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ORIGINAL ARTICLE

# Study complications and follow-up outcomes of preterm infants hospitalized in Ardabil city hospital in 2016

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## ABSTRACT

**Background:** Preterm birth is one of the leading and direct causes of newborn mortality. The aim of this was to study complications and follow-up outcomes of preterm infants hospitalized in Ardabil city hospital in 2016.

**Methodology:** This cross-sectional study was conducted on 73 preterm babies at Ardabil city hospital in 2016. The research-based checklist included demographics, and the outcome data were completed through the infant's examination and by studying hospital files. Collected data were analyzed by statistical methods in statistical package *for* the social sciences v.19.

**Results:** The rate of mortality was 21.2%, and the rate of developmental disorders (DD) was 26.2%. The main preterm infant's problems were respiratory distress syndrome (RDS) and ICTER, respectively. There was a significant inverse relation between gestational age (GA) and birth weight with the rate of mortality and developmental disorders. The relationship between sex and mortality rate was not significant. There was a significant relation between DD with RDS, age of infants, weight and round head of infants in 6 months.

**Conclusion:** Results showed that preterm infants are at risk for DD and mortality in comparison with full-term infants. Hence, specialized care for them is essential in the future.

**Keywords:** Preterm, mortality, developmental disorder, follow-up.

## Introduction

According to the World Health Organization, preterm delivery refers to the delivery that occurs during 20–30 weeks of pregnancy. Preterm labor is one of the leading causes of infant mortality in the developed countries that occur in 5%–10% of pregnancies, and its prevalence varies based on population size, economic, and social status of society [1,2]. Prematurity is a multifactorial issue, and its causes include complex embryonic, uterine, and maternal reactions, such as placental problems, nulliparous, maternal infection, uterine problems, alcohol consumption, smoking, and opium use, unauthorized drugs during pregnancy and lifestyle. Hence, these factors could lead to preterm delivery by different mechanisms, such as placental-uterine blood flow, uterine disability in the maintenance of the fetus, and premature rupture of membranes [3–5]. Preterm infants are at high risk of increased mortality, respiratory complications, hypoxia, infectious complications, brain injuries, childhood disorders, and behavioral problems than full-term infants [6–8]. Generally, in any time of delivery and pregnancy duration, with decrease in baby's birth weight, the mortality rate could be increased. The low birth weight of 30%–40% of newborn at the time of birth is due to delay in intrauterine growth and the rest due to early birth. Selecting special care at the birth time for premature newborns can be useful in reducing their mortality rate. These cares include remediation, vitamin K prescriptions, temperature and pulse control, air humidity, oxygenation and proper nutrition, especially lactation, and prevention of infection due to the high sensitivity of newborns [9–11]. Awareness about epidemiology of preterm infants in each region plays an essential role in preventing the birth of preterm infants. Due to less studies about this topic in Ardabil province, the present study aimed to investigate the complications and follow-up outcomes of preterm infants hospitalized in the neonatal ward at Bu-Ali hospital, Ardabil in 2016.

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## Methodology

This was a descriptive-analytical study that performed on 73 preterm infants hospitalized in the neonatal ward of Bu-Ali hospital in Ardabil city in 2016. The sample size calculated by the sample size formula; $n = z^2 / d^2 \times p(1–P)$ for descriptive studies at a 95% confidence interval and the rate of necessary parameters from similar studies. The data collection tool included demographic questions, such as age, residence place, history of smoking, nutritional habits, educational level, and history of familial diseases and neonate' gender, infant's height, weight, and age at birth and also clinical information of infants, including weight gain, height and head circumference, preterm late complications, mortality, complications, and follow-up outcomes of newborns, which was designed by research goals and completed through medical records and clinical examinations of samples. The collected data were analyzed using descriptive and analytical statistical methods in statistical package *for* the social sciences version 19. The *p*-value of $< 0.05$ was considered as significant.

