Neonatal and prenatal causes of death in Gorgan-North of Iran

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Abstract

Background: Reduction of neonatal mortality rate can improve health and newborn status of the society. This study was done to evaluate the prevalence and pattern of causes for neonatal mortality in Gorgan, North of Iran. Methods: this descriptive, cross-sectional study was carried out on all birth in the maternity Dezyani hospital in Gorgan, North of Iran during 1 September 2008 -31 March 2011. Causes of mortality were evaluated in newborns that admitted and died in the NICU. Died newborns were screened for primary and final causes of death. The final causes of the mortality in majority of neonates were extracted according to the International Coding of disease Ver10 (ICD10).

Results: The total number of births was14785. The leading primary obstetric causes of death were: spontaneous preterm labor 36(25.7%), fetal abnormality 31(22.1%), hypertensive disorders 21(15%), unexplained intrauterine death 21(15%), maternal disease 12 (8.6%), intra-uterine growth restriction (IUGR) 10 (7.1%), oligohydroamnios 5(3.6%) and ante partum hemorrhage 4 (2.9%). Mortality rate was 76.8% during the first week of life. General final causes of death were; pulmonary bleeding17.9%, septic shock16.8%, IVH15.8%, congenital anomalies and pnomotorax 13.7% in fourth grade.

Conclusion: The risk factors, main associated reason and procedures for prevention of spontaneous preterm labor and fetal abnormality should be includes as the main themes in perinatal research. In addition, there should be emphasized on necessity of genetic consultations and health care before and during pregnancy.

Keywords: Neonatal, Prenatal, Causes of death.

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Introduction

The neonatal mortality rate (NMR) involves infants´ death under 28 days which considered to be an important index for evaluating of public health (1).

First step for decreasing NMR is to assess various causes of mortality and morbidity in neonatals (2).

The Studies in Iran and other countries have showed that most of infant mortality happens during neonatal period, especially in the first week (3-6).

Annually one hundred thirty million neonates born around the world, in which four million die in the first 28 days of life (4-6, 7-10), while 20 thousand infants die before first 30 days of their life, in Iran (11).

Ninety nine percent of the death occur in the developing countries especially in South Asia and sub-Saharan African (7,12,13).

During the last decades, an improvement has been perceived in the mortality indicators in Iran, for instance U5MR and IMR indicator reduced from 135 and 100 per 1000 in 1976 to 36 and 71.14 per 1000 in 2009, respectively (14).

Obviously, low birth weight and prematurity are associated causes of neonatal mortality (15), in Iran; low weight, prema-

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turity, birth defects and infectious diseases are factors affecting neonatal death (16.17).

Regarding the importance of prenatal mortality and lack of documented data about neonatal death in our area, the present study was designed in order to discover the neonatal death etiologic factors in Northern Iran.

Methods

This cross sectional study was undertaken on all births (14,785), to identify details of all deaths registered in Dezyani Hospital including information on fetal (stillbirths) and neonatal deaths (deaths that occurr in live births up to 28 days of age), from September 2008 – March 2011, in Dezyani- a referral and a teaching hospital, which is the main site for about 80% of deliveries in Gorgan- a capital city in Golestan province in the north of Iran. This hospital has an annual rate of more than 6000 deliveries, accounting for 20% of annual birth in Golestan province of Iran. Golestan province has a population of about 1.8 million.

Patients are usually from moderate to low socioeconomic class families. To investigate cause of deaths, at a monthly stillbirth meeting held by a pediatrician and obstetrician in this center, for each baby these criteria were considered: (a) late abortion – a baby weighing: 500 g ,but of less than 28 weeks gestation or, if gestational age was unknown, weighing < 1000 g ,both live born and stillborn babies were included in this category;(b) stillbirth : any fetus without a heartbeat or any other sign of life or after 28 weeks' gestation or, if the gestational age was unknown, weighing ≥ 1000 g; (c) early neonatal death : a baby of≥ 28 weeks' gestation or, if gestation was unknown, weighing ≥1000 g born with a heartbeat but dying ≤ 7 days postpartum; (d) late neonatal death : a baby of≥ 28 weeks' gestation or, if gestation was unknown, weighing≥ 1000 g born with a heartbeat and dying after 7 days but ≤ than 28 days postpartum;(e) prenatally related infant death - an infant surviving the neonatal period but dies while still in hospital due to complications arising in the prenatal period,; and (f) total prenatally related wastage (TPRW) - the sum of all late abortions, stillbirths, early neonatal deaths, late neonatal deaths and prenatally related infant deaths.

A checklist was designed for gravid, residential area, gestational age, baby sex, and weight, duration of bedridden in NICU, kind of delivery and pregnancy risks. Causes of death were classified according to international coding of death version 10 (ICD-10).

