IJN
Iranian Journal of Neonatology
http://ijn.mums.ac.ir

Open Access
Original Article

Neonatal Medicine in Iran: Current Challenges and Prospects

Golnaz Rezaeizadeh[1], Fatemeh Nayeri[2], Maryam Mahmoodi[2], Mamak Shariat[1], Shahrbanoo Nakhaei[3]*

1. Family Health Institute, Maternal, Fetal, and Neonatal Research Center, Tehran University of Medical Sciences, Tehran, Iran
2. Family Health Institute, Breast Feeding Research Center, Tehran University of Medical Sciences, Tehran, Iran
3. Pediatric Department of Ali-Asghar Hospital, Iran University of Medical Sciences, Tehran, Iran

ABSTRACT

***Background*:** Pediatric medicine in Iran has been known as a specialty for more than 50 years; nevertheless, the neonatal-perinatal medicine is still in the first decades of its life. Regarding this, the present study was conducted to provide an overall view of the current situation of the neonatal medicine, its challenges, and prospects in Iran.
***Methods*:** For the purpose of the study, a questionnaire was sent to 62 neonatologists via post or email. The collected data included the current condition of available equipment, facilities, and human resources in the neonatal wards. Furthermore, the neonatologists were asked about the most important step to be taken in terms of the neonatal health.
***Results*:** Out of the 62 neonatologist, who received the questionnaire, 38 (61%) cases filled out the instrument. Based on the collected data, the presence of some services in the hospitals under investigation was reported to be indicative of some defects in the neonatal health system. These services included neonatal and pediatric development evaluation clinics (39.3%), psychology counseling sessions (25%), and access to placental and fetal pathology (53.3%). Significant shortage of human resources were mainly related to the lack of certain breast feeding consultant (25.7%), absence of social workers (24.1%), clinical pharmacists (75.9%), and genetic specialists (50%).
Conclusion: As the findings of the present study indicated, the most important deficiency in our health system was the incomplete establishment of perinatal regionalization system.

Keywords: Equipment and supplies, Health services, Hospital, Intensive care units, Neonatal

Introduction

The necessity of paying serious attention to the children's health was revealed nearly four centuries ago. Accordingly, pediatrics was gradually given high degree of importance among other fields of medicine in the European countries. Neonatal medicine originally dates back to two centuries ago, when a large number of scholars and physicians made great efforts in this regard. Pediatric medicine in Iran has been known as a specialty for more than 50 years; nevertheless, the neonatal-perinatal medicine is still in the first decades of its life (1).

It is notable that the neonatal mortality index was 30 cases per 1,000 live births in Iran before the Islamic revolution (1978); however, it dropped to around half, i.e., 11 case per 1,000, in 2012 (2). Therefore, in addition to training fellows, it is of paramount importance to pay more serious attention to integrated postnatal care and services. Moreover, training the health workers in charge of neonatal care, neonatal resuscitation, promotion of breastfeeding, prevention of hyperthermia, stabilization and transfer of ill neonates, standardization of neonatal wards, development of the Neonatal Intensive Care Units (NICUs), and above all perinatal regionalization is a considerably essential issue (3).

With this background in mind, the present study was conducted to provide an overall view on the current status, challenges, and prospect of neonatal medicine in Iran. We strongly hope that the documents presented in this study would greatly help the policy makers and health authorities to plan and implement programs targeting the promotion of the neonatal health

* *Corresponding author:* Shahrbanoo Nakhaei, Pediatric Department of Ali-Asghar Hospital, Iran University of Medical Sciences, Tehran, Iran. Tel: 00982166591316; Fax: 00982166591315; Email: snakhaei@yahoo.com

Please cite this paper as:
Rezaeizadeh G, Nayeri F, Mahmoodi M, Shariat M, Nakhaei Sh. Neonatal Medicine in Iran: Current Challenges and Prospects. Iranian Journal of Neonatology. 2017 Jun: 8(2). DOI: 10.22038/ijn.2017.20536.1230

status and development index in Iran.

Methods

This study was conducted within 2011-2013. For the purpose of the study, a researcher-made questionnaire was sent to 62 subspecialists of neonatal medicine throughout the country by means of post or email. The questionnaire was based on a standard checklist applied for the evaluation of the medical centers providing maternal and child healthcare services. This checklist was utilized by the Ministry of Health and Medical Education for rating the prenatal services. Since the checklist also covered the areas of obstetrics and gynecology, it was revised and irrelevant topics were excluded.

