



A Theory Map of the Causes of Perinatal Death in a Developing Country

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Abstract

Objectives: The rate of mortality in the perinatal period is considered one of the most important health indices in a community. Therefore, effective factors should be identified and appropriate strategies should be developed to maintain and enhance the health level of the neonates as a vulnerable group. Accordingly, the present study aimed to determine the rate of perinatal mortality in Semnan.

Materials and Methods: This cross-sectional study was performed on perinatal death certificates at the neonatal department of Amirmomenin hospital of Semnan University of Medical Sciences during 2016–2017. Based on the aim of the study, an anonymous self-administered questionnaire was developed and used.

Results: The findings indicated that 55.9% of the newborns were premature. In addition, 89.1% of the infants weighed less than 2500 g. Further, 35.8% of the deaths were due to prematurity while 1.9 of them were related to a congenital anomaly. Finally, a significant relationship was found between the gestational age and causes of death ($P < 0.05$).

Conclusions: In general, authorities are recommended to develop and equip maternity centers and provide access to experienced personnel in developing countries. Moreover, based on the findings, developing neonates care centers and having access to intensive care special for high-risk neonates are considered essential issues.

Keywords: Cause of Death, Infant, Newborn, Diseases, Infant, Premature, Diseases

Introduction

The health system of each country is believed to be capable when it can prevent preventable diseases and deaths at the level of national developmental capabilities (1). Accordingly, such a system can contribute to recording the events, collecting the data, calculating and comparing the indices with the standards, and finally, providing feedback on this information, which should be used in national strategic planning and policymaking (1-7).

The mortality rate in the perinatal period is regarded as one of the most significant health indices in a community. The influential factors should be determined and the appropriate strategies with respect to the situations should be developed to maintain and increase the health level of the neonates who are considered a vulnerable group. Identifying the rate of mortality based on the death certificate is one of the valid resources for achieving the preventive strategies which have received the attention of the health planners (8).

According to the World Health Organization (WHO),

the perinatal period begins from 22nd week of pregnancy and continues until 7 days after birth (1). In this death certificate, the certifier should record the causes related to maternal death, embryo or neonate, as well as other conditions and states involved in their death. Maternal causes include issues related to the mother and embryo or those which affect the neonate and embryo and lead to their death (9).

Many environmental, social, demographic, as well as obstetric and gynecological factors, were identified as the causes contributing to intrauterine death. In addition, a wide range of factors were found to be influential in perinatal mortality such as poverty, air pollution, race, inadequate perinatal cares, inappropriate maternal nutritional status, poor socioeconomic status of the mother (10), history of stillbirth, biochemical markers of maternal serum, genetic causes, embryo factors including embryo abnormalities, maternal complications during the pregnancy, infectious factors, factors related to placental problems such as placenta previa, blood disorders, embryo

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age, and weight during the birth. Most of the real factors of stillbirth cases are still unknown even after conducting various studies (11).

Examining the rate and causes of perinatal death in Yazd hospitals, Ghasemi et al found that the most common causes of the recorded perinatal deaths included respiratory distress syndrome, maternal recorded causes based on late delivery, and the placental recorded causes due to placental abruption (12). Further, Esmaelzadeh et al revealed that the perinatal mortality rate was 11.5 cases per 1000 births and early birth and death with an unknown factor were the most common causes of perinatal mortality (13).

By identifying the effective factors of perinatal mortality and increasing the knowledge of pregnant women regarding the importance of medical care during pregnancy, the rate of mortality can be significantly reduced. Given that the importance of enhancing the maternal and neonatal health is among the main goals of development, the current research sought to estimate the rate of intrauterine mortality in neonates aged less than 7 days and identify the related factors in hospitals affiliated to Semnan University of Medical Sciences. It was conducted aiming at taking steps to reduce the rate of this type of death.

Materials and Methods

The participants of this study included perinatal death certificates at the neonatal department of Amiral-momenin hospital of Semnan University of Medical Sciences recorded during 2016-2017. The census method was used to collect the required data. Totally, 106 death certificates were recorded, all of which were evaluated. An anonymous self-administered questionnaire was developed by the authors after reviewing the related literature. It was divided into 4 sections. The first section focused on the mother’s information such as national and ID numbers, age, occupation, education, along with the national number of the household head and address. Furthermore, the second section was related to newborn’s information including the birth and death time, sex, and weight. Moreover, causes of the newborns’ death including a 19-item checklist were addressed in the third section. The SPSS software was used to perform descriptive statistics in order to determine the distributions of the responses. Moreover, regression test was utilized to analyze the data at a significance level of 0.01.