## Results

Out of all 73 premature infants, 46.2% were girls, and the rest were boys. The average age of the neonates was 30.29 ± 3.30 weeks, and the mean weight of them was 1838 g (Table 1). Respiratory distress syndrome (RDS) with 55%, and jaundice with 20% were the most common early disorders, and evolutionary disorders (26%) were the most common late complication in premature infants, and the prevalence of mortality rate among studied neonates was 21.2% (Figure 1). The results showed that the relationship between mortality and neonatal birth age was statistically significant and the dead babies had less birth weight than live babes, but this difference was not statistically significant. The relationship between RDS incidence and age at birth was not significant, but the relationship between RDS and birth weight was significant (Table 2). There was no significant relationship between mortality, jaundice, and RDS in newborns with gender. The relationship between DD and gender was significant and boy neonates were significantly more prone to DD than girls (Table 3). The results showed that the incidence of evolutionary disorders in newborns was significantly related to the size of the round head, height, weight, and age (Table 4). Out of 21 infants with DD, 5 neonate (23.8%) had jaundice and 15 neonates (76.2%) had RDS (Figure 2).

***Table 1.*** *Demographic data of neonates in birth time and after 6 months.*

| Demographic data | Mean | Standard deviation (SD) |
|---|---|---|
| Age at birth time (month) | 30.3 | 3.02 |
| Weight at birth time (kg) | 1,838 | 1,058 |
| Weight after 6 months (g) | 6,783 | 1,689.4 |
| Height after 6 months (cm) | 59.8 | 7.8 |
| Head round after 6 months (cm) | 40.7 | 4.2 |

## Discussion

The early birth of newborns is one of the health system problems and one of the main causes of neonatal illness and death. According to the results of this study, the prevalence of mortality was 21.2%, and there was no significant relationship between mortality and gender of infants. In the study by Chen et al. [12] in Switzerland, the prevalence of mortality in neonates was 18.6%, which was lower than our study results. In line with our study, Pourarian et al. [13] did not show any correlation between sex and mortality in neonates. Suciu et al. [14] in a study in 2017 showed that the mortality rate in premature infants was declining over time based on the advancement of technology and special cares. The results of a review study by Chehade et al. [15] in 2018 showed that the birth rate of premature infants had increased over the past decades, but by improving the pre- and post-birth

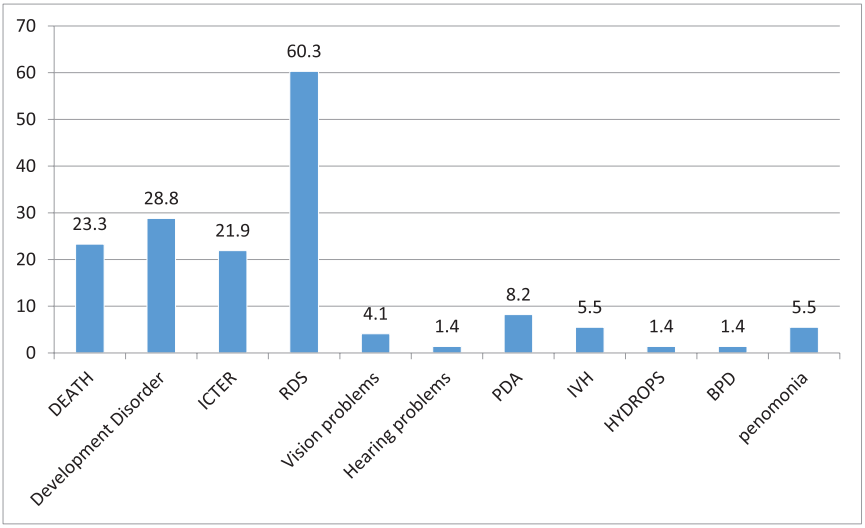


***Figure 1.*** *The prevalence of early and late disorders in preterm neonates.*

***Table 2.*** *The incidence of RDS, Mortality, and Jaundice by age and weight of neonates at birth time.*

| Incidence rate | Birth time by | Characterized | Mean | SD | *p*-value |
|---|---|---|---|---|---|
| Mortality | age | Dead | 27.4 | 3.3 | 0.001 |
| | | Live | 31.2 | 2.3 | |
| Mortality | Weight | Dead | 1,771 | 1,976.3 | 0.85 |
| | | Live | 1,859 | 571.8 | |
| Jaundice | Age | + | 30.4 | 3.32 | 0.89 |
| | | − | 30.3 | 2.96 | |
| Jaundice | Weight | + | 3,228 | 1,889 | 0.09 |
| | | − | 1,729 | 653 | |
| RDS | Age | + | 29.6 | 3.3 | 0.014 |
| | | − | 31.3 | 2.2 | |
| RDS | Weight | + | 1,765 | 1,273 | 0.475 |
| | | − | 1,949 | 604 | |

