Kahani et al., during the years of 1996-1999, 1,439 children less than 12 years old were referred to Tehran's forensic medicine office, 51.4% male and 48.6% female. The most common causes were accidents: 53.77%, burn 42.2%, burnout 3.91%, drowning 4.9%, fall 3.77%, poisoning 2.73%, external object swallowing 3%, cold weapons (Knife) 46.2%, being shot 18%, hanging 4.5%, debris and explosion 18.1% [9]. In 2007, in the city of Zabul, Shahrakhi and colleagues reported 93 deaths of 1- to 59-month-old children, most of whom were aged 1-12 months, 63% were males and 27% were female. 27% were by accidents, 18.3% respiratory disease and 15.6% due to gastrointestinal diseases. Significant risk factors wereparent'sinsusceptibility to the symptoms of disease and delayed referral to the treatment center and insist on early discharge due to economic problems [10]. Tajeedin et al. (2011) reported 383 deaths of 59-1 months old children in the population covered by Shahid Beheshti University that 52% were males and the most common causes were 17.5% congenital and chromosomal malformations, accidents 15.4% and cancers 11.6%. A study done by Arifin and colleagues in Bangladesh in 2004 reported 1174 deaths in children less than 5 years old. The most common causes of death were acute respiratory infections in girls and at birth asphyxia in boys. Generally, the most common causes were advanced infection (31%), accidents 22% (including drowning 19%), acute lung infection 21%, and asphyxia at birth 12% [11]. In the study conducted by Imamura et al. (2012), it was found that in children less than 1-year-old, the most common cause of death were accidental incidents threatening the breathing (other than drowning) and in older children driving accidents and drowning. [12]. Autard et al., (1989-2000) in the Senegal autopsied 3424 death cases less than 15 years' old which reported infectious diseases (diarrhea, malaria, respiratory infections (30-70%) were the cause of death in cases less than 10 years old [13]. In another study by Johnson et al (2010) the most common causes of death in 25 countries (sub-Saharan Africa, South Asia) were 31% pnumenia, 31% diarrhea, 26% malaria, 4% incidents and 3% meningitis [14]. In a study by Wolf et al (2014), in the whole of England, 60% of the deaths were related to age less than 1-year-old (3219 cases) and 10% to 1-4 years old and 6% 5-9 years old. In the age group of 1-4 years, the most common causes of mortality were 15% cancer, congenital malformation 14%, neurological disorders 12%, respiratory disorders 11% and infection 9% [15]. Brad Schaw et al reported that the most common cause of death in South Africa in 2000 was 40% AIDS, 11.2% low birth weight and 15% infectious diseases [16]. Breik and colleagues reported 10.6 million deaths in less than 5 years in studies conducted by WHO in 2000-2003, and the causes of death were the following, respectively: 19% pneumonia, 18% diarrhea, 8% malaria, and 10% sepsis or pneumonia [17]. Taravatmanesh and colleagues found that 51 children under 5 years old died in traffic accidents in Sistan and Baluchestan province which 45% were males and 55% were females. The death occurred most often in the spring and the least frequency was in the winter season [18]. According to Entezami and colleagues in 2010, 57 deaths of children under the age of 5 was following traffic accidents occurred in Golestan and Guilan and Mazandaran provinces, which were 56% males and 44% females, with the highest seasons in summer and the lowest in winter. The most common causes of death werereported as the followings: 48.92% head injury, 39.46%multiple fractures and3.98% bleeding [19]. According to Knight, burning more than 15% of the body in adults and more than 10% of the body in children requires a definite revival of fluids due to the loss and disturbance of water and electrolytes and its effects [20].

Method of the Study

Research variables:

Age
Gender
Location of the province
Autopsy performing

pathology sample
Sampling of the toxicology sample
Type of death
Cause of death
Year of death
Identity
Corruption
Type of the study:
Retrospective

Procedure:

In a retrospective descriptive study, only dead children under 5 years' old who were referred to the Forensic Medicine Law Hall of Golestan, Mazandaran, Guilan provinces 2013-2014 were investigated. The total number of cases of autopsy, the total number of samples of toxicology and pathology, corruption and total number of bodies with no identity were examined. The data were analyzed through descriptive checklist witha copy of the description of the body examination and using spss 21, and indicators such as frequency and percentage, mean and standard deviation. Descriptive analysis was performed using graphs and drawing tables.

Characteristics of the data collection tool and how it is collected:

The required information was extracted from the files of children under the age of 5 years old referred toforensic medicine centers of Golestan, Guilan, Mazandaran, and recorded as a computer file and coded and analyzed using spss software.

