ORIGINAL ARTICLE

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An Evaluation of the Infant Mortality Rate in 2014 and 2015 in Northeastern Anatolia

ABSTRACT

Objective: Infant mortality rates are one of the principal parameters reflecting countries' general and mother-baby health levels. Evaluating and lowering these rates is therefore highly important. This descriptive study examined the infant mortality rate in 2014-2015, its causes and the factors affecting it, and assessed preventable causes of infant death.

Methods: Our work was carried out in Erzurum, a province of northeast Anatolia. Erzurum Public Health Directorate Infant Mortality Commission reports and Provincial Infant Mortality Investigation Committee study forms concerning infant deaths were examined retrospectively. Causes listed in the Perinatal and Infant Mortality Information Form prepared by the Ministry of Health were used to classify causes of infant death as underlying, intermediate or immediate.

Results: The infant mortality rate in the province of Erzurum increased from 9.4 infant deaths per 1,000 live births in 2015 to 10.0 in 2015. Additionally, 27.3% of infant deaths in 2014 and 34.0% in 2015 occurred in the early neonatal period. The most common underlying cause of death was congenital anomaly in 2014 and sepsis in 2015. The most common intermediate cause of death in both years was prematurity.

Conclusions: Approximately 50% of mothers of deceased infants received insufficient prenatal care sessions, and infant mortalities largely derive from congenital anomaly, sepsis and prematurity.

Keywords: Cause of Mortality, Prematurity, Turkey, Erzurum, Public Health.

Kuzeydoğu Anadolu'da 2014 ve 2015 Yıllarında Bebek Ölüm Hızının Değerlendirilmesi

ÖZET

Amaç: Bebek ölüm hızları ülkelerin genel sağlık ve anne-bebek sağlık düzeyini yansıtan en önemli parametrelerden birisidir. Bu nedenle bebek ölüm hızlarının değerlendirilmesi ve azaltılması toplumlar için oldukça önemlidir. Tanımlayıcı nitelikteki çalışmamızın amacı 2014-2015 yıllarında meydana gelen bebek ölüm hızı, nedenleri ve bunları etkileyen faktörlerin incelenmesi, önlenebilir bebek ölüm nedenlerinin değerlendirilmesidir.

Gereç ve Yöntem: Erzurum Halk Sağlığı Müdürlüğü'nün bebek ölümleri ile ilgili İl Bebek Ölüm Komisyon Raporları ve İl Bebek Ölümlerini İnceleme Kurulu Çalışma Formları retrospektif olarak incelenmiştir. Bebek ölümleri temel, ara ve son ölüm nedenlerine göre gruplandırılmasında Sağlık Bakanlığı tarafından düzenlenmiş olan Perinatal ve Bebek Ölümleri Bilgi Formu'ndaki nedenler kullanılmıştır

Bulgular: Erzurum İli'nde 2014 yılı bebek ölüm hızı binde 9.4, 2015 yılında binde 10.3 dur. 2014 yılında ölen bebeklerin %27.3'ü, 2015 yılında ise %34.0'ı erken neonatal dönemdedir. 2014 yılında en sık temel ölüm nedeni konjenital anomali iken 2015 yılında sepsistir. Her iki yılda da en sık ölüme götüren ara neden prematüritedir.

Sonuç: Ölen bebeklerin annelerinin yaklaşık %50.0'sinin yeterli sayıda doğum öncesi bakım hizmeti almadığı, bebek ölümlerinin konjenital anomali, sepsis ve prematürite nedenli olduğu ortaya konulmuştur.

Anahtar Kelimeler: Bebek Ölüm Nedenleri, Prematürite, Türkiye, Erzurum, Halk Sağlığı

INTRODUCTION

Health criteria are used to define a community's level of health, to determine relations with various associated factors and changes occurring over time and to compare communities with one another. The determination of these criteria is necessary for the planning of health services. Mortality criteria occupy an important place among these. Infant mortality rates are regarded as markers of development revealing the status of health services provided in a country.

Infant mortality rates, one of the most important indicators of the general health of the community and mother-baby health levels, express the number of live births per thousand that fail to survive to the age of one year (1). The reduction of infant and child mortality is a priority target in order for countries to achieve the United Nations Millennium Development Goals (2).

Neonatal infant deaths are those occurring in the first 28 days after birth, those occurring in 0-7 days being defined as early neonatal and those in days 7-28 as late neonatal. The most common causes of death in the neonatal period are congenital malformations, infections, perinatal asphyxia and metabolic diseases (3).