***Table 3.*** *The incidence of RDS, Mortality, Jaundice and DD by sex and status of life.*

| Incidence rate of | Gender | Life status | *n* | % | *p*-value |
|---|---|---|---|---|---|
| Mortality | Girl | Dead | 9 | 12.2 | 0.52 |
| | | Live | 28 | 38.4 | |
| | Boy | Dead | 8 | 11 | |
| | | Live | 28 | 38.4 | |
| Jaundice | Girl | + | 8 | 11 | 0.52 |
| | | − | 29 | 39.6 | |
| | Boy | + | 8 | 11 | |
| | | − | 28 | 38.4 | |
| RDS | Girl | + | 20 | 27.4 | 0.2 |
| | | − | 17 | 23.3 | |
| | Boy | + | 24 | 32.9 | |
| | | − | 12 | 16.4 | |
| DD | Girl | + | 7 | 9.6 | 0.04 |
| | | − | 30 | 41.1 | |
| | Boy | + | 14 | 19.2 | |
| | | − | 22 | 30.1 | |

care, mortality rates could be reduced. The results of this study showed that the relationship between birth age and the mortality rate was significant, but the relationship between birth weight and mortality was not significant. In a study conducted by Mirzarahimi et al. [16] in 2008 in Ardabil, there was a significant relationship between birth weight, and mortality rate, which not in line with our study results. Almost 46.2% of the newborns were girls, and the rest were boys, but in the study of Mansoori et al. [17], 69% were girls that was higher than the present study results. In this study, RDS and jaundice were prevalent in premature infants and no significant relationship was found between age, weight, and gender with the prevalence of jaundice in neonates. In line with the present study, in the study of Baskabadi et al. [18], the causes for the high prevalence of jaundice in preterm infants were declared liver immaturity and high red blood cell count. In Puorarian et al. [13] study, the most prevalent neonatal illnesses were RDS, jaundice, and sepsis, which was similar to the present study. Another study by Simpson et al. [19] found that the lung function in early childhood was more vulnerable to childbirth and also in our study, we observed that RDS was one of the most common complications of premature infants. The uterus is a rich and complete environment for the development of the embryo and young age at birth can take the opportunity to grow physically and mentally from an embryo and can cause a lot of damage [20]. In this study, evolutionary disorders, visual, and auditory problems were one of the most common problems in the premature infants, and there was a significant relationship between age of follow-up, birth weight,

***Table 4.*** *The relation between DD and studied variables.*

| Index | DD | Mean | SD | *p*-value |
|---|---|---|---|---|
| Age at birth time | + | 29.6 | 2.08 | 0.23 |
| | – | 30.56 | 1.96 | |
| Weight at birth time | + | 1,412 | 393 | 0.028 |
| | – | 2,010.2 | 490.9 | |
| Age at follow-up | + | 26.9 | 4.93 | 0.013 |
| | – | 34.9 | 4.8 | |
| Weight after 6 months | + | 5,352.4 | 1,537.7 | 0.001 |
| | – | 7,672.1 | 1,058.4 | |
| Head round after 6 months | + | 37.9 | 3.06 | 0.001 |
| | – | 42.4 | 3.48 | |
| Height after 6 months | + | 55.6 | 7.4 | 0.001 |
| | – | 62.4 | 6.9 | |

