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PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.809416>Available online at: <http://www.iajps.com>**Research Article****INVESTIGATING THE CAUSES OF INFANT MORTALITY IN
IMAM-KHOMEINI AND MUSTAFA-KHOMEINI HOSPITALS,
ILAM, 2012 TO 2016****Jasem Mohamadi¹, Mojtaba Darabi², Mohamad Reza Havasian^{3*}**

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Abstract:

Neonatal mortality is defined for death of infants under age of 4 weeks. It is considered as an important indicator for developing in a country. Despite many efforts that were done in the last years, unfortunately there is high rate of mortality in new born infants; the aim of this study investigated the causes of the mortality of infants hospitalized in NICU of Imam-Khomeini and Mustafa-Khomeini hospitals of Ilam from 2012 to 2016. The present research is a cross-sectional study, the statistical population of which includes all deceased infants who were hospitalized in NICU of Imam Khomeini and Mustafa Khomeini hospitals of Ilam from 2012 to 2016. The information related to gender, gestational age, age at birth, birth weight, mode of delivery, Apgar scores in the first and fifth minutes, history of breast disease of the mother, and cause of death were recorded and the collected data was analyzed using SPSS, version 20 and statistical tests of chi-square and T-test. Based on the findings of the analysis, the most common causes of mortality among infants were respiratory distress syndrome (60.3%), asphyxia (9.3%), congenital cardiovascular diseases (7%), sepsis (6.7%), Intracerebral hemorrhage (3.7%), and Disseminated intravascular coagulation (2.7%). There, also, turned out to be a significant relationship between being stillborn, birth weight of the stillborn infant, gestational age, 1st and 5th minutes Agar rate, and the cause of death. Considering the high incidence of infant mortality at gestational age of less than 37 weeks, implementing stricter caregiving in order to prevent Preterm labor, as the most important cause of infant mortality, is of particular importance in reducing infant mortality.

Key Words: Neonatal Mortality, NICU, Ilam, Iran.**Corresponding author:****Mohamad Reza Havasian,**

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INTRODUCTION

According to NCHS definition, perinatal period covers the time range between 28 weeks' gestation up to 7 days after birth; other definitions have presented varying periods for this time, ranging from 20 weeks' gestation up to 7 days after birth or 20 weeks' gestation up to 28 days after birth [1]. IUID is the main cause of, at least, half of perinatal deaths; 75% of these infants are stillborn and 50% of them are born before 28th week of gestational age [2]. There occur 8 million prenatal deaths each year, 98% of which happen in developing and less developed countries [3]; this figure is, in particular, high in Africa [4-5]. Generally speaking, infant mortality, which is considered as one of the main factors of progress and advancement, refers to the death of the infant in the first 4 weeks after birth [6]. Despite numerous research and attempts conducted to reduce infant mortality, this rate is, unfortunately, still high; i.e. 65% [7-9]. More than 9 million children die each year, 98% of which occur in third world countries and about 6 million of this rate is related to infancy [7]. In Iran, about 20,000 children die before they reach one month of age; the most common cases of these deaths are infection, premature birth, low birth weight, and birth Asphyxia [10]. In fact, 13 out of 1000 births result in death in Iran; this rate is 5 out of 1000 in Qatar and 6 out of 1000 births in Kuwait [11]. Generally speaking, more than half of infant mortality occurs due to low weight, prematurity (birth before 37 weeks), Asphyxia, respiratory problems, congenital abnormalities, and sepsis [12]. Birth weight of less than 2500 gram and gestational age of less than 33 weeks are, also, important factors affecting the rate of mortality among infants [13]. Other important factors which might play role in determining the rate of infant mortality include Sepsis of the mother during pregnancy, younger than 16 and older than 35 years old mothers, mother's addiction to drug, socio-economic poverty, psychological and physical stress during pregnancy, multiple pregnancy, caesarean section, using Forceps, maternal chronic diseases such as diabetes, heart problems, and Rheumatologic, improper care during pregnancy, birth before 37 weeks and after 42 weeks, swallowing Meconium, Asphyxia at birth, paleness and anemia at birth, umbilical cord tied around the neck of an infant, neonatal respiratory distress, less than 4 Apgar rate in the first minute after birth, abortion, death records and intrauterine growth retardation in previous pregnancies [7, 8 and 9]. Based on death registration system events, the most common causes of death in infants are being stillborn, low birth weight diseases and conditions, congenital abnormalities and, infections in Iran [14]. In fact, infant mortality is an important indicator of

