Archive of SID
Iranian Journal of Reproductive Medicine Vol.6. No.4. pp: 205-208, Autumn 2008

# Neonatal mortality of low birth weight infants in Yazd, Iran

***Motahhareh Golestan M.D., Razieh Fallah M.D., Sedighah Akhavan Karbasi M.D.***

Department of Pediatrics, Shahid Sadoughi Hospital, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

*Received: 19 April 2008; accepted: 2 November 2008*

## Abstract

**Background:** Low birth weight (LBW) is one of the major determinants of neonatal survival as well as postnatal morbidity.

**Objective:** The main objective of the present study was to determine neonatal mortality rate (NMR) in LBW infants in Yazd, Iran.

**Materials and Methods:** In a prospective-cohort study, all births in the maternity hospitals of Yazd, Iran in 2004 were evaluated and mortality rate in LBW population over the course of the first month of extra uterine life was determined.

**Results:** In total, 8.4% (507 of 6016 births) of all newborns were LBW and 18.7% (95/507) of all LBW neonates died. Neonatal mortality rate in Yazd was 24/1000 live births .Two- third (95 /143) of all neonatal deaths occurred in LBW. Neonatal mortality rate (NMR) in LBW, Moderately low birth weight (MLBW), Very low birth weight (VLBW) and Extremely low birth weight (ELBW) were 23, 11.5 , 62.5 and 117 times more than that of normal weight newborns, respectively. Nearly 65% of all LBW neonatal deaths occurred in first 24 hours after birth. Overall NMR, Early Neonatal mortality rate (ENMR) and Late Neonatal mortality rate (LNMR) in LBW were 187, 118 and 9.8 in 1000 live births, respectively. The main causes of mortality among LBW in order of prevalence were respiratory distress syndrome (RDS) (59%), asphyxia (20%), septicemia (12%) and congenital malformation (9%).

**Conclusion:** Neonatal mortality rate in Yazd is high and LBW accounted for two-third of neonatal deaths. Therefore, effort should be intensified to implement effective strategies for the reduction of LBW births and improving the care of these vulnerable neonates.

***Key words****: Low Birth Weight, Neonatal Mortality Rate, Neonate.*

## Introduction

Perinatal and neonatal mortality are important public health issues in many developing countries. Low birth weight is one of the major determinants of neonatal survival as well as postnatal morbidity. Low birth weight neonates are subgrouped according to the degree of smallness at the first weight determination after birth:

Low birth weight (LBW): < 2500 g

Moderately low birth weight (MLBW): between 1500 and 2499g

Very low birth weight (VLBW): < 1500 g

Extremely low birth weight (ELBW) : <1000 g

LBW is caused by preterm birth, IUGR, or both factors. The predominant cause of LBW in the United State is preterm birth, whereas in developing countries, the cause is more often IUGR. Over the past 2 decades, LBW rate has increased primarily because of an increase in preterm births (1). The percentage of LBW has also increased in the United States, from 6.7% to 8.2% of all live births between 1984 and 2005, respectively, and the VLBW has increased from 1.2% to 1.5% between 1980 and 2005 (2). Both premature birth rate and LBW rate vary among different states of America, ranging from 8.3 to 17.9, and 6 to 11.6 per 1000 live births,

**Corresponding Author:**
*Motahhareh Golestan*, Shahid Sadoughi Hospital, Ebn Sina St., Shahid Ghandi Blvd, Yazd, Iran.
**E-mail:** mogolestan@yahoo.com

www.SID.ir

Archive of SID


respectively, in 2005 (2). "Low birth weight and prematurity are the second leading cause of infant mortality after congenital anomalies, but contribute disproportionately to the infant mortality rate (deaths in the first year after birth) " (2). Very low birth weight rate is an accurate predictor of the infant mortality rate. Infants with a LBW are 40 times more likely to die than infants with normal birth weight (NBW) and infants with a VLBW are 200 times more likely to die (1). " Infants with LBW are at a much higher risk of being born with cerebral palsy, mental retardation, and other sensory and cognitive impairments, compared with infants of NBW " (1).

Neonatal mortality rates in different countries and cities have to be identified and compared so that correct actions and interventions can be devised for each setting. Despite the apparent importance of LBW as an indicator, there have been few studies of outcome for LBW infants in developing countries. The main objective of the present study was to determine neonatal mortality rate (NMR) in LBW infants in Yazd, Iran.