Subsequently, a focus group discussion consisting of five neonatal subspecialists was held to consult and share their views concerning the questionnaire to finalize its content and questions. This questionnaire enquired about the information related to the equipment, facilities, and personnel in the wards, where the participants were working. The neonatologists were also asked about the most important step to be taken in terms of the neonatal health.

After the implementation of the necessary modifications, the questionnaire was administered as a pilot study on six neonatologists working at the Rasul Akram and Vali-e Asr hospitals (in the Imam Khomeini Hospital Complex), Tehran, Iran. After the pilot study, the questionnaire was revised for validity and reliability, rendering a Chronbach's alpha of 0.85.

These 62 subspecialists were selected from the list of all neonatologists (n=167) of the Iranian Association of Neonatology. Based on the available data, if two or more subspecialists were working in one NICU, just one was included in the study. The chiefs and NICU physicians, who were not neonatal subspecialists, did not enter the study. The cases who worked only in the private offices or were not actively involved due to travelling abroad, immigration, or being in fellowship training were excluded from the study.

Ultimately, a total of 62 subspecialists entered the study. These participants were asked to fill out the questionnaire via a telephone conversation at least twice. The participants were informed that the results would be given to the association of neonatal medicine to develop a data bank in this field in the future.

Results

According to the results, 55.6% of the participants were male. Out of the 62 neonatologists, 38 (61%) cases responded to the questionnaire, 91.2% of whom were working in the teaching hospitals. Based on the collected data, 62.9%, 11.4%, 17.1%, and 8.6% of the participants were working in the general, pediatric, women's, and two specialty (i.e., women and pediatric) hospitals, respectively. Regarding the care services, 91.2% of these hospitals provided stages 1, 2, and 3 care for the mothers, neonates, or both.

Furthermore, 13.5% of these hospitals did not have NICU. The approximate number of deliveries in the hospitals with labor ward ranged within 400-11,408 cases annually, rendering a total of 122,036 births taking place per year. However, a mean of 3,936.65 births occurred in each hospital. The approximate number of birth in all hospitals except for three was above 1,000 births per year.

Status of newborns

The prevalence and rate of birth weight less than 2,500 g were 20-4563 births and 13.3% in the hospitals under investigation, respectively. Furthermore, the prevalence and rate of birth under 38 gestational weeks were 17-6251 cases and 14.8%, respectively. The mortality rate of the neonates with the weight of 1,000-2,500 g was less than 50% in all the study wards. However, this rate was more than 50% in the neonates weighing less than 1,000 g in 65% of the wards.

In addition, while 60% of the neonates with less than 30 gestational weeks were found to have a mortality rate of above 50%, this rate was less than 50% in the neonates with above 30 weeks of gestation. A total of 7,194 neonates annually underwent mechanical ventilation in these hospitals, i.e., around 5.8% of all births per year. In other words, in each of the wards under study, an average number of 299.75 neonates (range: 5-2555, median: 90.5) annually received mechanical ventilation, which was about 7.6% of births occurring per year in each hospital.

The mean duration of mechanical ventilation was 6.1±3 days (range: 3-14 days). In addition, 437 newborns were annually diagnosed with chronic lung disease, which constituted about 0.35% of all births in these hospitals per year. In other words, an average of 17.48 neonates (range: 0-120, median: 9) were admitted to each ward with this diagnosis per year, corresponding about 0.44% of births in each hospital per year.

A total number of 1,038 neonates (i.e., almost 0.85% of all births in each hospital per year) were annually admitted with the diagnosis of symptomatic patent ductus artheriosus (PDA),

who underwent either surgery or medication therapy. In other words, an average number of 41.52 newborns (range: 0-250, median: 20) were admitted to each ward with the diagnosis of symptomatic PDA, representing around 1.05% of births in each hospital per year.

Annually, 2,263 neonates (about 1.85% of all births in these hospitals per year) were born with diagnosed or evident anomalies. Accordingly, an average of 102.86 neonates (range: 5-1426, median: 35) were annually born with abnormalities, corresponding about 2.6% of all births in each hospital per year. Each year a total of 258 newborns (about 0.2% of all births of these hospitals per year) were affected by retinopathy of prematurity (ROP), requiring treatment. Therefore, an average of 9.5 neonates (range: 0-90, median: 4) were affected by this disease, constituting around 0.24% of all births in each hospital each year.