the health index affecting the rate of infant deaths and deaths of children under 5 years old directly [15, 16]. Despite various research and attempts, including the use of effective interventions such as immunization and oral rehydration which were expected to drop mortality rate, there has been little success in decreasing the rate of mortality in infants aged less than 5 years [17]. Thus, the present study is conducted in order to examine the causes of the mortality of patients hospitalized in NICU of Imam Khomeini and Mustafa Khomeini hospitals of Ilam from 2012 to 2016.

MATERIALS AND METHODS:

The present research is a cross-sectional study, the statistical population of which includes all deceased infants who were hospitalized in NICU of Imam Khomeini and Mustafa Khomeini hospitals of Ilam from 2012 to 2016. Required information related to maternal age, maternal disease during pregnancy, gestational age, birth weight, place of delivery, mode of delivery, Apgar score first and fifth minutes, and causes of infant mortality, which mainly included gastrointestinal, hematologic, metabolic, cardiovascular, and brain causes, and the sex of the child was recorded in the file of the patient child. Death was divided in three categories in the present study: death before 24 hours after birth, death between 2 to 7 days after birth, and death between 8 to 28 days after birth. Infants who were born dead were excluded from the study. According to the definitions of the present study, stillborn infants were those who were born prior to 37 week's gestational age and weighed less than 2500 grams; the collected data was analyzed using SPSS, version 20 and statistical tests of chi-square and T-test [18].

FINDINGS:

Based on the findings of the present study, 300 infants out of 2800 hospitalized ones, 10.71%, died, 53% of whom were boy and 47% of whom were girl; 37.9% of the infants were born with natural childbirth and 60.3% were born with caesarean and 53.7% of infants weighed less than 1500 grams at the time of birth. 50% of infants lived for 2 to 7 days; the pregnancy age of 64.3% of mothers was 20 to 33 weeks; 80.7% of mothers were 20 to 35 years old and 80.3% of them lived in the city (Table 1). The most and the least common causes of infant mortality were respiratory distress syndrome and disseminated intravascular coagulation in order. 79.3% of infants were stillborn and 20.7% were born in due time. 74% of mothers of deceased infants were completely healthy and pre-eclampsia was the most common disease, 13%, among mothers (Table 2). Mothers of 81.2% of infants who dies because of respiratory

distress syndrome aged between 20 to 35 years; mothers of 28.6% of infants who dies because of congenital cardiovascular diseases aged more than 35 years; 89.3% of mothers of those whose mortality cause was asphyxia aged between 20 to 35 years, 80% of those dies because of sepsis aged between 20 to 35 years, and 81.8% mothers of infants dies because of Cerebral hemorrhage aged between 20 to 35 years ($P>0.44$)(Table 3). Also, 75.7% respiratory distress syndrom, 50% of mothers of infants who died because of respiratory distress syndrome, 57.1% mothers of infants who died because of Disseminated

intravascular coagulation, 60% mothers of infants who died because of asphyxia, 60% mothers of infants who died because of sepsis, 47.6% mothers of infants who died because of congenital cardiovascular complications, and 72.7% mothers of infants who died because of cerebral hemorrhage were at the pregnancy age of 20-33, 37-42, and 20-33 weeks ($P<0.001$). There was no significant relationship between birth weight and gestational age of deceases infants. The highest mean of Apgar rate was 5.41 in the first minute and 6.56 in the fifth minute ($P<0.008$)(Table 4).