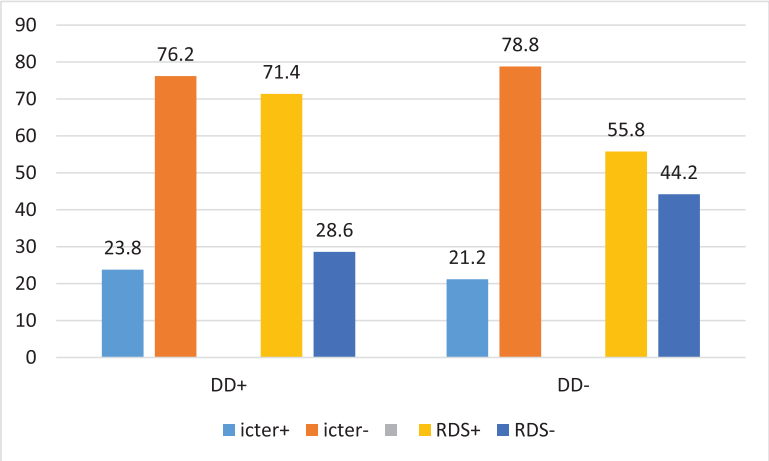


***Figure 2.*** *The incidence of DD by ICTER (jaundice) and RDS.*

height, and head circumference after 6 months with evolutionary disorders. In a study by Datar et al. [21], the adverse effects of low birth weight at birth on the motor and mental development of newborns in the first 2 years of life were also highlighted and in the present study, there was a significant relationship between birth weight and DD. In Kerstjens et al. [22] study, similar to our study, prematurity and low birth weight were the most common risk factors for DD. In the present study, there was a direct relationship between RDS and evolutionary disorders in follow-up and for this relation, we could say that respiratory problems and oxygen deficiency at the time of birth can lead to irreparable lesions in different parts of the brain and resulting to neurological problems [24]. Also, in the present study, it was found that the higher age of follow-up correlated with a lower rate of motor delay and developmental abnormalities. Studies have shown that increases in the age of premature infants and growth of their nervous system and rehabilitation measures, such as occupational therapy, physiotherapy, and increasing the awareness of parents about the proper principles of care for premature infants could gradually improve motor skills and reducing developmental abnormalities. In general, underweight children are 2–3 times more likely to suffer disabilities, physical, mental, and social problems in comparison to other infants and should be considered in the future [23]. Mirzarahimi et al. [24] in a study showed that the mortality rate was 6.6%, and 68.5% of neonates had prematurity and 62.5% had RDS which was similar to our study results.

Soltani et al. [25] in a study showed that 17% of the preterm children were detected as having DD that were lower than our study results which declared this rate about 29%.

## Conclusion

According to the results of this study, disorders, such as jaundice, sepsis, which contribute to the high prevalence of mortality rate in newborns, need immediate attention to be paid to premature infants, especially premature infants with low birth age and low birth weight. Also, screening for common disorders, such as jaundice, sepsis, RDS, and developmental disorders, for faster treatment and their casualty, is essential in future.

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### List of Abbreviations

DD Development disorder
RDS Respiratory distress syndrome

### Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

### Funding

None.

### Consent for publication

Informed consent was obtained from all the parents of the participating children.

### Ethical approval

The study results were approved by the ethical committee of the Ardabil University of Medical Science and registered by ethical code IR.REC.ARUMS.2016.719.