## Materials and methods

In a prospective - cohort study, during 2004, all births taking place in all maternity hospitals of Yazd- Iran, were evaluated and followed for one month .

The objective was to quantify mortality in LBW population over the course of the first month of extrauterine life. Variables such as age of mother, maternal educational level, type of delivery, neonate sex; gestational age and vital condition of newborn in delivery time were carefully recorded via medical records of mother and neonate. If an infant died before discharge from the hospital, an immediate verbal autopsy was sought and the diagnosis confirmed with attending doctors.

Postnatal mortality surveillance included regular visits to hospitals, cemeteries, register offices and local health Departments. For deaths occurred out of the hospital, information was obtained from death certificates and complemented with information from home visits. Gestational age was calculated using the first day of the last normal menstrual period (LMP), estimated by obstetric sonography and the Dubowitz Scale.

"Births of less than 37 weeks were classified as preterm and those more than 42 weeks, as post term. Neonate birth weight of less than 2500gr was classified as LBW and that of more than 4000gr as LGA (large for gestational age). Neonatal mortality rate (NMR) is defined as deaths occurring from birth to 28 days of age per 1000 live births that include early NMR (ENMR, deaths occurring in the first week of life) and late NMR (LMNR, deaths occurring from eighth to 28th day of life). " (2)

This study has been approved by the Ethic Committee of Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

**Statistical analysis**

The data were analyzed using SPSS.11 statistical software. $X^2$ analysis and Fisher exact test were used for data analysis of qualitative variables. Differences considered as significant at p-values < 0.05.

## Results

During one year, 8.4 %( 507 of 6016 births) of all newborns were LBW and 0.7 % (46 of 6016) of them were VLBW. In LBW neonates, 7%, 9% and 84% were ELBW, VLBW and MLBW respectively.

Table I illustrates NMR based on birth weight. 18.7% (95/507) of all LBW neonates, 0.8% of NBW (2500- 4000 g) newborns (46/5369) and 0.7% (1/140) of LGA died. In other words, two third (95 /143) of all neonatal deaths occurred in LBW. NMR in LBW was 23 times more than that of normal weight newborns (p-value=0.0001). Nearly 65% (61/95) of all LBW neonatal deaths occurred in first 24 hours after birth, 93% (N= 60) in early and 7% (N=5) in late neonatal periods. Overall NMR, ENMR and LNMR in LBW were 187, 118 and 9.8 in 1000 live births, respectively. Type of delivery was cesarean section in 41% of LBW births (N=207) and 43% (N=41) of neonatal deaths. Frequency of neonatal death was 18% in vaginal deliveries and 20% in cesarean section, and neonatal death was not different in both types of delivery (p-value =0.42). 48 % (N=243) of all LBW births were girls and 52% (N=264) were boys. Neonatal deaths in boys and girls were 52 and 43 neonates respectively (p-value = 0.16). 31 % (161/507) of all LBW were preterm and 69% of them were term newborns.

Table II demonstrates neonatal mortality based on maternal age. Neonatal mortality was higher in mothers younger than 20 years old (p-value=0. 04).

Table III shows neonatal deaths based on maternal educational level that indicates NMR in illiterate mothers was 4.3 times more than that of highly educate mothers (p-value=0.0001). The main causes of mortality among LBW in order of prevalence were (RDS) respiratory distress


www.SID.ir

Archive of SID


syndrome (59%), asphyxia (20%), septicemia (12%) and congenital malformation (9%).

**Table I.** Neonatal deaths based on birth weight.

| Birth weight | Total number of births | Neonatal death | NMR** |
|---|---|---|---|
| ELBW* | 35 (0.6%) | 33 (23%) | 940 |
| VLBW* | 46 (0.8%) | 23 (17%) | 500 |
| MLBW* | 421 (7.3%) | 39 (27.2%) | 92 |
| NBW | 5369 (89%) | 46 (32.2%) | 8 |
| LGA | 140 (2.3%) | 1 (0.6%) | 7 |
| Total | 6016 (100%) | 143(100%) | 24 |

* (p-value = 0.0001)
**Neonatal mortality rate (NMR) = deaths occurring from birth to 28 day of age per 1000 live births.
Normal birth weight (NBW): 2500-3999gr.
Large for gestational age (LGA): >4000gr.

