Ministry of Health
Republic of Armenia

unicef

ASSESSMENT OF NEONATAL CARE SERVICES AT THE REGIONAL MATERNITY HOSPITALS IN ARMENIA

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Preface

One of the most sensitive indicators in the evaluation of the health care system of a particular country is the infant mortality rate. Governments, international and national organizations have made a tremendous effort in the improvement of child survival rates and the reduction of infant mortality worldwide. However, it is estimated that the reduction of deaths before the age of five has occurred due to lives saved after the first four weeks of life. Neonatal deaths, estimated at nearly four million annually, now account for 36 % of deaths in children under five years of age. Given the fact that the Millennium Development Goal 4 stipulates a reduction by two-thirds the deaths of children aged less than five years, a substantial reduction in neonatal deaths will be required to meet the MDG – 4.

The situation is similar in Armenia. Over the last 10 years extensive political, social and economic changes in Armenia have brought about important reverses in the national health care system. The deteriorating economic situation has reduced financial resources allocated to the health sector, which has had a particularly negative impact on the quality and accessibility of mother and child health care services, including neonatal services, and has lead to inadequate progress in reducing the infant mortality rate, especially the neonatal mortality rate.

The most recent household survey-based estimate of infant mortality is twenty-six per 1,000 live births[1], showing a mild decline from thirty per 1,000 for the 1996-2000 reference period. The reduction in infant mortality is largely attributed to a decline in post-neonatal mortality. As a result, the structure of infant mortality continues to change, with neonatal mortality accounting for more than 77% of infant deaths in 2008 compared to less than 45% in the 1990s. Moreover, infant mortality rates are three times higher among the poorest quintile when compared to the wealthiest quintile. These figures point to poor care-seeking behaviour, an ineffective referral system from the primary-level healthcare facilities to hospitals, as well as shortcomings in the quality of emergency pediatric care at regional hospitals.

The increasing importance of neonatal mortality, combined with the government's priority to improving the mother and child health care, indicates the need for concerted attention in addressing the issue. A firm foundation for this already exists in the country, both in terms of public health structures and practices. At this stage UNICEF wishes to assist the Government of Armenia in the development of a renewed, quality-based and equitable, neonatal care service. Based on the information revealed and analyzed, this study develops a set of recommendations aimed at improving the neonatal care services in the country. These recommendations should provide the Government of Armenia with a solid foundation for consideration and decision-making.

[1] ADHS 2005

Acronyms

CPAP	Continuous Positive Airway Pressure
ICD	International Classification of Diseases
IMR	Infant Mortality Rate
MCH	Mother and Child Health
MDG	Millennium Development Goal
MOH	Ministry of Health
RA	Republic of Armenia
SCJSC	State Closed Joint-Stock Company
UNICEF	United Nation’s Children Fund
WHO	World Health Organization

EXECUTIVE SUMMARY

Infant mortality is one of the most sensitive and comprehensive indicators of the availability, utilization and quality of healthcare services. Moreover, the Infant Mortality Rate (IMR) is considered as one of the most thorough indicators of the overall socioeconomic development of a country. Since 1994 the Government of Armenia and UNICEF have been effectively collaborating in the implementation of activities aimed at the improvement of children's health, and these efforts have contributed to a reduction of the IMR in the country. However, during the last four to five years the IMR appears to have stagnated. This tendency has been caused mainly by the increase in the proportion of neonatal deaths in the age structure of infant and child mortality, **accounting for 77% of infant and 67% of under 5 deaths in 2007,** as well as by the absence of effective strategies aimed at the reduction of neonatal mortality. It seems obvious that without essential improvement of neonatal care services, Armenia cannot ensure further reduction in infant mortality and achievement of the MDG 4.

Due to this alarming situation, the Ministry of Health and UNICEF initiated an assessment of neonatal care services at the regional maternity hospitals. The main objective of the study is to evaluate the quality and organization of neonatal services at the regional level, identify gaps in knowledge and practice, ascertain obstacles in delivering quality services, as well as to develop recommendations in order to strengthen the neonatal services in the country.

The assessment was conducted in thirty facilities by interviewing key personnel and assessing the capacities of the visited facilities in terms of the physical condition of maternity wards, the availability of basic neonatal equipment, supplies and drugs, availability and quality of laboratory services and testing, as well as adequate staffing. The medical practice of health providers on correct diagnosis, along with treatment and compliance of the organization and implementation of neonatal services with approved standards was also assessed through a review of medical records.