Form:

1- Age	1-7 daysO8-30 days O1-6 monthO6 onth-2 yearsO 2-5 years O
2- Gender	Male O Female OUnknownO
3- Death type	Driving accident OUnknown cause ONatural causeOBurn O Congenital causes O Neglect of child and child abuse O Falling from height O Premature o Drowning O Poisoning O Hard object hitting O Aspiration of externalobject O Mockonium aspirationO Penetrating or winning object O Electrocution O Being shotO Fracture and intracranial hemorrhage O unknownOAsphyxiaO
4- cause of death	Pneumonia O Several injuries O Sepsis O Hemorrhagic shock O Poisoning with opioid O Poisoning with anticonvulsant drugs O Carbon monoxide poisoning O Severe malnutrition O Cardiac failure O Intraperitoneal hemorrhage O Arrhythmia OGastrointestinal obstructionOHemorrhagic shockO
5- Autopsy done?	Yes ONo O
6- Toxicology Sampling	Yes ONo O
7- Pathology sampling	Yes ONo O
8- Serology and DNA sampling	Yes ONo O
9. Identity detected?	Yes ONo O
10- There is a body corruption?	Yes ONo O
11- Does it have an anal / vaginal sexual assault?	Yes ONo O
12- Place of death	Hospital O Home O outdoors O
13- Year of death	2013 O 2014 O
14- Season of death	Spring OSummerOFallOWinter O

Methods of calculating the sample size and its number:

All deaths of children under the age of 5 years in the provinces of Golestan, Guilan and Mazandaran during the years 2013-2014 were calculated.

Ethical Considerations:

All amendments to the case file are considered confidential and after obtaining the necessary approvals from the centers of the environment of this study is carried out.

Findings

During the years 2014-2014, 218 children under the age of 5, 88 girls (40.4%) and 130 boys (59.6%) were referred to the forensic medicine office in Golestan, Mazandaran and Guilan provinces, including 66 (30%) 23 Girl and 43 boys from Golestan province, 80 (37%) were 35 girls and 45 boys from Mazandaran province and 72 (33%) were 42 boys and 30 girls from Guilan province (Table 1).78 patients (35.8%) of the total population were under autopsy, of which 26 were from Golestan province, 8 from Mazandaran and 44 from Guilan (Table 2). Out of all referrals, toxicology sampling was done on 45 (20.6%) cases in which 12 were from Golestan, 3 from Mazandaran and 30 from Guilan (Table 3). Also, 55 (25.2%) children were sampled in toxicology, 12 of which were from Golestan, 4 from Mazandaran and 39 from Guilan (Table 4).

Table 1: Frequency of dead children under the age of five referred to the forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014 by gender

Gender	Total of 3 provinces		Golestan province		Mazandaran province		Guilan province	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Male	130	59.6	43	65.2	45	56.3	42	58.3
Female	88	40.4	23	34.8	35	43.8	30	41.7
Total	218	100	66	100	80	100	72	100

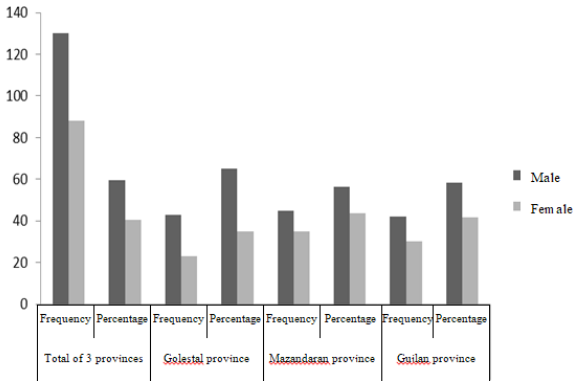

Figure 1. Frequency of dead children under the age of 5 referred to forensic medicine offices of Golestan, Mazandaran, and Guilan provinces during 2013 and 2014 by gender

Table 2: Autopsy frequency of children under the age of 5 years referred to forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014

Autopsy situation	Total of 3 provinces		Golestan province		Mazandaran province		Guilan province	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Done	78	35.8	26	39.4	8	10.0	44	61.1
Not done	140	64.2	40	60.6	72	90.0	28	38.9
Total	218	100.0	66	100.0	80	100.0	72	100.0

Table 3: Frequency of toxicology samples of children under the age of 5 years referred to forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014

Toxicology sample situation	Total of 3 provinces		Golestan province		Mazandaran province		Guilan province	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Done	45	20.6	12	18.2	3	3.8	30	41.7
Not done	173	79.4	54	81.8	77	96.3	42	58.3
Total	218	100.0	66	100.0	80	100.0	72	100.0

Table 4: Frequency of pathology sampling of children under the age of 5 yearsreferred to forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014