A total of 1,287 neonates were annually transferred from these wards to other hospitals, i.e., an average of 30.25 newborns (range: 0-217, median of 9.5). Some of the most important reasons for the transfer of neonates to other hospitals included the demand for surgery (mainly neurosurgery and cardiac surgery), followed by financial and insurance problems, emergent consultation, and lack of hospital beds.

In addition, 932 newborns were annually transferred to these wards from other hospitals, representing an average of 53.63 neonates (range: 0-200, median: 27.5) to each ward per year. The most significant reasons that the neonates were transferred to these wards were mainly the serious need for the NICU ward, followed by the demand for surgery, emergent consultation, as well as financial and insurance problems.

According to the available data, the rate of transfer to other hospitals gradually decreased in 28.6% of the wards, which was due to the increase in the number of hospital beds, establishment of new NICUs, and employing neonatal specialist. Furthermore, reduced transfer rate to other hospitals and the transfer from other hospitals increased in 7.1% of the wards under study.

Hospital facilities

The hospitals were equipped with a total number of 550 NICU beds, 476 (86.5%) of which were active. The study wards were examined in terms of facilities and equipment for long- and short-term morbidity monitoring, such as cerebral ultrasound scan, ROP screening, auditory deficiency screening, and neonatal growth intervention. According to the results, all wards, except for two, were found to be equipped with cerebral ultrasound scan (94%).

In addition, 60.5%, 81.7%, and 39.3% of these wards were able to perform ROP screening, auditory deficiency screening, and neonatal growth intervention. However, one ward had none of these facilities, and 33.3% of them had all the required facilities and equipment to perform the respective tests. The first follow-up clinic was established in 1988 in which the physical and developmental growth as well as chronic diseases were monitored and followed up since then. Overall, 51.7% of these hospitals had the possibility to follow up these conditions; nevertheless, 10.3% of them were unable to deliver such care.

In this regard, 82.7% of the hospitals were able to follow up the physical growth, and 65.4% of them could check and follow up development and growth. Nevertheless, only one of these hospitals benefited from a certain follow-up service in terms of child development. Additionally, 68.9% of the hospitals had the possibility to follow up and control the chronic diseases and morbidities.

It is of great importance to state that in addition to the ordinary NICU facilities, 18.2% of our wards had a private room for the parents to visit their neonates, 11.8% of which were acoustic. Furthermore, 74.3%, 39.3%, and 25% of the wards were able to provide consultation on breast feeding, follow up child growth and development, as well as offer psychology services, respectively. It is notable that 50% of the hospitals had access to all biochemistry, clinical, microbiology, hematology, as well as placental and fetal pathology laboratories. However, only 46.7% of them were devoid of biochemistry, clinical, microbiology, and hematology laboratories, and had no access to placental and fetal pathology laboratory.

Hospital educational programs

All of the under study hospitals provided the physicians and nurses with consistent medical education and training and facilitated the access to computer and internet connection. However, consulting sessions with gynecologists and obstetricians as well as consistent educational program on neonatal resuscitation were not available in 8.1% and 5.4% of the hospitals, respectively. Perinatal regionalization system did not exist in most of the provinces except for the hospitals in the Eastern Azerbaijan and Fars provinces, which were a part of this system benefiting from the neonatologists, who participated in this study.

Table 1. Frequency of medical subspecialists in the hospitals under investigation

Specialty	Number of specialists	Range of specialists	Percentage of hospitals equipped with these personnel
Neonatologist	97	1-7	100%
Pediatric pulmonalogist	6	0-3	12.5%
Immunologist/PhD of pediatric immunology	22	0-3	50.1%
Pediatric endocrinologist	31	0-3	56.3%
Pediatric gastrointestinologist	33	0-5	61.4%
Pediatric nephrologist	41	0-4	65.7%
Pediatric hematologist and oncologist	40	0-3	68.7%
Pediatric infectionist	42	0-4	78.7%
Pediatric cardiologist	48	0-5	78.7%
Plastic surgeon	28	0-7	35.5%
Pediatric urologist	13	0-2	40%
Pediatric surgeon	41	0-5	56.2%

Hospital personnel

As shown in Table 1, in terms of the hospital personnel shortage, the pediatric pulmonologists had the highest frequency in this regard. It was notable that only two hospitals did not have any pediatric pulmonologists. Pediatric cardiologist was the most available specialist in these hospitals. There was no gynecologist in three pediatric hospitals. Additionally, there was no perinatologist in 12 out of the 19 general hospitals and 3 out of the 5 women's hospitals; however, there was one perinatologist in each of the two specialty hospitals.