Results

The findings demonstrated that 62% of mothers aged between 18 and 35 years old. Totally, 43.3% of the mothers were employees while 55.8 % of them were illiterate. As regards the gender of the newborns, 54% of them were males. Additionally, 55.9% of the newborns were premature and finally, 89.1% of the infants weighed less than 2500 g (Table 1).

Table 1. Newborns and Mothers’ Characteristics

Characteristics	Groups	No.	%
Mother’s age (y)	<18	5	5
	18-35	62	62
	>35	33	33
Mother’s job	Housekeeper	55	56.7
	Employee	62	43.3
Mother’s education	Illiterate	53	55.8
	Diploma	31	33.7
	Bachelor degree	10	10.5
Newborn’ sex	Female	42	43.8
	Male	54	56.2
Gestational age	Preterm	57	55.9
	Term	43	42.1
	Postterm	2	2
Newborn’ weight (g)	<2500	90	89.1
	≥2500	11	10.9

As shown in Figure 1, 35.8% of the deaths are related to prematurity whereas 1.9 of them are due to a congenital anomaly.

Based on the data illustrated in Figure 2, there is a significant relationship between gestational age and the causes of death ($P < 0.05$).

Discussion

According to the WHO, perinatal mortality in developing countries is defined “as neonatal deaths of less than seven days of age and fetal deaths after 28 weeks of gestation”. The current study was implemented to evaluate the causes of perinatal mortality. Based on the results, only a number of mothers aged less than 18 years. The age between 18

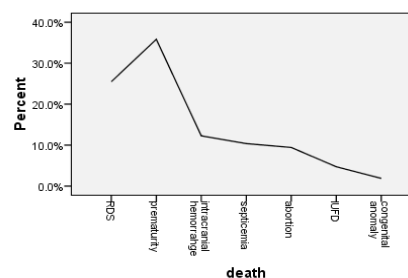


Figure 1. Percentage of Causes Related to Perinatal Mortalities.

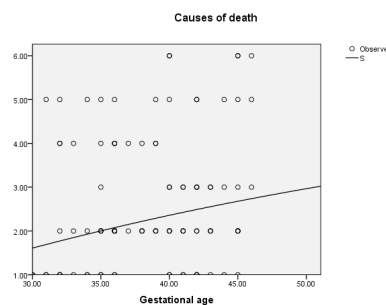


Figure 2. The relationship between gestational age and causes of death.

and 35 years for pregnancy was safer than any other ages. Given the increasing effect of this factor on the health of the mother and neonate and as this factor can be greatly planned for, special attention should be paid to this factor in the health interventions.

In addition, the results indicated that the number of perinatal mortality varied in terms of gender. The results of this research are in line with those of other studies (14, 15). While other studies conducted in Arak revealed that male neonates were more vulnerable (16), no significant difference was observed between the genders in the present study.

As expected, more than half of the dead neonates were premature and a significant relationship was found between the pregnancy age and the causes of perinatal mortality ($P < 0.05$). Further, the majority of neonates had low weight, which is in conformity with the results of other studies (17,18). Furthermore, the results demonstrated that more than one-third of the causes of perinatal deaths were reported to be neonatal prematurity so that prematurity of the neonates was the first cause of perinatal mortality in the current research. The findings of other studies conducted in England, Norwich, and across European countries confirm the results of the current study (19,20). The low Apgar score of neonates died in minutes 1 and 5 can be justified by underlying diseases of the neonate and the abnormalities, that is, they made neonate prone to death and caused a low Apgar score.

Moreover, based on the results, respiratory distress syndrome was the second leading cause of perinatal mortality. Ramanathan et al reported that 45% of the causes of death were severe respiratory distress syndrome and severe prematurity (21). In the United States, mortality caused by respiratory distress syndrome significantly reduced (22), indicating the importance of neonatal intensive care unit (NICU) in the care of neonates. The findings of the current study represented that less than a quarter of perinatal mortality were due to intracranial bleedings. This cause of death is one of the major consequences of prematurity. This finding corroborates with the findings of the other studies (23,24).