Pathology sample situation	Total of 3 provinces		Golestan province		Mazandaran province		Guilan province	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Done	55	25.2	12	18.2	4	5.0	39	54.2
Not done	163	74.8	54	81.8	76	95.0	33	45.8
Total	218	100.0	66	100.0	80	100.0	72	100.0

The type of death in the total population studied in three provinces based on the prevalence was respectively: 71 (32.6%) of driving accident, 36 unknown cause (16.5%), 27 death due to natural causes (12.4%),13 of each of burns and congenital causes (each 6%), 10 neglect of the child and child abuse (4.6%), 8 fall from the height (3.7%), 7 of each of prematurity and drowning (each 3.2%), poisoning and hit the hard object (except for accidents and falls) each 5 patients (each 2.3%), external object aspiration and meconiumeach 4 patients (1.8% each), penetrating object and CPD (fetal abnormalities with the pelvic floor), each 2 patients (0.9%), electrocution and anaphylaxis, being shot and the amputation caused by the winning object each was one person(0.5%).The most common death types in the provinces of Golestan were 17 people in driving accidents (25.8%), 12 naturaldeaths (18.2%) and 10 unknown cause (15.2%), and in Mazandaran province: 41 in driving accidents (15.3%), 19 death due to unknown cause (23.8%), 7 burn (8.8%) and in Guilan province 14 natural deaths (19.4%), 13driving accidents (18.1%), 8 child abuse (11.1%) (Table 5).

Table 5: Frequency of children under the age of five referred to the forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014, by type of death

Death type	Total of 3 provinces		Golestan province		Mazandaran province		Guilan province	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
toxicity	5	2.3	4	6.1	1	1.3	0	0
car accident	71	32.6	17	25.8	41	51.3	13	18.1
stab trauma/slash	2	.9	2	3.0	0	0	0	0
Natural cause	27	12.4	12	18.2	1	1.3	14	19.4
Un known	36	16.5	10	15.2	19	23.8	7	9.7
Burning	13	6.0	1	1.5	7	8.8	5	6.9
Drowning	7	3.2	2	3.0	2	2.5	3	4.2
Being shot	1	.5	1	1.5	0	0	0	0.0
Fall from height	8	3.7	5	7.6	1	1.3	2	2.8
blunt trauma	5	2.3	0	0.0	1	1.3	4	5.6
child abuse/neglect	10	4.6	2	3.0	0	0.0	8	11.1
congenital disease	13	6.0	5	7.6	1	1.3	7	9.7
Chiping wound/cutting	1	.5	0	0.0	1	1.3	0	0.0
aspiration	4	1.8	0	0.0	1	1.3	3	4.2
electrocution	1	.5	1	1.5	0	0.0	0	0.0
CPD	2	.9	0	0.0	2	2.5	0	0.0
Meconium aspiration	4	1.8	1	1.5	2	2.5	1	1.4
Prematurity	7	3.2	3	4.5	0	0.0	4	5.6
Anaphylaxis	1	.5	0		0	0.0	1	1.4
Total	218	100.0	66	100.0	80	100.0	72	100.0

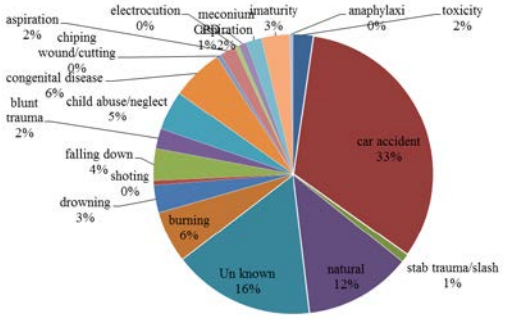

Figure 2: Percentage of children under the age of 5 five referred to the forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014, by type of death

The causes of death in children under the age of five referred to the autopsy halls of all three provinces during 2013-2014 were respectively:60 skull fractures and intracranial hemorrhage (27.5%), 37 unknown (17%), 33 asphyxia (15.1%), 22nausea (10%), 17 multiple injuries (7.8%), 14 sepsis (6.4%), 12 electrocution (5.5%), 10 hemorrhagic shock (4.6), 3 of each

opium poisoning and severe malnutrition (each one 1.4%), 2 heart failure (0.9%), poisoning with carbon monoxide and anticonvulsant medications, as well as one person from each of intra-abdominal bleeding, arrhythmias and gastrointestinal obstruction person (each one 0.5%). In different provinces by prevalence respectively: 15 skull fractures and intracranial hemorrhage (22.7%), 11 unknown cause (16.7%), 9 sepsis (13.6%), and in Mazandaran province, respectively: 28 skull fractures and intracranial hemorrhage (22.5 %), 10 asphyxias (12.5%) and in the Guilanprovince: 19 Asphyxia (26.4%), 17 skull fractures and intracranial hemorrhage were (23.6%), and 14 pneumonias (19.4%) (Table 6).