The assessment revealed that:

a) None of the visited maternity wards has newborn resuscitation and intensive care units;
b) Almost half of the maternity wards have only one neonatologist and about one-third of employed health providers are near retirement;
c) The majority (about 90%) of neonatologists working in maternity wards are not specialized in neonatology (have not participated in clinical internship), and 13% of neonatologists have never gone through training or have done so more than 10 years ago;
d) The majority of facilities lack basic equipment, supplies and drugs;
e) A lack of standard guidelines and protocols on neonatal care and disease management has lead to incorrect case management;
f) There is insufficient performance of laboratory tests due to outdated equipment and reagents and lack of knowledge on requirements; and
g) Absence of standard recording and reporting system at the facility level.

The main recommendations provided by the working group, based on the findings of the assessment, are:

1. Regionalization and Financing, which includes the establishment of three regional third level neonatal centers and provision of targeted financing;
2. Improvement of human resources by ensuring that all maternity wards have at least two neonatologists by creating incentive mechanisms for attracting specialists to the regions;
3. Enhancement of training opportunities particularly for regional health providers and revision of the content and modality of training courses;
4. Establishment of an Intensive Neonatal Care Unit in all regional maternities with essential equipment and supplies;

5. Revision of standards on laboratory tests and examinations;
6. Development and introduction of standardized and updated recording and reporting systems and standardized newborn case history forms; and
7. Introduction of standard guidelines and protocols for neonatal care and management of neonatal diseases as well as development of organizational standards.

INTRODUCTION

Infant mortality is one of the most sensitive and comprehensive indicators of the availability, utilization and quality of healthcare services. Since 1994 the Government of Armenia and UNICEF are effectively collaborating in implementation of activities aimed at improvement of children's health, and these efforts contributed to reduction of IMR in the country. However, during the last four to five years the infant mortality appears to have stagnated. This alarming tendency is conditioned mainly by the increase of proportion of neonatal death in the age structure of infant and child mortality, **accounting for 77% of infant and 67% of under 5 deaths in 2007** and absence of effective strategies aimed at reduction of neonatal mortality. It seems obvious that without essential improvement of neonatal care services Armenia can not ensure further reduction in infant mortality, and achievement of the MDG 4.

Having this alarming situation the Ministry of Health and UNICEF initiated the assessment of neonatal care services at the regional maternity hospitals. From 01/06/08 – 15/06/08, a working group established by the Ministry of Health studied and evaluated the organization and quality of neonatal services in thirty health facilities providing obstetric services and obstetrics/gynecology departments in all of the ten Marzes around the country. The study was conducted within the framework of cooperation between the MOH and UNICEF, and as part of targeted programs under the 2003-2015 National Strategy on Mother and Child Health Care. The working group consisted of four leading neonatologists chaired by the head of the MCH Unit of the MOH. The assessment was conducted by the working group in thirty maternity facilities using a structured questionnaire covering the following issues:

1. Structural units of maternity wards;
2. Medical staff;
3. Training of neonatologists and pediatric nurses;
4. Availability of equipment required for neonatal services;
5. Availability of drugs and disposable supplies;
6. Availability and quality of laboratory services and testing;
7. Neonatal statistics;
8. Study of patient management guidelines and the literature utilized;
9. Breastfeeding;
10. Compliance of the organization and implementation of neonatal services with standards developed by the Ministry of Health of the Republic of Armenia (RA); and
11. Study of newborn infants' case histories.

The medical practice of health providers on correct diagnosis and treatment, as well as the compliance of the organization and implementation of neonatal services with approved standards was assessed through a review of medical records.

Structural Units of a Maternity Ward

Nine (30%) of the Marz health facilities providing obstetric services are separate institutions; the rest are obstetrics or combined obstetrics/gynecological departments within another hospital. The separate health facilities are:

1. Artik Mother and Child Healthcare Center State Closed Joint-Stock Company (SCJSC)
2. Hrazdan Maternity Ward SCJSC
3. Martuni Maternity Ward SCJSC
4. Gavar Maternity Ward SCJSC
5. Garni Health Center SCJSC
6. Abovyan Maternity Ward SCJSC
7. Vagharshapat Maternity Ward SCJSC
8. Vedi Maternity Ward SCJSC
9. Akhuryan Mother and Child Health Center SCJSC

None of the monitored obstetric health facilities have resuscitation and intensive care units specifically intended for newborns, and newborn infants are treated in intensive care rooms. It is well known that in such cases the cost of treating ill newborns inside obstetric health facilities is not reimbursed by the state. Despite the fact that, at the moment, none of the intensive care rooms for newborns in any of the thirty monitored health facilities aspire to become separate departments (third-level medical service), the issue of their financing needs to be reviewed. The working group believes that not financing the treatment of newborn infants in second-level obstetric health facilities is a serious obstacle for the development of neonatal services. The working group recommends:

1. The best obstetric health facilities in the Marzes should receive financing for treating ill newborn infants if these institutions meet certain requirements and have successfully passed a probation period of at least one year. It is worth noting that the meeting of certain requirements and successfully passing a probation period of one year could be quite difficult, both in practice and in theory, and those who pass this test will be worthy of receiving the financing. In any case, a newborn in serious condition is transferred from the second-level facility and the state still pays for the child's treatment. If this recommendation is implemented, the newborn who avoids being transferred, which can cause unpredictable complications, the Marz health facility, which receives additional financial resources, and Yerevan's resuscitation units, which will experience less overload and fewer cases with lethal outcomes because of a reduction in the number of newborns in critical condition who are forced to be transferred from the Marzes, would all benefit. If a newborn infant in critical condition is not moved to Yerevan for a number of objective and subjective reasons, he/she is likely to be doomed to a lethal outcome, given the current level of material/technical equipment and professionalism in the Marz facilities. This is yet another argument in favor of creating well-equipped units staffed with highly professional personnel in the Marzes. In this recommendation, the working group also sees elements of regionalization and competitiveness, and considers that such units should be created in cities that are especially far from Yerevan (e.g. Gyumri, Vanadzor and Goris). Even if they cover an area in the radius of fifty km (a maximum travel time of 1 to 1.5 hours) around them, they will be able to reduce infant mortality significantly, contribute to the development of neonatal services and increase the quality of medical services. The implementation of this program requires that there be no abuses on the part of maternity wards in the Marzes, for which national and international morbidity rates could serve as clear standards.
2. Part of the money provided for obstetric services should be set aside for neonatal services and used to improve the quality of neonatal services in obstetric health facilities.

Medical Staff

In the thirty monitored obstetric health facilities in the Marzes, there are a total of sixty-nine neonatologists. Fourteen out of the thirty aforementioned health facilities have only one neonatologist each, six facilities have two neonatologists each, two facilities have three neonatologists each, five facilities have four neonatologists each, one facility has five and two have six neonatologists.
The following facilities have four and more neonatologists:

1. Masis Medical Center SCJSC
2. Vedi Maternity Ward SCJSC
3. Goris Medical Center SCJSC
4. Vanadzor Hospital Complex No. 1 SCJSC
5. Abovyan Maternity Ward SCJSC
6. Gyumri Maternity Ward SCJSC
7. Artashat Medical Center SCJSC
8. Vagharshapat Maternity Ward SCJSC.

In twenty-two maternity wards (73%), there is no neonatologist on round-the-clock duty, and in twenty maternity wards (67%) not every delivery takes place in the presence of a neonatologist. This is a rather dangerous practice and one of the main causes of the high neonatal mortality rate within twenty-four hours of birth (more than 70% of neonatal mortality). In this situation, neonatology services in the Marzes urgently need to get new specialists. Also of concern is the fact that one-third of the sixty-nine aforementioned neonatologists are over fifty years of age, and the problem of human resources digenesis is becoming more pronounced.

The following recommendations can be considered as a potential solution to the problem of a shortage of specialists:

1. State-financed, contract-based clinical internship on neonatology requiring post-diploma (post-graduate) specialization, free of charge or at a significant discount, with a requirement to work for at least five years in a Marz;
2. Pediatricians taking one year to specialize in neonatology, free of charge or at a significant discount, with a requirement to work at least five years in a Marz;
3. Providing incentives for neonatologists and even leading specialists working in the capital to work in Marzes.

The following problems exist in connection with mid-level medical staff: only three of the thirty monitored obstetric health facilities in the Marzes have a full-time position of a nurse for the intensive care room for newborn infants (Goris Medical Center SCJSC, Artashat Medical Center SCJSC and Abovyan Maternity Ward SCJSC). In all the other maternity wards, post-delivery department nurses also cover intensive care rooms for newborn infants. This cannot be considered as an optimal option in terms of work organization, especially in maternity wards with a high number of births.
The number of pediatric nurses on duty in post-delivery departments is very different in different maternity wards; it ranges from a total lack of pediatric nurses to more than a dozen pediatric nurses in a single institution. Not all maternity wards have a full-time position of a daytime nurse for newborn infants (who mainly does vaccination and helps in the intensive care room) (Table 1, Annex 2).

It is worth noting that post-delivery departments need to have at least five pediatric nurses in order to provide quality care for newborn infants. This problem can be resolved by having the same nurse care for both the newborn infant and the mother in the post-delivery department. This would increase the workload and responsibility of both obstetricians and pediatric nurses. It

should be noted that it is easier for pediatric nurses to learn obstetrics than for obstetricians to learn pediatric nurses' work.
At the same time, it must be stressed that the average age of nurses (especially in the Marzes) is rather high. Therefore, the issue of improving the quality of medical services for newborn infants needs to be addressed by a gradual replacement of the older staff.