Table 1: Frequency distribution of deceased infants in terms of demographic variables

| Variable | | Frequency | Percent |
|------------------|---------------|-----------|---------|
| Gender | Boy | 159 | 53 |
| | Girl | 141 | 47 |
| Mode of delivery | NVD | 119 | 39.7 |
| | C/S | 181 | 60.3 |
| Birth weight | <1500 | 161 | 53.7 |
| | 1500-2500 | 59 | 19.7 |
| | >2500 | 80 | 26.7 |
| Age at Birth | < 24hours | 71 | 23.7 |
| | 2-7 days | 150 | 50 |
| | 7-28days | 79 | 26.3 |
| Gestational Age | 20-33weeks | 193 | 64.3 |
| | 34-36weeks | 33 | 11 |
| | 37-42weeks | 74 | 24.7 |
| Age of Mother | <20 | 16 | 5.3 |
| | 20-35 | 242 | 80.7 |
| | >35 | 42 | 14 |
| Mother Education | Under Diploma | 112 | 37.3 |
| | Diploma | 119 | 39.7 |
| | Diploma above | 69 | 23 |
| Location | Urban | 241 | 80.3 |
| | Rural | 59 | 19.7 |

Table 2: Frequency distribution deceased infants in terms of history of mother's diseases

| Health Mother | Frequency | Percent |
|------------------------------------|------------|------------|
| Healthy | 222 | 74 |
| History of Oligohydramnios | 3 | 1 |
| Pre-eclampsia | 39 | 13 |
| Family Marriage | 6 | 2 |
| Premature in previous delivery | 1 | 0.3 |
| Devilman | 5 | 1.7 |
| Placenta Previa | 1 | 0.3 |
| PROM | 5 | 1.7 |
| Hypothyroidism | 5 | 1.7 |
| Thrombocytopenia | 1 | 0.3 |
| Encephalopathy | 1 | 0.3 |
| Splenomegaly + Anemia | 1 | 0.3 |
| Mother Died | 2 | 0.7 |
| History of Previous Neonatal Ictus | 1 | 0.3 |
| Polyhydramnius | 5 | 1.7 |
| Mother Heart Disease | 1 | 0.3 |
| Total | 300 | 100 |

Table 3: The Relationship between the Age of the Mother and Mortality Causes.

| Cause of Death | Age of mother (Year) | | | | | | | |
|--|----------------------|------------|------------|-------------|-----------|-----------|------------|------------|
| | 20< | | 20-35 | | 35> | | Total | |
| | Frequency | Percent | Frequency | Percent | Frequency | Percent | Frequency | Percent |
| Respiratory Distress Syndrome | 8 | 4.4 | 147 | 81.2 | 26 | 14.4 | 181 | 100 |
| Congenital Heart Disease | 3 | 14.3 | 12 | 57.1 | 6 | 28.6 | 21 | 100 |
| Disseminated Intravascular coagulation | 0 | 0 | 7 | 87.5 | 1 | 12.5 | 8 | 100 |
| Asphyxia | 2 | 7.1 | 25 | 89.3 | 1 | 3.6 | 28 | 100 |
| Sepsis | 12 | 5 | 16 | 80 | 3 | 15 | 20 | 100 |
| Intracerebral Hemorrhage | 1 | 9.1 | 9 | 81.8 | 1 | 9.1 | 11 | 100 |
| Other | 1 | 3.2 | 26 | 83.9 | 4 | 12.9 | 31 | 100 |
| Total | 16 | 5.3 | 242 | 80.7 | 42 | 14 | 300 | 100 |

Table 4: The relationship between 1st and 5th minutes Apgar and the cause of the death of the infant.

| Apgar | Cause of Death | Frequency | Mean | Standard Deviation | P |
|--------------|--|-----------|------|--------------------|-------|
| First Minute | Respiratory Distress Syndrome | 181 | 5.41 | 1.83 | 0.008 |
| | Congenital Heart Disease | 21 | 5.28 | 1.70 | |
| | Disseminated Intravascular Coagulation | 8 | 5.12 | 1.95 | |
| | Asphyxia | 28 | 4 | 1.83 | |
| | Sepsis | 20 | 4.6 | 1.84 | |
| | Cerebral Hemorrhage | 11 | 5.09 | 1.57 | |
| | Other | 31 | 5.64 | 1.85 | |
| Fifth Minute | Respiratory Distress Syndrome | 181 | 6.65 | 1.62 | 0.031 |
| | Congenital Heart Disease | 21 | 6.42 | 1.5 | |
| | Disseminated Intravascular Coagulation | 8 | 6.37 | 2.13 | |
| | Asphyxia | 28 | 5.6 | 1.83 | |
| | Cerebral Hemorrhage | 11 | 6.45 | 1.21 | |
| | Sepsis | 20 | 5.95 | 1.7 | |
| | Other | 31 | 6.9 | 1.59 | |