Additionally, the results represented that a limited number of causes of perinatal mortality were related to congenital anomalies. Comparing the results of abnormality status in the current research with those of other studies (25,26) suggests that this factor plays a less significant role in neonatal death. This may be attributed to higher deaths due to prematurity, lack of paying adequate attention to examinations at birth and detection of abnormalities, lack of performing paraclinical procedures such as cardiac echocardiography and kidney sonography, and finally, lack of autopsy in dead neonates. In addition, in some studies, the results were reported merely based on autopsy, therefore the results of our study may naturally differ from those of other studies and the rate of abnormalities to be higher.

In this study, less than a quarter of the causes of perinatal mortality belonged to infections. However, in other studies, the most common cause was reported to be septicemia death (27,28) which is due to *Streptococcus* group B and *Staphylococcus aureus*.

The research findings indicate that the present risk factors lead to future diseases (Figure 3). Hence, current research has several implications worth mentioning. The results suggest that establishing and equipping maternity centers and providing access to experienced personnel in developing countries should be given priority. Further, based on the findings, creating neonates care centers and having access to intensive care special for high-risk neonates are among the most vital issues. Finally, developing plans with an emphasis on reducing the pregnancies under the age of 18 and more than 35 should be promoted in the community.

Limitations of the Study

The current study suffers from several limitations which need to be acknowledged. Comparing the findings of the present study with those of many other studies regarding the causes of perinatal period mortality yields several limitations due to the lack of paying attention and emphasizing the use of the same guidelines in order to accurately record the information such as the mother's status and history, the conditions and stages of delivery, the neonate condition before, during, and after the birth and after the delivery, as well as cares during and after the birth and transfer to other centers. Furthermore, in many cases, the method of recording the death certificate and the system of classification used to determine the exact cause of death is not appropriate, complete, and the same, and thus maternal or neonatal causes are not recorded at all. Accordingly, it leads to the emergence of causes such as prematurity or asphyxia and anoxia, which are not valuable elements for exchanging and comparing the information in terms of data. Eventually, there is a possibility of entering incomplete, inadequate, or incorrect data due to the great number of documentaries from the source of non-reporting. However, all cycles of this system need to act accurately and adequacy in order for the comparisons to be correct and reliable.

Conclusions

In general, the findings revealed that the deaths of the perinatal period are important indicators of recording the data and obtaining information on women, new mothers (with newborns), and neonates. This type of information provides an opportunity for decision-makers to identify the problems, develop an appropriate follow-up process, determine the goals, and undergo a change in order to improve the general health of the community. Moreover, the deaths occurred during this period are indicators of maternal care, maternal health and nutrition, and the quality of care provided for neonates and women and

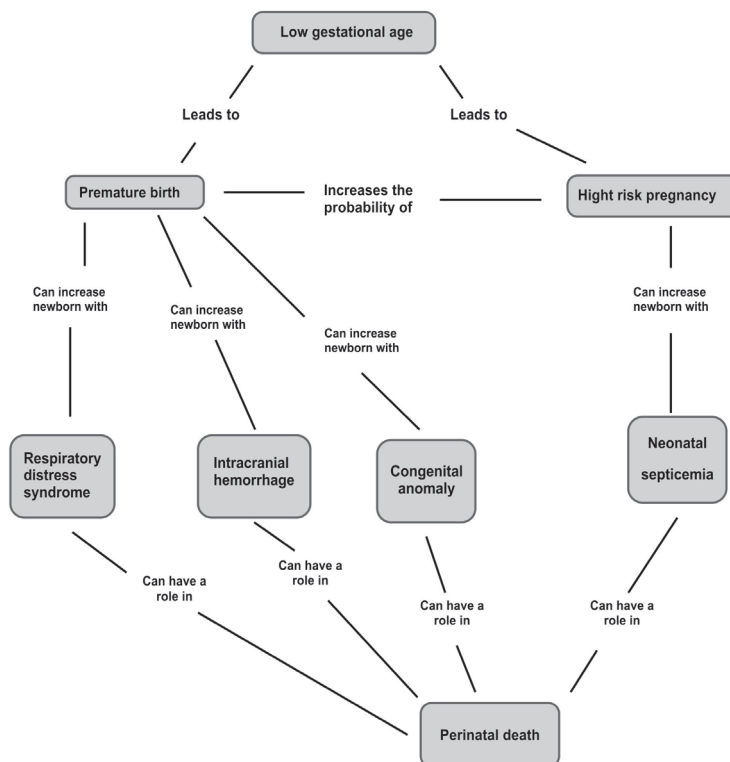


Figure 3. Theory Map Regarding the Causes of Perinatal Death.

that factors related to community, policy, and economics can have an effect on the outcome of delivery. Based on the findings, it is recommended to use internationally valid instruments to record the events and to provide the conditions for comparison.