Table 6: Frequency of children under the age of 5 referred to the forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014, by type of death

Type of death	Total of 3 provinces		Golestan province		Mazandaran province		Guilan province	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
unknown	37	17.0	11	16.7	18	22.5	8	11.1
CO poisoning	1	.5	0	0	1	1.3	0	0
opium/id toxicity	3	1.4	2	3.0	1	1.3	1	1.4
anticonvulsant	1	.5	1	1.5	0	0	0	0
severe malnutrition	3	1.4	2	3.0	0	0	0	0
multiple trauma	17	7.8	6	9.1	8	10.0	3	4.2
skull fx/hg	60	27.5	15	22.7	28	35.0	17	23.6
Intra-abdominalhemorrhage	1	.5	1	1.5	0	0	0	0
sepsis	14	6.4	9	13.6	1	1.3	4	5.6
Asphyxia	33	15.1	4	6.1	10	12.5	19	26.4
electrolytes disturbance	12	5.5	1	1.5	6	7.5	5	6.9
arrhythmia	1	.5	1	1.5	0	0	0	0
hemorrhagic shock	10	4.6	3	4.5	6	7.5	1	1.4
GI obstruction	1	.5	1	1.5	0	0	0	0
HF	2	.9	2	3.0	0	0	0	0
pneumonia	22	10.1	7	10.6	1	1.3	14	19.4
Total	218	100.0	66	100.0	80	100.0	72	100.0

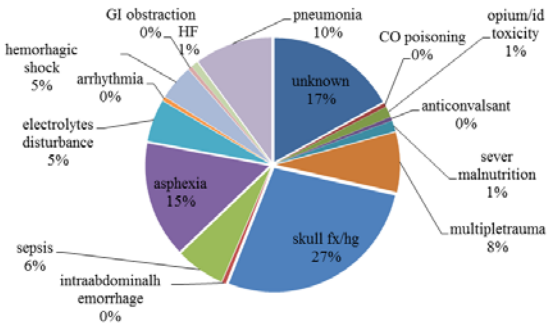

Figure 3: Percentage of children under the age of 5 referred to the forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014, by type of death

Ten cases (4.6%) of child neglect and child abuse were reported that the two of them were from Golestan, 8 from Guilan province. No case was reported from Mazandaran province. In none of these cases, there was no evidence of sexual assault. It was also found that often in the age range of 1-6 months, a frequency of 5 people (40% of cases of child malnutrition) and often a female (60%) occurred. Five people (2.3%) died of poisoning, 4 of them were from Golestan province (3 were poisoned with opium and opioid, and one was poisoned with anticonvulsants), and one from Mazandaran province (CO poisoning).

Feet followed by congenital malformations occurred in 13 (6%) patients, of which 5 were reported in Golestan province, one in each of Mazandaran andGuilan provinces. Death due to unknown cause occurred in 36 (16.5%) cases, of which 10 were from Golestan province, 19 from Mazandaran and 7 from Guilan. Due to body corruption, the cause of deathin 6 (2.8%) cases was not detectable of which 2 cases beloned to Mazandaran province, 2 to Guilan province and 2 to Golestan province. Ten (4.6%) of children had an unknown identity, of which 3 were from Golestan province and 3 from Mazandaran and 4 from Guilan. The mortality of children under the age of 5 in the total of three provinces during the period from 2013 to 2014by prevalence in age range was respectively: 2-5 years (39.4%), 6-24 months (24.3%), 1-6 months (16.1%), 1-7 days (12.4%) and 7-30 days (7.8%) (Table 7).

Table 7: Frequency of dead children under the age of 5 referred to the forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014, by the age range

Age range	Total of 3 provinces		Golestan province		Mazandaran province		Guilan province	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1-7 days	27	12.4	5	7.6	5	6.3	17	23.6
7-30 days	17	7.8	7	10.6	6	7.5	4	5.6
1-6 months	35	16.1	16	24.2	7	8.8	12	16.7
6-24 months	53	24.3	13	19.7	21	26.3	19	26.4
2-5 years	86	39.4	25	37.9	41	51.3	20	27.8
Total	218	100.0	66	100.0	80	100.0	72	100.0

36 cases (16.5%) of the study population had unknown death cause which 26 (72.2%) were male and 10 (28%) were female (Table 8) and often 25% were at the age range of 1 to 6 months (Table 9).