DISCUSSION:

The rate of infant mortality, which includes the death of all infants who die up to 28 days after their birth, is one of the basic indicators in the assessment of public health, measured out of each one thousand births [19]. Identifying the cause of death is undoubtedly the first step in reducing mortality and improving public health indicator [20]. The present study, which was conducted on 2800 infants, 300 of whom (10.71%) dies, investigated the causes of the mortality of infants hospitalized in NICU of Imam Khomeini and Mustafa Khomeini hospitals of Ilam from 2012 to 2016. The mortality rate of the present study turned out to be less than that of Hemmati et al study which as conducted in Kermanshah in 2001 [21]; according to this study, the mortality rate was 34.6%; this difference might be traced back to differences in statistical population of two researches. However, according to Lekontseva et al, 2010, the mortality rate turned out to be 4% in Canada [22], with this difference indicating considerable difference between developed and developing countries in terms of hygiene, economy, culture, and public health. Out of 300 infants who died during the present study, 71 subjects died during the first 24 hours after birth, 150 subjects from the second to the seventh day after birth, and 79 subjects dies after 8 days after birth. According to study of Mohagheghi et al 2012, 64% of deaths occurred in the first 24 hours after birth, 27% from the second to the seventh day, and 9% after the first week in Tehran [23]; this was not consistent with the results of the present study and the reason of such inconsistency might be the absence of NICU in Gynecology and Obstetrics

section and sending the infant patients to other centers. According to study of Sareshtedari et al, 2010, 28% of deaths occurred in the first 24 hours, 40% from the second to the seventh day, and 32% from the eighth to the twenty eighth day after birth in Qazvin [24], which was almost consistent with the present study. 53.7% of deceased infants weighed less than 1500 grams, 19.7% weighed between 1500 to 2500 grams, and 26.7% weighed more than 2500 grams. 79.3% of infants were stillborn in the present study, which is consistent with the findings of a study conducted in Ahvaz in 2011 probably due to the high incidence of premature births in the centers [25]. The results study of Baqui et al, 2006 in India showed that 50% of deaths occur during the first three days after birth and 71% occur in the first week [26]. The most and least common causes for infant mortality, according to this study, were respiratory distress and disseminated intravascular coagulation in order, which was consistent with the findings of majority of studies [27]. 64.1% of infants with respiratory distress weighed less than 1500 grams; 52.4% of infants with congenital cardiovascular complications weighed less than 2500 grams; 50% of babies suffering from disseminated intravascular coagulation weighed between 1500 to 2000 grams; 57.1% of infants with asphyxia and 55% with sepsis weighed less than 1500 grams; this is consistent with the findings study of Magh-Mungeh et al, 2014 conducted in Cameron [28]. 53.7% of babies weighing 1500 grams and 23.7% who weighed between 1500 to 2500 grams died at early hours after birth due to low birth weight; this was, also, consistent with the findings of other studies who had

introduced low birth weight as the most common cause of infant mortality among stillborn babies [29, 30]. The highest Apgar rate was 5.41 in the first and 6.65 in the fifth minute after birth, which is also consistent with the findings of other studies [31].

CONCLUSION:

Based on the results of the present study, the most common causes of infant mortality are respiratory distress syndrome, asphyxia, congenital heart disease, sepsis, intracranial hemorrhage, disseminated intravascular coagulation. Considering the high incidence of infant mortality at gestational age of under 37 weeks, implementing more strict caregiving in order to prevent Preterm labor, as the most important cause of infant mortality, is of particular importance in reducing infant mortality.

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