Perinatal deaths include those occurring after the 28th week of pregnancy or in the first week after birth. The most common causes of death in this period are abortus, abandonment and cases of suspected infanticide (4).

Prenatal care (PNC) is particularly important in terms of mothers having a healthy pregnancy and healthier babies. Mothers receiving no PNC during pregnancy are reported to give birth to more low birth weight (LBW) babies, and babies have a higher risk of mortality in the perinatal period (5, 6).

The World Health Organization (WHO) initiated a Safe Motherhood Initiative in 1987 aimed at reducing maternal infant deaths in 2000 (7). Provincial commissions were established in Turkey, and infant deaths began being researched under the 'Monitoring Child Mortality Project' published in 2009. With the programs implemented by Turkey since those years, infant mortality and death rates under the age of six years have decreased significantly (8). In a report by UNICEF aimed at determining the scale and nature of problems concerning the neonatal period and at producing solutions to them, Turkey is described as one of the countries achieving the Millennium Development Goals ahead of time and even surpassing them. The same report also describes Turkey as the country achieving the second-highest decrease in mortality under the age of six from among all members of the OECD (9).

The purpose of this study was to examine the infant mortality rate in the province of Erzurum in 2014-2015 and associated factors, and to evaluate the causes of preventable infant death.

MATERIAL AND METHODS

Our work was carried out in Erzurum, a province of northeast Anatolia. This descriptive study retrospectively evaluated Erzurum Public Health Directorate infantile mortality records. One hundred forty-three infant deaths occurred in 2014 and 157 in 2015, and the Provincial Infant Mortality Commission reports and Provincial Infant Mortality Investigation Committee Study reports for these were examined. Descriptive data for mothers and babies, such as babies' birth time, number of days lived, birth weight, time of death, place of death and cause of death and mother's age, type of delivery, gestation week and receipt of prenatal care were evaluated. Causes in the Perinatal and Infant Mortality Information Form lists prepared by the Ministry of Health were used to classify causes of infant death as underlying, intermediate or immediate. Statistical analysis of data was performed on SPSS 20.0 software. Descriptive data were expressed as number and percentage distributions and mean±standard deviation. Analysis was performed using the chi-square test, and p values <0.05 were regarded as statistically significant.

RESULTS

The number of live births in the province of Erzurum was 15,832 in 2014 and 15,173 in 2015. One hundred fifty infant deaths occurred in 2014 and 153 in 2015. The infant mortality rate in the province of Erzurum increased from 9.4 infant deaths per 1,000 live births in 2015 to 10.0 in 2015.

In terms of location, 39.3% of deaths occurred in the central districts of Erzurum and 25.7% in the southern districts of Hınıs, Tekman, Karayazı and Karaçoban. No difference was determined between the study years in terms of infant mortality by location ($p=0.56$), with decreases of 1.75% and 22.8% being observed in the center and southern districts, and a 10.7% decrease in other districts.

Mean ages of mothers were 28.6±6.4 in 2014 and 28.3±6.2 in 2015, and the percentages of mothers receiving four or more sessions of PNC were 49.3% and 49.7%, in 2014 and 2015, respectively. In terms of delivery, 68.3% of babies dying in 2014 and 52.3% of those in 2015 were born vaginal.

In addition, 32.0% of babies dying in 2014 and 44.1% of those in 2015 were evaluated as premature, and a statistically significant difference was observed in terms of distribution of infant mortalities by gestation week ($p=0.031$). A 39.5% increase was determined in infant mortality in 2015 compared to 2014. Moreover, 30.7% of infants dying in 2014 and 34.6% of those dying in 2015 were LBW (<2500 g). Analysis revealed that 27.3%

of infant deaths in 2014 occurred in the early neonatal period (0-7 days), 16.7% in the late neonatal period (8-28 days), and 56.0% in the postneonatal (29-365 days) period. The comparable figures for 2015 were 34.0%, 11.8% and 54.2%. Thirty percent of infant deaths occurred in the home in 2014 and 26.8% in 2015 (Table 1).