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### References

1. Goldenberg R, Culhane J, Iams J, Romero R. Preterm birth 1: epidemiology and causes of preterm birth. Obstet Anesth Dig. 2009;29(1):6–7. https://doi.org/10.1097/01.aoa.0000344666.82463.8d
2. Goldenberg RL, McClure EM. Maternal, fetal and neonatal mortality: lessons learned from historical changes in high income countries and their potential application to low-income countries. Matern Health Neonatol Perinatol. 2015;1(1):3. https://doi.org/10.1186/s40748-014-0004-z
3. Ananth CV, Ananth CV, Vintzileos AM. Epidemiology of preterm birth and its clinical subtypes. J Matern Fetal Neonatal Med. 2006;19(12):773–82. https://doi.org/10.1080/14767050600965882
4. Beck S, Wojdyla D, Say L, Betran AP, Merialdi M, Requejo JH, et al. The worldwide incidence of preterm birth: a systematic review of maternal mortality and morbidity. Bull World Health Organ. 2010;88:31–8. https://doi.org/10.2471/BLT.08.062554
5. Blencowe H, Cousens S, Chou D, Oestergaard M, Say L, Moller A-B, et al. Born too soon: the global epidemiology of 15 million preterm births. Reprod Health. 2013;10(1):S2. https://doi.org/10.1186/1742-4755-10-S1-S2
6. Doyle LW, Anderson PJ. Pulmonary and neurological follow-up of extremely preterm infants. Neonatology. 2010;97(4):388–94. https://doi.org/10.1159/000297771
7. Soleimani F, Zaheri F, Abdi F. Long-term neurodevelopmental outcomes after preterm birth. Iran Red Crescent Med J. 2014;16(6). https://doi.org/10.5812/ircmj.17965
8. Villar J, Giuliani F, Bhutta ZA, Bertino E, Ohuma EO, Ismail LC, et al. Postnatal growth standards for preterm infants: the Preterm Postnatal Follow-up Study of the Intergrowth-21st Project. Lancet Glob Health. 2015;3(11):e681–91. https://doi.org/10.1016/S2214-109X(15)00163-1
9. Kamath-Rayne BD, DeFranco EA, Chung E, Chen A. Subtypes of preterm birth and the risk of postneonatal death. J Pediatr. 2013;162(1):28–34.e2. https://doi.org/10.1016/j.jpeds.2012.06.051
10. Whitehead NS. The relationship of socioeconomic status to preterm contractions and preterm delivery. Matern Child Health J. 2012;16(8):1645–56. https://doi.org/10.1007/s10995-012-0948-4
11. Borg F, Gravino G, Schembri-Wismayer P, Calleja-Agius J. Prediction of preterm birth. Minerva Ginecol. 2013;65(3):345–60.
12. Chen F, Bajwa NM, Rimensberger PC, Posfay-Barbe KM, Pfister RE. Thirteen-year mortality and morbidity in preterm infants in Switzerland. Arch Dis Child Fetal Neonatal Ed. 2016:105(5):F377–83. https://doi.org/10.1136/archdischild-2015-308579
13. Pourarian S, Vafafar A, Zareh Z. The incidence of prematurity in the hospital of Shiraz University of Medical Sciences and Health Services, 1999. Razi J Med Sci. 2002;9(28):19–25.
14. Suciu LM, Puscasiu L, Cucerea M, Szabo B, Ognean ML, Petrescu O, et al. Trends in outcomes of very preterm infants in Romania: a tale of three cities. Pediatr Int. 2017;59(11):1157–64. https://doi.org/10.1111/ped.13415
15. Chehade H, Simeoni U, Guignard J, Boubred F. Preterm birth: long term cardiovascular and renal consequences. Curr Pediatr Rev. 2018. https://doi.org/10.2174/1573396314666180813121652
16. Mirzarahimi M, Abedi A, Shahnazi F, Saadati H, Enteshari A. Causes and rate of mortality among the newborns in NICU and newborns unit at Imam Khomeini and Alavi hospitals in Ardabil from September 2006 to September 2007. J Ardabil Univ Med Sci. 2008;8(4):424–30.
17. Mansoori M, Janani S, Chavoshi D, Mohaghegh P, Hemmatpouر S, Fatolahpour A, et al. Evaluation of the side effects and mortality of surfactant therapy with mechanical ventilation comprise with manual ventilation in Neonates Admitted to NICU ward of Besat hospital of Sannandaj in 2012–2013. Razi J Med Sci. 2017;24(155):66–72.
18. Boskabadi H, Navaei M. Relationship between delivery type and jaundice severity among newborns referred to Ghaem Hospital within a 6-year period in Mashhad. Iran J Obstet Gynecol Infertil. 2011;14(4):15–21.
19. Simpson SJ, Turkovic L, Wilson AC, Verheggen M, Logie KM, Pillow JJ, et al. Lung function trajectories throughout childhood in survivors of very preterm birth: a longitudinal cohort study. Lancet Child Adolesc Health. 2018;2(5):350–9. https://doi.org/10.1016/S2352-4642(18)30064-6
20. Araújo BFd, Zatti H, Madi JM, Coelho MB, Olmi FB, Canabarro CT. Analysis of neonatal morbidity and mortality in late-preterm newborn infants. J Pediatr. 2012;88(3):259–66. https://doi.org/10.2223/JPED.2196
21. Datar A, Jacknowitz A. Birth weight effects on children's mental, motor, and physical development: evidence from

twins data. Maternal Child Health J. 2009;13(6):780. https://doi.org/10.1007/s10995-009-0461-6

22. Kerstjens JM, de Winter AF, Bocca-Tjeertes IF, ten Vergert EM, Reijneveld SA, Bos AF. Developmental delay in moderately preterm-born children at school entry. J Pediatr. 2011;159(1):92–8. https://doi.org/10.1016/j.jpeds.2010.12.041
23. Asgari Z, Bagheri F, Boskabadi H. The study of preterm infant develpment at early 2 years based on ASQ. Babol Med Sci Univ. 1394;18(2):7–49.
24. Mirzarahimi M, EnteshariMoghaddam A, Khademi S. Neonatal mortality rate (NMR) in intensive care unit (ICU) of Ardabil city hospitals and related factors. Int J Reprod Contracept Obstet Gynecol 2018;7:4531–5. https://doi.org/10.18203/2320-1770.ijrcog20184502
25. Soltani M, Razavi Ardekani S M, Erami A, Eskandari Kootahi Z, Yazdani N. Study of Developmental Delay and Its Related Factors in Low Birth Weight Infants, Iran J Pediatr. 2018;28(5):e14393. doi: 10.5812/ijp.14393.