**Table II.** Neonatal mortality in LBW based on maternal age.

| Mother age | Total number | Neonatal deaths |
|---|---|---|
| < 20 yr* | 143 | 60 (63%) |
| 20-40 yr | 331 | 30 (32%) |
| >40 yr | 33 | 5 (5%) |
| Total | 507 | 95 (100%) |

* (p-value = 0. 04)

**Table III.** Neonatal deaths in LBW based on maternal educational level.

| Maternal Educational level | Total | Neonatal deaths | NMR |
|---|---|---|---|
| Illiterate* | 15(3%) | 7(7.5%) | 467 |
| Primary -secondary school | 305(60%) | 5(53.5%) | 162 |
| High school | 132(26%) | 31(32.5%) | 235 |
| Higher education | 55(11%) | 6(6.5%) | 109 |
| Total | 507(100%) | 95(100%) | 187 |

* p-value =0.0001
Relative Risk of NMR in illiterate mothers is 4.3 times of highly educate mothers.
Neonatal mortality rate (NMR) = deaths occurring from birth to 28 days of age per 1000 live births.

## Discussion

Neonatal mortalities are important public health issues in many developing countries. “Although infant mortality rates in developing countries have declined significantly in the past two to three decades, NMR has remained relatively constant” (3). LBW and especially VLBW are major predictors of infant morbidity and mortality. The risk of neonatal death for LBW in this study was 23 times more than that of NBW. In other studies, this rate varies between 25- 40 times (4).

In the present study, the risk of neonatal death in MLBW, VLBW and ELBW were respectively 11.5, 62.5 and 117 times higher than that of normal weight newborns. In other studies, the risk of early death for infants born at MLBW (1500–2499g) is 5 times higher than that of heavier infants and the risk for VLBW infants is >100 times that of infants born at 2500g (5) and also VLBW infants account for 50% of neonatal death and have a 200-fold higher risk of neonatal death (1). In this study, 23% and 66 % of neonatal deaths occurred in ELBW and LBW. In the United States, ELBW infants account for <1% of all births but approximately one third of the total infant mortality rate (6) and in Karachi 77% of neonatal deaths were in LBW (7).

In the present study, 0.8% of live births were VLBW which was similar to this rate in Italy (8). In our study, 18.7% of LBW, 50% of VLBW and 94 % of ELBW died. In Thailand , survival rate of VLBW infants and ELBW infants were 81% and 52% (9) and in the United Arab Emirates, mortality rates among LBW, VLBW and ELBW were 5.7% , 20% and 50% respectively. (10) **I**n Italy the mortality rate in VLBW was 19.6% (8). In Sao Paulo, Brazil, according to birth weights of 500-749, 750-999, 1000-1249 and 1250-1499 g, survival rates were 15, 71, 93 and 96% in 2000 (11)**.** In New Delhi, India, neonatal mortality rate till discharge was 15.7% in VLBW group and 33.3% in ELBW group (12).

The most obvious factor in the present study which influenced the NMR was LBW which is similar to other studies (13-15). In this study, neonatal mortality rate was higher in males than in females which are similar to other studies (16, 17). Our data showed that neonatal mortality was higher in mothers younger than 20 years old. “Adolescent childbearing causes many adverse outcomes including unwanted, repeated childbearing and increased risks of having low birth weight, preterm births and neonatal mortality” (18). In this study, low maternal educational level associated with increase in NMR. In a study in San Bernardino County, the most significant contributors to adverse birth outcomes among Black women were length of gestation and maternal education, whereas the most significant predictor of infant mortality was birth weight (19)**.**

Finaly, in the present study, 66% of neonatal deaths occurred in LBW, while in the similar studies in Iran, this rate was 82% in Valiasr Hospital of Tehran and 50% in Fars province (20,


www.SID.ir

Archive of SID


21). However in Fars, 18.46% of dead infants had no records.

## Conclusion

Neonatal mortality rate in Yazd is high, and LBW is accounted for two-third of neonatal deaths. Therefore, effort should be intensified to implement effective strategies for the reduction of LBW births and improving the care of these vulnerable neonates.