Table 8: Frequency of death due to unknown cause in children under the age of 5 years referred to the forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014

Province	Gender	
	Female	Male
Golestan	2	8
Mazandaran	6	13

Guilan	2	5
Total of 3 provinces	10	26

Table 9: Frequency of type of death in children under the age of 5 referred to the forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014, by the age range

Type of death	1-7 days		7-30 days		1-6 months		6-24 months		2-5 years	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Toxicity	0	0	0	0	1	2.9	1	1.9	3	3.5
Driving accident	0	0	1	5.9	6	17.1	22	41.5	42	48.8
Stab trauma/slash	0	0	0	0	0	0	1	1.9	1	1.2
Natural	2	7.4	6	35.3	10	28.6	7	13.2	2	2.3
Un known	3	11.1	8	47.1	9	25.7	8	15.1	8	9.3
Burning	0	0	0	0.0	1	2.9	2	3.8	10	11.6
Drowning	0	0	0	0.0	0	0.0	2	3.8	5	5.8
Being shot	0	0	0	0.0	0	0.0	0	0.0	1	1.2
Fallfrom height	0	0	0	0.0	0	0.0	1	1.9	7	8.1
Blunt trauma	3	11.1	0	0.0	0	0.0	0	0.0	2	2.3
Child abuse/neglect	2	7.4	0	0.0	4	11.4	1	1.9	3	3.5
congenital disease	5	18.5	1	5.9	2	5.7	5	9.4	0	0.0
chiping wound/cutting	0	0.0	0	0.0	0	0.0	0	0.0	1	1.2
aspiration	0	0.0	0	0.0	1	2.9	2	3.8	1	1.2
electrocution	0	0.0	0	0.0	0	0.0	1	1.9	0	0.0
CPD	2	7.4	0	0.0	0	0.0	0	0.0	0	0.0
Meconium aspiration	3	11.1	1	5.9	0	0.0	0	0.0	0	0.0
Prematurity	7	25.9	0	0.0	0	0.0	0	0.0	0	0.0
Anaphylaxis	0	0.0	0	0.0	1	2.9	0	0.0	0	0.0
Total	27	100.0	17	100.0	35	100.0	53	100.0	86	100.0

129 cases (59.2%) in the hospital, 61 cases (28%) in outdoor and 27 cases (12.8%) died at home (Table 10).

Table 10: Frequency of dead children under the age of referred to the forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014, by the place of death

Place of death	Total of 3 provinces		Golestan province		Mazandaran province		Guilan province	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Hospital	129	59.2	38	57.6	42	52.5	49	68.1
Outdoor	61	28.0	16	24.2	31	38.8	14	19.4
Home	28	12.8	12	18.2	7	8.8	9	12.5
Total	218	100.0	66	100.0	80	100.0	72	100.0

Sixty-five people (29.8%) in the summer, 53 (24.3%) in the spring and in the autumn and winter of each, 50 people (22.9%) died. In the Golestan province, deaths occurred most often in summer (25 people), in Mazandaran province in the summer of 24 people and in Guilan Province in the spring 20 deaths occurred (Table 11).

Table 11: Frequency of dead children under the age of referred to the forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014, by the season of death

Season of death	Total of 3 provinces		Golestan province		Mazandaran province		Guilan province	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Spring	53	24.3	13	19.7	20	25.0	20	27.8
Summer	65	29.8	25	37.9	24	30.0	16	22.2
Fall	50	22.9	19	28.8	14	17.5	17	23.6
Winter	50	22.9	9	13.6	22	27.5	19	26.4
Total	218	100.0	66	100.0	80	100.0	72	100.0

The death cause of 23 (10.6%) was undetectable and according to the judicial authority, it was stated that 18 (78%) were male and 5 (22%) were female. Of the 23 cases mentioned, 13 (56%)were from Mazandaran, 9 (39%) were from Golestan and 1 was (5%)from Guilan (Table 12). According to tables 13 and 14, there was a significant relationship between the province and the undetectable cause of the death according to the judicial authority. In this way, judges in Mazandaran issued more orders for issuing death certificates without consideration by the forensic medicine, and judges in the province of Guilan issued minimum of the same order.