Table 1. Distribution of infant deaths in 2014 and 2015

	2014		2015		
	n	%	n	%	Significance
Mother's age (years)					
<20	11	7.3	12	7.9	
20-29	69	46.0	79	52.3	p=0.610
30-39	65	43.3	54	35.8	x^2=1.824
>40	5	3.3	6	4.0	
Prenatal care (PNC)					
Less than 4 sessions	76	50.7	77	50.3	p=0.953
4 or more	74	49.3	76	49.7	x^2=0.003
Age at death					
0-7 days	41	27.3	52	34.0	p=0.299
8-28 days	25	16.7	18	11.8	x^2=2.417
29-365 days	84	56.0	83	54.2	
Gestastional age					
Premature	48	32.0	67	44.1	p=0.031
Mature	102	68.0	85	55.9	x^2=4.672
Postmatur	0	0.0	0	0.0	
Birth weight (g)					
Less than 1500 g (vlbw)	18	28.1	27	33.8	p=0.469
Less than 2500 g (lbw)	46	71.9	53	66.3	x^2=0.524
Way of birth					
Vaginal	95	68.3	80	52.3	p=0.005
Cesarean	44	31.7	73	47.7	x^2=7.820

In terms of underlying causes of death, congenital anomaly was observed in 16.7% (n=25) of cases in 2015 and sepsis in 5.3% (n=8). The comparable figures for 2015 were 9.2% (n=14) and 26.1% (n=40), respectively (Table 2). The difference between 2014 and 2015 in deaths of sepsis origin was statistically significant (p<0.001). No significant difference was determined in terms of mortality deriving from congenital anomaly (p=0.051), although a 44% decrease was observed in 2015. The most common intermediate cause of death was prematurity, at 20.3% in 2014 (n=31) and 12.7% in 2015 (n=19). The most common immediate cause of death was sepsis, at 21.3% in 2014 (n=32) and 15.0% in 2015 (n=23).

The committee assessed 23.3% of infant deaths in 20154 and 19.0% in 2015 as preventable. A 17.1% decrease in preventable infant deaths occurred in 2015.

DISCUSSION

Countries' demographic, environmental and socioeconomic characteristics directly affect the extent of access to health and social services and a country's mortality criteria. Several studies have shown that these factors affect the infant mortality rate (10-12). Although the live birth rate of 15,832 in our province in 2014 decreased by 4.1% to 15,173 in 2015, the infant mortality rate was 9.4‰ in 2014 and 10.0 per thousand in 2015. One study from the province of Erzurum in 2009 reported an infant mortality rate of 14.4 per thousand (13). According to UNICEF's State of the World's Children 2014 report, the infant mortality rate in Turkey in 2012 was 12.0 per thousand, while the figure according to Turkish Demographic and Health Survey (TDHS) 2013 data was 13.0 per thousand (1, 14). According to Turkish Statistical Institute reports, the infant mortality rate was 11.1 per thousand in 2014 and 10.7 per thousand in 2015 (15, 16). With the improvement of protective health services in Turkey, the infant mortality rate is declining compared to previous years, but is still not at the desired level compared with developed countries. The 22.8% increase in infant mortality in our southern districts in 2015 may be due to low socioeconomic level (17, 18), harsh winter conditions and delays in accessing services because of transport difficulties.

Table 2. Distribution of main causes of death in 2014 and 2015

	2014		2015	
	n	%	n	%
Main cause of death				
Congenital anomalies	25	16.7	14	9.2
Judicial event	17	11.3	13	8.5
Metabolic disease	12	8.0	3	2.0
Congenital heart disease	11	7.3	9	5.9
Perinatal asphyxia	11	7.3	7	4.6
Sepsis	8	5.3	40	26.1
Lower respiratory tract infection	6	4.0	12	7.8
Sudden infant death syndrome (SIDS)	6	4.0	4	2.6
Aspiration	5	3.3	1	0.7
Other	49	32.7	50	32.7

The TDHS 2013 report cites a figure of 17.7% for women aged 15-49 in the Northeast Anatolia Region, to which our province belongs, educated to high school level or above. There is generally an inverse correlation between maternal education levels and infant mortality rates. As the mother's level of education rises, her knowledge and awareness of infant nutrition, family planning and pre- and postnatal care also increase, and this results in a decrease in infant mortality. Variation in terms of infant mortality rates between urban and rural areas was also revealed in one multicenter study (19).

Forty-four percent of infant deaths in our province in 2014 and 45.8% in 2015 occurred in the neonatal period. According to WHO data, approximately 45.0% of deaths under the age of five every year take place in the neonatal period (20).

The early neonatal mortality rate in our study was 27.3% in 2014 and 34.0% in 2015. According to studies from Turkey performed in previous years, neonatal deaths represent 38-58% of infant mortalities (21-23). According to the WHO, 25.0-45.0% of all neonatal deaths occur in the first 24 h of life, and 75% in the first week (20). Our results are compatible with those of the previous literature and show that the position has not altered over time.