The classification system was non-hierarchical and allowed for the identification of the following obstetric cause of neonatal death. Preterm labor (<37weeks), premature rupture of membranes, ante partum hemorrhage, infection, intra uterine growth retardation, hypertension, fetal abnormality, maternal disease, trauma and un explained intra uterine death.

Congenital abnormalities included chromosomal and somatic malformations.

Each outcome of delivery routinely visited by a neonatologist and the final diagnosis confirmed by another neonatologist (Dr. Mirfazeli).

Results

Recorded from 14785 births, neonatal mortality and stillbirths rates were 6.42 and 3.04 per 1000 births respectively. There were sixty nine multiple pregnancies that, 65 pairs of twins delivered.

The women were enrolled at 23-40 weeks′ gestation. Forty eight and nine percent of mothers were first and 51.1% second gravid.

Three percent (95 of 3195 newborns′ bedridden) of infants admitted in NICU died after therapy.

The intra uterine fetal deaths (IUFD) were male 27(60%) and female 18(40%). The live born infants were fifty seven male (60%) and thirty eight female (40%).

The primary obstetric cause of death or bedridden is shown in Table1 .The highest losses were in the less than 1500 g group, accounting for 69.5% of live birth (Table 2).

Table1. Total primary obstetric cause of death

Primary obstetric causes	Still birth	Early neonatal death	Late neonatal death	Total prenatally related infant death (%)
Spontaneous preterm Labour	10	19	7	36(25.7)
hypertension	6	9	6	21(15)
IUGR	-	9	1	10(7.1)
Fetal abnormality	11	16	4	31(22.1)
Maternal disease	5	4	3	12(8.6)
Ante partum hemorrhage	-	4	-	4(2.9)
Oligohydroamnios	2	2	1	5(3.6)
Unexplained intra-uterine death	11	10	-	21(15)
Total (%)	45(32.1)	73(52.2)	22(15.7)	140

Table2. Primary Obstetric cause of death in birth weight categories in live births

Primary obstetric causes	>1500 gr	1500-2499 gr	≥2500 gr
Spontaneous preterm Labour	18	3	4
hypertension	12	2	1
IUGR	9	1	-
Fetal abnormality	9	9	2
Maternal disease	4	-	3
Ante partum hemorrhage	1	1	-
Oligohydroamnios	3	-	-
Unexplained intra-uterine death	10	3	-
Total (%)	66(69.5)	19(20)	10(10.5)

In the group with spontaneous preterm labour, 20 deaths were due to premature rupture of membranes (7 had poly hydroamnios), one was due to an incompetent cervical os and one had bicorn uterus.

In the group of deaths caused by ante partum hemorrhage was in consist of placenta previa and abruption placenta.

In group of deaths which primarily caused by hypertension, 19 were associated with preeclampsia. The fetal deaths due to maternal disease 5 for diabetes mellitus, 2 hypothyroid and 5 addicted. The respiratory disorders were responsible for 52% of early neonatal death had the common cause of neonatal death was pulmonary bleeding, septic shock, IVH, birth defect and pneumothorax, respectively (Table 3).

Out of the 95 neonatal deaths, 54.7% and 76.8% occurred in the first 48 hours and within 7 days, respectively.

According to our result there was a significant association between neonatal death and weight under 1500 gr and 1500gr-2500gr, respectively (p=0.001, CI95%; 0.439-0.442) (p<0.001, CI95%; 25.15-1117.55).There was not significant correlation between neonatal death and gender (OR=1.44 CI95%:0.96-2.18).

There was a significant correlation between gestational age (≤37 in compared with> 37 week), premature rupture of membrane time (PROM<12h in compared with≥ 12h) in neonatal deaths groups (p<0.001).

Preterm newborns comprised 95.8% of the total neonatal deaths including 82.1%< 34 wks, 13.7% (35 – 37 wks) and 4.2%> 37 wks of gestational age.

Type of delivery was cesarean section in 91.8% of LBW births (45) and 51.6% of neonatal deaths. Frequency of

Neonatal death was 48.4% in vaginal delivery. Prematurity was found in 95.8% of neonatal deaths and 93.4% in stillbirths.

Discussion

Evaluation of cause of infant death is a first step toward decreasing the death. Several studies have been conducted around the world and it is seams that improving the survey can help to prevent and predict death, among infants.