All hospitals benefited from an anesthesiologist; nevertheless, 33.3% (n=9) of them did not have a neurosurgeon. There was a radiologist in all hospitals; however, only 28.6% of them had access to a pediatric radiologist. In addition, 32.1% (about 1.3 hospitals) of the hospitals did not have an ophthalmologist. Furthermore, there were a total of 12 pediatric orthopedists, who were active only in eight hospitals, and the other hospitals had no pediatric orthopedist (72.4%).

There were no ear, nose, and throat specialist, dermatologist, medical genetic specialist, and respiratory therapist in 22.2%, 25.9%, 50%, and 85.2% of the hospitals, respectively. We had a pathologist in all hospitals except for three. There was a clinical pharmacist only in seven hospitals; nevertheless, 75.9% of them had no pharmacist. Approximately one fourth of the hospitals were in shortage of a social worker and feeding consultant (24.1% and 25.7%, respectively). Additionally, four hospitals did not have a medical engineer.

Hospital equipment

The data related to the most important NICU equipments of the hospitals under investigation are shown in Table 2. In answering the last question of the questionnaire, 100% of the neonatologists strongly believed that the most important measure to be taken in terms of neonatal health was the complete implementation of the perinatal regionalization system and provision of biomedical equipment. In addition, they highlighted the importance of directing more serious attention to the qualitative and quantitative supply of human resources needed in the NICUs, defining appropriate tariffs or even modifying the present ones, training more perinatologist, and standardizing the physical environment of the NICUs.

Discussion

The specialized neonatal services in Iran were launched a short time after their initiation in the developed countries, i.e., in the middle of the 80s. Nevertheless, the neonatal medicine was developed and popularized nearly 15 years later. However, this growth has been very slow in case of maternal-fetal medicine, and the educational courses related to this area have been developed for less than 10 years in Iran (1).

Table 2. Percentage of equipped hospitals

Equipment		Percentage of equipped hospitals
Incubator		100%
Infusion pump		91.4%
Syringe pump		88.6%
Mechanical ventilation	CPAP	80%
	IMV/CMV	80%
	AC/SIMV	62.9%
	PSV	60%
	HFV/HFO	37.1%
Cardiopulmonary monitoring		85.7%
Pulse oximetry		94.3%
Portable ultrasound scan/sonography		74.3%
Radiation warmer		94.3%
Air-oxygen mixer		68.6%
Intracranial pressure monitor		2.9%
Capnograph		11.4%
Disposable bacterial filters		50%
Disposable trocar		25.8%

CPAP: continuous positive airway pressure, IMV/CMV: intermittent/continuous mandatory ventilation, AC/SIMV: Assist control/synchronized intermittent mandatory ventilation, PSV: pressure, support, ventilation, HFV/HOV: high-frequency ventilation/ high-frequency oscillatory ventilation

According to the results of this study, 91.2% of the neonatologists worked in the hospitals with three levels of neonatal care (4). Although this was not an ideal situation, these specialists were placed in proper positions to provide specialized services.

The high rate of birth and premature birth as well as low birth weight deliveries in the hospitals under investigation indicated that most of these specialists were working in big or referral centers with a large number of high risk deliveries. Despite the extensive efforts made by the health authorities, specialists, neonatal nursing personnel, and others, which led to a significant decline in the neonatal mortality over the past 30 years, it is still rated 11 cases per 1,000 live births (2).

The important point to take into attention in this study was the high rate of mortality in the newborns with extremely low birth weight (i.e., less than 1,000 g) and less than 30 gestational weeks. Another notable point was the mean duration of ventilation, which was rather short indicating that the cases of chronic lung disease were rare in the NICUs. Further studies should be carried out to reveal if the low rate of chronic lung disease in Iran is due to genetic factors or the defects in services provided for the low birth weight or premature neonates, who are more prone to this disease and die before being affected.