Table 12: Frequency of the issuance of the burring license and the unknown death certificate, according to the order of the judicial authority for children under the age of 5 years, referred to the forensic medicine offices of the provinces of Golestan, Mazandaran and Golestan in 2013 and 2014, by gender

The status of the issuing of a burring license and the unknown death certificate according to the judicial authority	Gender	Frequency	Percentage
Issued	male	18	8.3
	Female	5	2.3
	Total	23	10.6
Not issued	male	male	51.4
	Female	Female	38.1
	Total	Total	89.4
Total		218	100.0

Table 13: Frequency of the issuance of the burring license and the unknown death certificate, according to the order of the judicial authority for children under the age of 5 years, referred to the forensic medicine offices of the provinces of Golestan, Mazandaran and Guilan in 2013 and 2014

The status of the issuing of a burring	Province	Total of 3

license and the unknown death certificate according to the judicial authority Issued	Golestan	Mazandaran	Guilan	provinces
Issued	9	13	1	23
Not issued	57	67	71	195
Total	66	80	72	218

Table 14: The significant status of the issuance of the burring license and the unknown death certificate, according to the order of the judicial authority for children under the age of 5 years, referred to the forensic medicine offices of the provinces of Golestan, Mazandaran and Guilan in 2013 and 2014

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.823[a]	2	.007
Likelihood Ratio	12.815	2	.002
Linear-by-Linear Association	5.703	1	.017
N of Valid Cases	218		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 6.96.

Trough the examination and autopsy of the dead following driving accidents, face scratches 19.7%, face and head bruises 16.5%, scalp 15.1%, temporal bone fracture 12.8%, each of the body scratches and head and face lesions 11%, 8.3% bruised, 7.8% bone fracture, 6.4% osteoporous bone fracture, 6% frontal bone fracture, each of the bruising and fracture of the ridge 5%, vertebral fracture and intrahepatic hemorrhage 4. 6%, parietal bone fracture 10.1%, intracranial hemorrhage 4.1%, limb lesions 3.7%, nasal bone fracture 3.7%, liver and spleen laceration, and mandible fracture 1.8%, sternum fracture 0.9%, Clavicle fracture 0.5% were reported (Table 15).

Table 15: Frequency of injuries from driving accidents in children under the age of 5 years referred to forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014

Injuries from driving accidents	Frequency	Percentage
head.face.abrasion	43	19.7
limb.abrasion	33	15.1
body.abrasion	24	11.0
bruisis.head.face	36	16.5
bruisis.limb	18	8.3
temporal.fx	28	12.8
mandible.fx	4	1.8
parietal.fx	22	10.1
zigoma.fx	9	4.1
vertebral.fx	10	4.6
intraabdominalhemorrhage	10	4.6
bruisis.body	11	5.0
laceration.limb	8	3.7
frontal.fx	13	6.0
laceration.head.face	24	11.0
limb.fx	17	7.8
nasal.fx	8	3.7
occipital.fx	14	6.4
rib.fx	11	5.0
Intra-thorasichemorrhage	9	4.1
clavicle.fx	1	0.5
sternom.fx	2	0.9
liver.laceration	4	1.8
spleen.laceration	4	1.8

In the dead with unknown cause, no clinical or laboratory finding was found.

In child abuse and neglect, each of head and face scratches, body scalp and bruise, the limb laceration, osteotomy, ostetomonas and frontal bone fractures were found to be 0.5%, each of limb scratches and lacerations, head and face bruises 0.9% and parietal bone fractures found to be 1.4%. (Table 16).

Table 16: Frequency of injuries caused by child abuse and neglect in children under the age of 5 years referred to forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014

Injuries caused by child abuse and neglect	Frequency	Percentage
head.face.abrasion	1	0.5
limb.abrasion	2	0.9
body.abrasion	1	0.5
parietal.fx	3	1.4
bruisis.head.face	2	0.9
bruisis.limb	1	0.5
temporal.fx	1	0.5
laceration.limb	1	0.5
frontal.fx	1	0.5
laceration.head.face	2	0.9
occipital.fx	1	0.5
rib.fx	1	0.5
penetrating.trauma.neck	1	0.5

In the aftermath death followed by fall from the height, body, head and face bruises 2.3%, parietal bone fractures 1.8%, temporal and occipital bone fractures, body scratches and head and face laceration 1.4%, limb bruises 0.9%, head and face and body scratches and limb laceration, hemorrhage of the chest and fractures of the mandible, zygomatic and frontal bones and the limbs and nose each were found to be 0.5% (Table 17).

Table 17: Frequency of injuries caused by fall in children under the age of 5 years referred to forensic medicine offices of Golestan, Mazandaran and Guilan provinces during 2013 and 2014

Injuries caused by fall	Frequency	Percentage
parietal.fx	4	1.8
head.face.abrasion	1	0.5
limb.abrasion	3	1.4
body.abrasion	1	0.5
bruisis.head.face	5	2.3
bruisis.limb	2	0.9
temporal.fx	3	1.4
mandible.fx	1	0.5
zigoma.fx	1	0.5
bruisis.body	5	2.3
laceration.limb	1	0.5
frontal.fx	1	0.5
laceration.head.face	3	1.4

limb.fx	1	0.5
nasal.fx	1	0.5
occipital.fx	3	1.4
intrathorasichemorrhage	1	0.5

Burn was cause of the death of 13 people (6%) of the population, of which 3 were from Golestan province and 7 from Mazandaran and 6 from Guilan. The highest death, 7 cases (54% of total burns), occurred in the range of 30-50%. Five people (38%) died of burns less than 30% (Table 18).