In this study, the first of primary obstetric cause of death was spontaneous preterm labor which was similar to Majeed-Saidan et al [18], Boskabadi et al [19], Javanmardi et al [20] and Jonqorban et al [21], but in Quonita Talip et al, was the second cause [22] and in Metin Alim et al study [23] was

Table3. Final cause of neonatal death according gender and ICD10 code

Variable	ICD10 code	Male	Female	Total (%)
Pulmonary bleeding	P26	11	6	17(17.9)
Septic Shock	P36.9	6	10	16(16.8)
IVH (intraventricular hemorrhage)	P10.2	10	5	15(15.8)
Pneumothorax	P24	6	7	13(13.7)
Birth defects	Q	8	5	13(13.7)
Nosocomial infection	P00.2	4	3	7(7.4)
PFC (Persistent fetal circulation)	P29.3	5	1	6 (6.3)
Asphyxia	R09.01	3	0	3(3.2)
DIC (Disseminated intravascular coagulation)	D65	1	1	2(2.1)
RDS (respiratory distress syndrome)	P22.0	2	0	2(2.1)
IEM (Inborn Errors of Metabolism)	E71.42	0	1	1(1.1)

in third cause of neonatal death. This can be due to unsuitable health care in pregnancy or quality of NICU departments in this area.

Fetal abnormality was the second of primary obstetric cause of death which was similar to Majeed-Saidan et al (18), Javanmardi et al (20) and Jonqorban et al (21), but in Quantina Talip et al (22) and Jehan et al (24) was in fifth grade, that it can be due to high prevalence of congenital abnormalities in that region.

Fifty four percents of neonatal death occurred in the first 48 hours and 76.8% within 7 days, that was similar to Jehan et al study (24).

In our study, a significant association between neonatal death and infant weight was found which was similar to Jehan et al (24) and Golestan et al study (25), thus LBW and especially VLBW can be major predictors for morbidity or mortality in infants.

However, 51.6% of neonatal death occurred in cesarean section but it did not had correlation with neonatal death but in Jehan et al study, neonatal death was higher in cesarean sections than vaginal deliveries (24).

Neonatal mortality was higher in males than females which was similar to Kamal et al study (26), but in Jehan et al study it was inversed (24).

In our study, there was a significant association between neonatal mortality and residency but such no association found in Kamal et al (26) study.

Prematurity in our study was 95.8% but it was57.4% in Boskabadi et al (Iran) (19). Prematurity problems and fetal abnormali-

ties were the commonest cause of neonatal death in our hospital same as Javanmardi (20) and Jonqorban et al study (21). Preterm birth prevention is very important by effective prenatal care.

The respiratory disorders were first cause of neonatal death in present study which was similar to Metin et al in Turkey (27).

Congenital malformation is one of important causes of fetal and neonatal mortality. Suitable prenatal diagnosis and early treatment can decrease intensity of problems. In the study of Metin Alim et al (23) congenital heart disease was the most common anomaly, while the Nervous system, gastrointestinal and renal system anomalies were the most common causes of death in that study. Unfortunately, it seems prenatal care; early diagnosis and intensive care were inadequate.

Congenital anomaly and prematurity were the main causes of early neonatal mortality in our study which was similar to Karabulut et al (28) and Boskabadi et al (19) studies.

Moreover, it is necessary to instate cooperation network of neonatologist as a healthy organization for assessment and progressing the efficiency of neonatal care. There is also a need for new technologies in NICUs and professional training for doctors and nurses.

Conclusion
According to primarily obstetric causes of death and pattern of final cause of neonatal death in the present study, prevention of preterm labor and neonatal low birth weight, can prevent congenital diseases and

suitable of prenatal care, could be an effective way in reducing neonatal mortality in our area.

Limitations

Chromosomal and genetic tests, was not possible in our study.

Acknowledgements

References

1. Bala Ghafari A, Siamian H, Aligolbandi K, Rashida S. Sh. Survey of characteristics of neonatal death in neonatal intensive care unit of Boo-Ali Sina educational & therapeutic center between 2003-2006 J Mazand UniMed Sci 2009; 20(74):79-83 (Persian).

2- Moss W, Darmstadt G L, Marsh D R, Black R E, and Santosham M. Research Priorities for the Reduction of Perinatal and Neonatal Morbidity and Mortality in Developing Country Communities. J perinat Med, 2002; 22: 484-495.

3. Lawoyin TO. Risk factors for infant mortality in a rural African community. Soc Health. 2001; 121(2):114-8.

4. Esmail Nasab N, Majidzadeh SR, Nadim A.An epidemiologic study of neonatal mortality and fetal death and risk factors in Kordestan. Hakim Research Journal (Persian). 2001; 4(4):272-7.

5. Jehan I, Hariris H, Salat S, Zeb A, Moobin N, Pasha O, ET al. Neonatal mortality, risk factors and causes: a prospective population-based cohort study in urban Pakistan.Bull World Health Organ 2009 Feb; 87(2); 130-8.