The current study presented some results related to the neonates with respiratory diseases, PDA, and congenital abnormalities annually admitted to the hospitals. These findings can help the hospital managers and authorities of health system to seriously focus on effective supply, distribution of necessary facilities and equipment for treatment, and support of these patients, especially due to the probable load of such diseases. The hospitals with fewer such cases should be considered if they are to be known as the tertiary level of neonatal care and be equipped accordingly.

There were some interesting points to consider in terms of the available biomedical equipment in the wards under study. For instance, it seems that more activities and efforts have been made in equipping the hospitals with modern incubators, which were simultaneously used in Iran as in the USA (1, 5), as well as other facilities and equipment (Table 2). However, some equipment, such as intracranial pressure monitors, antibacterial filters, disposable intravascular trocars, and capnography, have been considered less important (Table 2), which seems logical due to the basics of health economy. However, there were essential weaknesses in other aspects, which should be drawn into attention in order to achieve an acceptable level of neonatal health. The study clearly revealed that some areas associated with the follow-up of the high risk neonates were in emergent and serious need to be taken into attention. These areas included attending to the auditory, cerebral, and visual development, as well as the presence of feeding and nutrition consulting services, psychology, social working services, mother or parents accommodation in hospital, presence of a clinical pharmacist, provision of acoustic environment in the wards, and implementation of inter-department meetings among the gynecologists, obstetricians (or perinatologists), and neonatologists.

The main defect of the health system was reported to be the incomplete perinatal regionalization. The regionalization of the neonatal health care centers began in some European countries from the mid twentieth century. The perinatal regionalization system was first introduced in the US in 1971, which was developed and reviewed within the next years that could play an important role in the promotion of neonatal health and reduction of the mortality rate at this stage of life (6-8).

This system was first introduced about six years ago by the society of the neonatologists, and the first administrative steps have been taken by the Ministry of Health since the last three years. However, only a few wards officially entered this system during the study. One probable reason for the slow regionalization of this system in Iran could be the need for major investment and its high cost.

The most important factors involved in the establishment of this system are management, programmming, and education.

Conclusion

All of the neonatologists involved in this study unanimously agreed that the most important step to be taken was the complete administration of the perinatal regionalization system in order to achieve an acceptable level of neonatal health.

Acknowledgments

Hereby, we extend our gratitude to all the neonatologists throughout the country, who participated in this study and made their best efforts. In particular, we are grateful to Dr. Nili, Amini, Esmaeeli Nia, Mohagheghi, Basir, Marandi, Heidar Zadeh, Habibo-llahi, and Afje-ee, for their great cooperation in this study.

Conflicts of interests

The authors of the present study confirm that they have no conflicts of interest.

References

1. Rezaeizadeh G, Nayeri F, Shariat M. A history of neonatal medicine in Iran. Arch Iran Med. 2014; 17(12):855-61.
2. You D, Hug L, Ejdemyr S, Beise J, Perez-Escamilla R, Moran VH, et al. Levels and trends in child mortality. Estimates developed by the UN Inter-agency Group for Child Mortality Estimation (IGME). Report 2015. Matern Child Nutr. 2016; 52(3):1-6.
3. Amini E, Iranpour R, Bahman Bijari B, Pishva N, Khosravi N, Zahedpasha Y, et al. Customer training programs and specialized courses in neonatal and perinatal. Tehran, Iran: Iranian Council for Graduate Medical Education, Health Ministry; 2009. P. 4-8.
4. Stark AR; American Academy of Pediatrics Committee on Fetus and Newborn. Levels of neonatal care. Pediatrics. 2004;114(5): 1341–1347.
5. Raju TN. From infant hatcheries to intensive care: highlights of the century of neonatal medicine. In: Martin RJ, Fanaroff AA, Walsh AA, editors. Neonatal-Perinatal Medicine: Diseases of the Fetus and Infant. 9th ed. St. Louis: Mosby; 2010. P. 3-18.
6. Ryan GM, Butterfield LJ. Childbirth, American style. JAMA. 1975; 233(5):451.
7. March of Dimes, Committee on Perinatal Health toward Improving the Outcome of Pregnancy. Recommendations for the Regional Development of Maternal and Perinatal Health Services. White Plains, NY: March of Dimes National Foundation; 1976.
8. Rashidian A, Omidvari AH, Vali Y, Mortaz S, Yousefi-Nooraie R, Jafari M, et al. The effectiveness of regionalization of perinatal care services-a systematic review. Public Health. 2014; 128(10):872-85.