Conflict of Interests

Authors have no conflict of interests.

Ethical Issues

The present study was approved by the Ethics Committee of Semnan University of Medical Sciences (IR. SEMUMS. REC.1396.39).

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References

1. Henriksson DK, Ayebare F, Waiswa P, Peterson SS, Tumushabe EK, Fredriksson M. Enablers and barriers to evidence based planning in the district health system in

- Uganda; perceptions of district health managers. *BMC Health Serv Res.* 2017;17(1):103. doi:10.1186/s12913-017-2059-9
2. Alipour J, Safari Lafti S, Askari Majdabadi H, Yazdiyani A, Valinejadi A. Factors affecting hospital information system acceptance by caregivers of educational hospitals based on technology acceptance model (TAM): A study in Iran. *The IIOAB Journal.* 2016;7(8):119-123.
3. Ziari A, Binaei F, Ansari M, Valinejadi A. The gap between the service quality and patients' expectations in amir-al-momenin hospital of Semnan university of medical sciences in 2016, Semnan, Iran. *Koomesh.* 2018;20(2):221-227.
4. Ghoochani M, Kahouei M, Hemmat M, Majdabadi HA, Valinejadi A. Health information technology and health care activists: Where is the place of Iranians? *Electron Physician.* 2017;9(10):5657-5662. doi:10.19082/5657
5. Sadoughi F, Hemmat M, Valinejadi A, Mohammadi A, Askari Majdabadi H. Assessment of Health Information Technology Knowledge, Attitude, and Practice among Healthcare Activists in Tehran Hospitals. *International Journal of Computer Science and Network Security.* 2017;17(1):155-158.
6. Safdari R, Ghazi Saedi M, Valinejadi A, Bouraghi H, Shahnnavazi H. Technology Acceptance Model in health care centers of Iran. *International Journal of Computer Science and Network Security.* 2017;17(1):42-47.
7. Emadi A, Ghoochani M, Zarei J, Mohammadi A, Hemmat M, Valinejadi A. Evaluation of hospital information system performance from the perspective of users in educational hospitals. *International Journal of Computer Science and Network Security.* 2017;17(7):336-340.
8. Igberase G. Perinatal mortality in a rural referral hospital in the Niger Delta, Nigeria. *Afr J Med Health Sci.*