6. Lawn JE, Kerber K, Enweronu-Laryea C, Massee Bateman O. Newborn survival in low resource setting –are delivering? BJOG 2009 Oct: 116(Supp11):49-59.

7. Malqvist M. Neonatal mortality: an invisible and marginalized trauma. Global Health Action 2011; 4: 5724.

8. Black RE, Cousens S, Johnson HL, Lawn JE, Rudan I, Bassani DG, et al. Global, regional, and national causes of child mortality in 2008: asystematic analysis. Lancet 2010; 375:1969-87.

9. Lawn JE, Kerber K, Enweronu-Laryea C, Massee Bateman O. Newborn survival in low resource settings –are we delivering? BJOG 2009; 116:49-59.

10. World Health Organization (WHO). The world health report 2005: make every mother and child count. Geneva, Switzerland, 2005.

11. [Neonatal Status of Iran and provide solution to reduce neonate's mortality].Tehran: Ministry of Health; 2008. [In Persian]

12. Rajaratnam JK, Marcus JR, Flaxman AD, Wang H, Levin-Rector A, Dwyer L, et al. Neonatal, postneonatal, childhood and under-5 mortality for 187 countries, 1970-2010: a systematic analysis of progress towards Millennium Development Goal 4. Lancet 2010; 375:1988-2008.

13. Titaley CR, Dibley MJ, Agho K, Roberts CL and Hall1 J. Determinants of neonatal mortality in Indonesia. BMC Public Health 2008; 8:232.

14. Amani F, Kazemnejad A, Habibi R. Changing Pattern of Mortality Trends in Iran, South, South-West Asia and World, 1970-2010. Iranian J Publ Health, Vol. 39, No.3, 2010; 20-26.

15. Hamilton BE, Minin AM, Martin JA, Kochanek KD,Strobino DM, Guyer B. Annual summary of vital statistics: 2005. Pediatrics 2007; 119: 345-360.

16. Naghavi H. Death appearance in 18 provinces of the country, 2001.

17. Jehan I, Harris H, Salat S, Zeb A, Mobeen N, Pasha O, et al. Neonatal mortality, risk factors and causes: a prospective population-based cohort study in urban Pakistan. Bull World Health Organ 2009; 87:130–138.

18. Majeed saidan M.A, Kasblan F.T, Al-Zabrani A.A, Ezzedeen F.Y, Ammari A.N. Pattern of neonatal and post neonatal death over a decade (1995-2004) at a Military Hospital in Saudi Arabia. Saudi Med J 2008; 29(6):879-883.

19. Boskabadi H, Parvini Z, Barati T, Moodi A. Prenatal complications causing neonatal jaundicein Ghaem Hospital, Mashhad- Iran Journal of North Khorasan University of Medical Sciences 2011; 3(2): 7-12.

20. Javanmardi Z, Beigi M, Nouhpisheh E, Memarzadeh M, Radan M.R. The reported causes for neonatal death in hospitals of Isfahan province in 2005. IJNMR 2008; 13(2): 87-89.

21. Janqorban R. A comparison study of the frequency of causes of neonatal death in Fars province during 2004 and 2005. Mother and Neonate Health 2006; 5: 33.

22. Talip Q, Theron G, Steyn W, Hall D. Total perinatally related losses at Tygerberg Hospital –a comparison between 1986, 1993 and 2006 SAMJ. 2010; 100(4)

23. Metin Alim F, Ovali F. Changing Rates of Perinatal Mortality in İstanbul. The New Journal of Medicine 2013; 30(1):19-22

24. Jehan I, Haris H, Salat S, Zeb A, Moobin N, Pasha O, Et al. "Neonatal mortality, risk factors and causes: a prospective population-based cohort study

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in urban Pakistan." Bull World Health Organ. 2009;116(11): 49-59.

25. Golestan M, Fallah R Akhavan Karbasi S. Neonatal mortality of low birth weight infants in Yazd, Iran. Iranian Journal of Reproductive Medicine 2008; 6(4): 205-208.

26. Kamal SMM, Ashrafuzzaman M, Nasreen SA. Risk factors of neo natal Mortality in Bangladesh. J Napal paediatr. soc. 2012; 32(1):37-46.

27. Metin Alim Fa, Ovali F, Kamil Z. Changing Rates of Perinatal Mortality in İstanbul. The New Journal of Medicine 2013; 30(1):19-22.

28. Karabulut A, İstanbullu B, Karatan T, Özdemir K. Two year evaluation of infant and maternal mortality in Denizli. Journal of Turkish-German Gynecology Association 2009; 10:95-8.