Table 18: Frequency of Children under the age of 5 years referred to forensic medicine offices of Golestan, Mazandaran, and Guilan Provinces during 2013 and 2014, by severity of burn

Range of the burn	Total of 3 provinces		Golestan province		Mazandaran province		Guilan province	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1-10 %	1	.5	1	1.5	0	0	1	1.4
10-20%	2	.9	1	1.5	0	0	0	0
20-30%	2	.9	0	0	2	2.5	0	0
30-50%	7	3.2	1	1.5	4	5.0	2	2.8
50-80%	3	1.4	0	0	1	1.3	2	2.8
80-100%	1	.5	0	0	0		1	1.4
No burn	202	92.7	63	95.5	73	91.3	66	91.7
Total	218	100.0	66	100.0	80	100.0	72	100.0

Discussion and Conclusion

During the period 2013 to 2014, 218 children under the age of five were referred to the forensic medicine halls of the northern provinces of the country (Golestan, Mazandaran, and Guilan), which were often male (59.6%) and male children were 1.47 times more than female children. It was also reported in a similar study by Amani et al., that the ratio of male to female was 1.3 times, as well as the study of Kahani et al in 1999, in which 51.4% were male and 48.6% were female, also it was in agreement with the study by shahraki in 2007 (63% boys and 27% girls), and Tajeddin et al. in 2012 (52% and 48% female).

Most fatalities occurred in the hospital and summer season in 59.2% of cases, which coincided with the study of Entezami et al. Among the three northern provinces of the country, forensic medicine in Guilan province had more venom and pathology samples (20.6% and 25.2%, respectively) than other provinces, which indicates a more sensitive issue for determining the death of children forforensicmedicine system.

The most common way of death in all three provinces was driving accidents (32.6%) that was not unexpected due to the tourist attraction of the three northern provinces of the country and being in the direction of the pilgrimage province of Khorasan Razavi and it was in agreement with the study by Kahani et al. in 1999 and shahraki et al. in 2007, and also the study of Imamura in 2012. Compared to similar studies, other methods of deathin this study were less prevalent. The second most commonly reported death rate was death with unknown cause (16.5%), which is a high prevalence, which was justifiable, regarding that in10.6% of the cases, judges issued on non autopsy and the issuance of just a burring license. According to the findings, judges of Mazandaran province issued the highest order of non-autopsy and issuance of burringl licenses, while no child abuse cases were reported from Mazandaran province during these two years, which in total could indicate a low sensitivity and importance of the issue of the death of children and child abuse for the judiciary and affiliated agencies of that province.

According to the examinations carried out and registered in referral children, no cases of child sexual abuse were reported, which could be due to body corruption, low precision and skill in the examination, and a judicial order to issue a burring license and non-autopsy.

In the discussion of the cause of death, considering that the most common form of death was accidents, the fracture of the skull and intracranial hemorrhages were the most common cause of death, which was consistent with the study of Entezami et al. in 2010. According to the findings of the autopsy, the severity and prevalence of injuries in the accidents were more and more varied than other methods of death, which could indicate an impact of a force with more energy. Fatal burns occurred in 6% of children and often in the range of 30% to 50%, which was consistent with Knight's notation in the Forensic pathology book by Knight on severe disorder of water and electrolyte and its consequences in burns higher than 10% in children. Also, Of the 13 children burned, 12 were burned higher than 10% and only one person died of burn less than 10%.

Suggestions:

1. Conducting the training courses on the rules and principles for the transfer of children by vehicles for families and the public
2. Conducting the training courses for judges and affiliated organizations in order to increase their sensitivity and awareness of the death of children underthe age of 5 especially in the field of child abuse
3. Conducting the training courses for forensicmedicine specialistsfor better autopsy of children under the age of 5 years
4. Making the roads more appropriate and especially routes with higher traffic by the authorities.

References

1. Homairad Enayatollah, Samadi Ali Hossein, Bayizidi Yahya, Hayati Ramin, Comparison of Effective Economic and Social Factors in MENA Countries. Quarterly Journal of Economic Modeling. No. 12. Summer 2013. Pages 135-151.
2. Nouri Abed, Barati Leila, Ghazsfali Farzad, Niazi Sedigheh, Causes of Neonatal Deaths in rural areas of Kalaleh during 2012-2014., Student Research Committee

of Golestan University of Medical Sciences, Autumn and winter 2013. Vol.1, No. 2, Pages 32 to 37.