- 2014;13(1):47-50. doi:10.4103/2384-5589.139443
9. Allanson ER, Muller M, Pattinson RC. Causes of perinatal mortality and associated maternal complications in a South African province: challenges in predicting poor outcomes. *BMC Pregnancy Childbirth*. 2015;15(1):37. doi:10.1186/s12884-015-0472-9
 10. Man J, Hutchinson JC, Heazell AE, Ashworth M, Levine S, Sebire NJ. Stillbirth and intrauterine fetal death: factors affecting determination of cause of death at autopsy. *Ultrasound Obstet Gynecol*. 2016;48(5):566-573. doi:10.1002/uog.16016
 11. Garg S, Kumar N. Analysis of factors responsible for intrauterine fetal death in rural pregnant women at tertiary care centre of Northern India. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(9):4071-4074. doi:10.18203/2320-1770.ijrcog20174064
 12. Ghasemi F, Vafaenasab M, Ebrahimi Firoozabadi M, Sardadvar N, Zare M. Evaluating Rate and Causes of Perinatal Mortality in Hospitals of Yazd Province in 2012. *Journal of Shahid Sadoughi University of Medical Sciences*. 2015;23(9):819-832.
 13. Esmaelzadehsaeieh S, Zahmatkesh E, Rahimzadeh M, Azami N. Assessing the Cause of Prenatal Mortality in Medical Centers of Alborz Province. *J Holist Nurs Midwifery*. 2016;26(4):19-26.
 14. Vasak B, Verhagen JJ, Koenen SV, et al. Lower perinatal mortality in preterm born twins than in singletons: a nationwide study from The Netherlands. *Am J Obstet Gynecol*. 2017;216(2):161.e161-161.e169. doi:10.1016/j.ajog.2016.10.005
 15. Hinkle SN, Sjaarda LA, Albert PS, Mendola P, Grantz KL. Comparison of methods for identifying small-for-gestational-age infants at risk of perinatal mortality among obese mothers: a hospital-based cohort study. *Bjog*. 2016;123(12):1983-1988. doi:10.1111/1471-0528.13896
 16. Khatamidoust F, Vakilian K, Fattahi Bayat G. Study of perinatal mortality risk factors in Taleghani hospital (Arak-Iran). *Journal of Medical Council of Islamic Republic of Iran*. 2010;28(1):56-61.
 17. Tashiro J, Perez EA, Sola JE. Reduced Hospital Mortality With Surgical Ligation of Patent Ductus Arteriosus in Premature, Extremely Low Birth Weight Infants: A Propensity Score-matched Outcome Study. *Ann Surg*. 2016;263(3):608-614. doi:10.1097/sla.0000000000001228
 18. Diaz J, Arroyo V, Ortiz C, Carmona R, Linares C. Effect of Environmental Factors on Low Weight in Non-Premature Births: A Time Series Analysis. *PLoS One*. 2016;11(10):e0164741. doi:10.1371/journal.pone.0164741
 19. Wilson E, Maier RF, Norman M, et al. Admission Hypothermia in Very Preterm Infants and Neonatal Mortality and Morbidity. *J Pediatr*. 2016;175:61-67.e64. doi:10.1016/j.jpeds.2016.04.016
 20. Norheim OF, Jha P, Admasu K, et al. Avoiding 40% of the premature deaths in each country, 2010-30: review of national mortality trends to help quantify the UN sustainable development goal for health. *Lancet*. 2015;385(9964):239-252. doi:10.1016/s0140-6736(14)61591-9
 21. Ramanathan R, Bhatia JJ, Sekar K, Ernst FR. Mortality in preterm infants with respiratory distress syndrome treated with poractant alfa, calfactant or beractant: a retrospective study. *J Perinatol*. 2013;33(2):119-125. doi:10.1038/jp.2011.125
 22. Kurland G, Deterding RR, Hagood JS, et al. An official American Thoracic Society clinical practice guideline: classification, evaluation, and management of childhood interstitial lung disease in infancy. *Am J Respir Crit Care Med*. 2013;188(3):376-394. doi:10.1164/rccm.201305-0923ST
 23. Paridaans NP, Kamphuis MM, Taune Wikman A, et al. Low-Dose versus Standard-Dose Intravenous Immunoglobulin to Prevent Fetal Intracranial Hemorrhage in Fetal and Neonatal Alloimmune Thrombocytopenia: A Randomized Trial. *Fetal Diagn Ther*. 2015;38(2):147-153. doi:10.1159/000380907
 24. Winkelhorst D, Kamphuis MM, de Kloet LC, Zwaginga JJ, Oepkes D, Lopriore E. Severe bleeding complications other than intracranial hemorrhage in neonatal alloimmune thrombocytopenia: a case series and review of the literature. *Transfusion*. 2016;56(5):1230-1235. doi:10.1111/trf.13550
 25. Gatt M, England K, Grech V, Calleja N. Contribution of Congenital Anomalies to Neonatal Mortality Rates in Malta. *Paediatr Perinat Epidemiol*. 2015;29(5):401-406. doi:10.1111/ppe.12206
 26. Cui H, He C, Kang L, et al. Under-5-Years Child Mortality Due to Congenital Anomalies: A Retrospective Study in Urban and Rural China in 1996-2013. *Am J Prev Med*. 2016;50(5):663-671. doi:10.1016/j.amepre.2015.12.013
 27. Fairchild KD, Schelonka RL, Kaufman DA, et al. Septicemia mortality reduction in neonates in a heart rate characteristics monitoring trial. *Pediatr Res*. 2013;74(5):570-575. doi:10.1038/pr.2013.136
 28. Wynn JL, Scumpia PO, Stocks BT, et al. Neonatal CD71+ Erythroid Cells Do Not Modify Murine Sepsis Mortality. *J Immunol*. 2015;195(3):1064-1070. doi:10.4049/jimmunol.1500771

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