## References


1. American Academy of Pediatrics and the American College of Obstetricians and Gynecologists. Guidelines for Perinatal Care. American College of Obstetricians and Gynecologists. *Washington* DC; 2002; 138- 145.
2. Hamilton BE, Minin AM, Martin JA, Kochanek KD, Strobino DM, Guyer B. Annual summary of vital statistics: 2005. *Pediatrics* 2007; 119: 345-360.
3. Darmstadt GL, Lawn JE, Costello A. Advancing the state of the world's newborns. *Bull World Health Organ* .2003; 81: 224-225.
4. Kruger C. The missing link: neonatal care in rural communities. *Bull World Health Organ* 2002; 80:759-760.
5. Mathews TJ, Mac Dorman MF. Infant mortality statistics from the 2003 period linked birth/infant death data set. *Natl Vital Stat Rep* 2006; 54: 1 –32.
6. Centers for Disease Control and Prevention (CDC). Unregistered deaths among extremely low birth weight infants--Ohio, 2006. *MMWR Morb Mortal Wkly Rep* 2007; 56: 1101-1103.
7. Mufti p, Setna F, Nazir K. Early neonatal mortality: effects of intervention on survival of low birth babies weighing 1000-2000g. *J Pak Med Assoc* 2006; 56:174-176.
8. Corchia C, Orzalesi M . Geographic variations in outcome of very low birth weight infants in Italy. *Acta Paediatr* 2007; 96: 35-38.
9. Sritipsukho S, Suarod T, Sritipsukho P. Survival and outcome of very low birth weight infants born in a university hospital with level II NICU. *J Med Assoc Thai* 2007; 90: 1323-1329.
10. Dawodu A , Varady E, Verghese M, Al-Gazali LI. Neonatal audit in the United Arab Emirates: a country with a rapidly developing economy. *East Mediterr Health J* 2000; 6: 55-64.
11. de Mello FB, de Almeida MF, dos Santos AM, de Paula Fiod Costa H, Miyoshi MH, Amaro ER. Factors associated with survival of very-low-birth-weight infants in a Brazilian fee-paying maternity in the 1990s. *J Trop Pediatr* 2007; 53: 153-157.
12. Roy KK, Baruah J, Kumar S, Malhotra N, Deorari AK, Sharma JB . Maternal antenatal profile and immediate neonatal outcome in VLBW and ELBW babies. *Indian J Pediatr* 2006; 73: 669-673.
13. Barros AJ, Matijasevich A, Santos IS, Albernaz EP, Victora CG. Neonatal mortality: description and effect of hospital of birth after risk adjustment. *Rev Saude Publica* 2008; 42: 1-9.
14. Campbell O, Gipson R, el-Mohandes A, Issa AH, Matta N, Mansour E, et al. The Egypt Nationa Perinatal/Neonatal Mortality Study 2000. *J Perinatol* 2004; 24: 284 -249.
15. Osorno Covarrubias L, Acosta Mass A, Dávila Velásquez J, Rodríguez Chapuz J, Escamilla Sosa M, Echeverría Eguiluz M. Neonatal mortality in a regional perinatal hospital in Merida, Yucatan, 1995-2004 I. Analysis of the gross, specific rates. *Ginecol Obstet Mex* 2006; 74: 401-419.
16. Hong JS, Yi SW, Han YJ, Park YW, Nam CM, Kang HC, et al. Fetal growth and neonatal mortality in Korea. *Paediatr Perinat Epidemiol* 2007; 21: 397-410.
17. Alonso V, Fuster V, Luna F. Causes of neonatal mortality in Spain (1975-98): influence of sex, rural-urban residence and age at death. *J Biosoc Sc* 2006; 38: 537-551.
18. Lee SH, Yen CH, Wu WY, Lee MC. A review on adolescent childbearing in Taiwan: its characteristics, outcomes and risks. *Asia Pac J Public Health* 2007; 19: 40-42.
19. Nanyonjo RD, Montgomery SB, Modeste N, Fujimoto E. A Secondary Analysis of Race/Ethnicity and other Maternal Factors Affecting Adverse Birth Outcomes in San Bernardino County. *Matern Child Health J* 2008; 12: 435-441.
20. Nayeri F, Amini E, ,Oloomi Yazdi Z, Dehghan Naieri A. Evaluation of the cause and predisposing factors in neonatal mortality by using international coding diseases version 10 in Valiasr Hospital. *Iran J Pediatr* 2007; 17(Suppl 1): 21-26
21. Keshtkaran A, Keshtkaran V .Factors affecting neonatal death in Fars Province, Southern Iran, 2004. *MEJFM* 2007; 5: 42-45.



www.SID.ir