3. Tajjadini Fatemeh, Dalbarpur Ahmadi Shahnaz, Ehdaie Vand Farnaz, Moghimi Dehkordi Bijan, Turkeman Nejad Sharif, Farsar Ahmad Reza, Epidemiologic Study of Child Mortality in the Population Covered by Shahid Beheshti University of Medical Sciences in 2012, Nursing and Midwifery Clinical Journal, Spring 2014, Vol. 3, No 1, Pages 62-71.
4. Hosseini Khaboshan Zahra, Pour Adineh Maryam, Seraj Akbari Nasim, a survey on the pattern and causes of mortality in children under 5 years old in rural area of North Khorasan Province during the years of 2004-8.
5. Zamani Kiasari Aaliyeh, Kabirzadeh Azar, Mohseni Saravi Beniamin, Rezazadeh Esmaeel, Khademloo Mohammad, Biazar Tahmineh, Study on the causes of perinatal period mortality in Imam Hospital of Sari (2006) Iranian Journal of Obstetrics and Gynecology, Summer 2009 Vol. 12. Number 2 Page 23 to 30.
6. Nakhin Kobab, Sharifzadeh Gholamreza, Study of mortality in children under one-year-old and its related factors in Birjand. Journal of Isfahan University of Medical Sciences. Tehran, Iran, 2009. Vol 27. No. 95. Pages 275 to 282.
7. Amani Firouzeh, Barak Manouchehr, Amini Sani Nayereh, Dehghan Mohammad Hossein, Factors related to Neonatal mortality in hospitals affiliated to Ardebil University of Medical Sciences. 2012-2013. Journal of Ardabil University of Medical Sciences Vol 5, Issue 4, Winter 2005, pp. 305-310.
8. Fallahi Minoo, Jodaki Nasim, Mohseni Bandpei Hakmeieh, Causes of Infant Mortality Admitted to Shohada-e-Tajrish Hospital from 2004 to 2007. Journal of Shaheed Beheshti University of Medical Sciences. April and May of 2009. Vol. 14., serial 67, No. 1, Pages 43 to 47.
9. Mahfouzi Ali, Kahani Alireza, Abolmasoomi Zahra, Masihi Farzaneh, Prevalence of causes of mortality due to accidents in children under 12 years of age referred to the forensic medicine of Tehran province during the period from 1996 to 1998, Scientific Journal of Forensic Medicine, Fall 2001. No. 7. Pages 5 to 14.
10. Shahraki Vahed Aziz, Mardani Hamouleh Marjan, Arab Maryam, Firooz-Kuhi Zohreh, Causes of Mortality of 1-59 month-old children in Zabol, Journal of Nursing Research. Summer 2010. Vol. 5. No.17. Pages 6 to 13.
11. Arifeen sh, Akhter, T, Rahman H, Rahman K, Chowdhnry E, Alan n, Haqued Baqni A. Causes of Death in children under five years of age. 125-133.
12. Imamura J, Trosher E, olive ira C. what types of unintentional injaries Kill our children? CLINICs journal. 2012: 67(9): 1101-1116.
13. etard J, Hesram J, Diallo A, Diallo J, Ndiaye J, Delauay V. childhood mortality and probable causes of death using verbal autopsy in Niakhar. International Journal of epidem lolgy. 2004. 10.193/lie/561-259.
14. Johnson H, Lin L, ficher- walker C, black R. Estimating the distribution of causes of death among children age 1-59 months in high- mortality countries with in complete death certification. 10.1093.ije dyg.
15. Wolf I, Macfarlane A, Donkin A, Marmot M, viner R. why children die A report in British Association Public Health 2010.
16. Bradshaw D, Bourne D, nannan N. what are the leading causes of death among south African children. MRC Policy Brief. 2003. No.3
17. Bryce.J, Bosch- pinto C, Black R, WHO child Health Epidemiolagy Refrence group. WHO estimates of the causes of death in children. 2005. No. 365. 1147-115
18. Taravat Manesh S., Hashemi Nazari S., Ghadirzadeh M. Epidemiological study of driving accidentsresulted in death in Sistan and Baluchestan province in 2012. Journal of safety improvement and injuries prevention. 2015; 3 (3): 168-161.
19. Lentezami N., Hashemi-Nazari S., Suri H., Epidemiologic pattern of fatal driving accidents in the northern provinces of Iran in 2010. Journal of safety improvement and injuries prevention. 2015. 3 (1): 1-8.
20. Sauko P,Knight B.Knight's Forensic Pathology .USA.CRC press.2016.P:312-313.