In our research, 49.3% of mothers in 2014 and 49.7% in 2015 received four or more sessions of PNC. The Ministry of Health has made it obligatory for all women to receive at least four sessions of PNC from family physicians and family health workers during pregnancy. According to TDHS 2013 findings, 89.0% of women received four or more sessions of PNC. The level of women aged 15-49 reporting receiving PNC in the Northeast Anatolia Region, to which our province belongs, is 85.4% (1). Pre- and postnatal access to and use of health services are of great importance in preventing infant and child mortality. Many risks can be brought under control through simple precautions. For that purpose, in 2008 the Turkish Ministry of Health initiated a Guest Mother Project to enable women approaching labor in high-risk areas lacking appropriate conditions to give birth in hospital. Hospital births are thus facilitated, and mothers are also given instruction concerning breastfeeding, personal hygiene and postnatal mother and baby care. Significant advances have been made in improving services for pregnant women, although they are still not at the desired level.

In this study, 29.3% of babies in 2014 and 47.7% in 2015 were born by cesarean delivery. According to TDHS 2013 data, 48.0% of all births in the previous five years were by cesarean delivery (1). One study performed in Hatay in 2014 and 2015 reported that 54.8% of still births and 54.4% of live births were by cesarean delivery (24). One international study revealed that infantile deaths are more common when cesarean levels are high (25). This may be due to cesarean delivery being more commonly employed in risky pregnancies.

An increase has been observed in numbers of premature babies among infant deaths, and a higher incidence of prematurity has been observed as an intermediate cause of death. This is compatible with the results of a study performed in our province in 2009 (13). The most common underlying cause of death was congenital anomaly in 2014 and sepsis in 2015. Studies performed in Aydın in 2004 and Denizli in 2009 similarly showed that infant mortality most commonly derived from premature births and congenital anomalies (21, 23). One eight-center study using the Network for Women's and Children's Health Research determined that prematurity and asphyxia were the most common causes of death in the first day of life, while infection was most common in subsequent days (26). Various international studies have also noted infant deaths due to prematurity and congenital anomaly (27-29). Levels of 11.3% have been determined for adolescent and advanced age pregnancies in our province. This may have laid the foundation for premature births. According to the Turkish Statistical Institute 2017 report, the

level of individuals reporting consanguinity with their spouses is 23.2%, and the level is reported to be higher in the region to which our own province belongs (30).

In terms of locations of deaths, a mean 28.3% of mortalities over the two study years occurred in the home. One study from Kayseri in 2006 reported that 9.8% of infant deaths occurred in the home, while a study from Aydın in 2007 determined a figure of 27.3% (22, 31). The high level of home deaths, despite increased access to and use of health institutions in recent years, is striking. In terms of preventability, 62.0% of deaths in 2014 and 68.0% in 2015 were assessed as preventable by the Provincial Infant Mortality Investigation Committee. Although the high level of home deaths derived from an increase in preventable infant mortality rates, it may still be concluded that there are deficiencies in terms of early diagnosis and transportation to health institutions in the event of emergencies.

In conclusion, the rate of infant mortality has increased in our province and approximately half of the mothers whose babies died did not receive sufficient PNC. This reveals the need for sufficient and better quality PNC to be provided within the scope of primary services for the early identification and treatment of complications that may occur in gravidas for the prevention of infant mortality.

Family physicians making home visits to see the family environment, determine deficiencies and provide information will assist with the identification of causes and the elimination of underlying factors, particularly in districts with higher infant mortality rates.

Increasing the numbers and quality of neonatal units will help reduce deaths deriving from immaturity. Due to the importance of the care of premature babies after discharge, education needs to be provided for families on this subject.

In order to prevent consanguineous marriages in the context of reducing congenital anomaly-associated deaths, social education must be supported and health literacy awareness must be improved, after which the importance of physical examination and screenings for early diagnosis must be emphasized.

Gravida monitoring, baby and child monitoring, births taking place in hospital, NRP seminars, neonatal screening programs, breastfeeding support, inoculation and vitamin D and iron support all occupy an important place in reducing infant mortality. We think that such medical support programs for high-risk mothers and newborns can be effective in reducing infant mortality.

Our study was performed using data from the Erzurum provincial Public Health Directorate. Families experiencing infant deaths were not contacted. Data such as numbers of pregnancies and miscarriages, time elapsing between two births, and the family's education and income levels being unavailable for that reasons represents a limitation of this study, but it will nevertheless serve as a guide for subsequent research.

Conflict of Interest

On behalf of all authors, as the corresponding author of the manuscript, I warrant that the manuscript submitted is our original work, all authors participated in the work in a substantive way and are prepared to take public responsibility for the work. There is no conflict of interest in our work.

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