Training

Only 52% of the sixty-nine neonatologists from the thirty monitored obstetric health facilities in the Marzes have gone through training at the National Health Institute in the last five years. About 13% of neonatologists have never gone through training or have done so more than ten years ago. For many, this training is almost impossible strategically, due to the fact that neonatologists do not have anyone to replace them while they are gone. On the whole, there is a widespread arbitrary and capricious attitude towards training.
Another serious problem is that the majority of neonatologists working in maternity wards are not specialized in neonatology (they have not participated in clinical internships). There is also an obvious shortage of new specialists. Also of concern is doctors' ignorance of and indifference towards research and social/public activities. Nevertheless, the working group believes that some of the maternity wards in the Marzes have the potential to undertake major reforms, due to their neonatology services and professional qualities of their neonatologists.
Having examined the issue of training, the objective difficulties associated with training, as well as the fact that the programs implemented to date have not been sufficiently effective, the working groups find the following:

1. The essence of training needs to be changed drastically. In particular, "on-site training" is recommended, which would entail leading specialists being sent to Marzes for two weeks to work in a local maternity ward with the local staff. Such on-site training has the following advantages:
   - The effectiveness of training is significantly higher;
   - Training is focused on the special problems of the specific institution; with joint efforts, these problems are resolved more precisely and in greater detail;
   - The available time for work is no longer strictly limited, there is an opportunity for longer and more detailed conversations and discussions, as well as an opportunity to manage patients together;
   - The time when the neonatologist is away from his/her workplace is reduced;
   - Such training can take place in two neighboring maternity wards at the same time (e.g. Vayk and Yeghegnadzor, or Sisian and Goris); and
   - Obstetricians and mid-level medical staff are also involved in the training process.
2. The financial/technical aspect of training must undergo drastic changes. Payments must be in line with the trainees' real income, and the obstetric health facility must have its share in the payment (partial reimbursement of leading specialist's business trip expenses).
3. The procedure and frequency of trainings must be clear; training must really serve to improve the specialists' theoretical knowledge and practical skills and truly increase the professionalism of neonatologists.
4. A clear and modern regular training program for neonatologists should be developed by joint efforts of the National Health Institute's neonatology department and the working group; people and specific departments responsible for the implementation of this training program should be clearly identified.

Considering the fact that in two-thirds of maternity wards in the Marzes it is not possible to ensure a neonatologist's presence during every delivery, as well as a rather high rate of neonatal mortality within twenty-four hours after birth (the vast majority of these deaths are caused by the

insufficient level of primary resuscitation of newborn infants in delivery rooms), it is extremely important to improve the theoretical knowledge and practical skills of pediatric nurses. Essentially, this is a separate and coordinated program. In addition to educating pediatric nurses during on-site training of neonatologists, all pediatric nurses from the Marzes should undergo two-week trainings in Yerevan maternity wards that provide third-level obstetric services (one nurse from each department may be away from work at one time).

Availability of Equipment

The delivery rooms and maternity wards were assessed in terms of the availability of basic equipment, including phototherapy lamps, fluometers, pulsoxymeters, infusion pumps and laryngoscopes.
The availability of equipment (medical equipment in proper working condition) in the delivery rooms and intensive care rooms for newborns of the thirty monitored obstetric health facilities is presented in Tables 2 and 3, Annex 2.
The data provided shows that 33% of facilities do not have such basic equipment for neonatal care as radiant warmers, and 10% facilities lack suction equipment, which poses a direct threat to newborn infants' health.

The issue of phototherapy lamps is of serious concern. In the vast majority of maternity wards, these lamps have never been replaced, which renders phototherapy (the main treatment for jaundice) meaningless and ineffective. Some maternity wards are not even aware that phototherapy lamps need to be replaced regularly (after 2,000 hours or three months of operation). Others claim not to have the resources for acquiring new lamps.
There is also a serious problem with fluometers. If there are no fluometers (especially if there are no pulsoxymeters, as well), oxygenotherapy becomes extremely dangerous because it becomes uncontrolled and can cause a number of complications (such as retinopathy in premature newborn infants).
Two-thirds of the monitored institutions have no pulsoxymeters, which is a required item for the monitoring of an infant's condition.
43% of the monitored maternity wards have infusion pumps; however, only three maternity wards have 50-60 ml syringes, which are required for the proper operation of the pumps (Akhouryan Mother and Child Healthcare Center SCJSC, Masis Medical Center SCJSC and Abovyan Maternity Ward SCJSC).
More than half of the maternity wards have laryngoscopes, but the working group found only one case history where intubation was described (Yeghegnadzor Medical Center SCJSC).

Availability of Drugs and Disposable Supplies

Antibiotics
The thirty monitored obstetric health facilities in the Marzes are provided with antibiotics. Nevertheless, there are still some serious mistakes and problems in the organization and provision of antibacterial treatment of newborn infants. These include:

- Aggressive antibacterial treatment (antibacterial treatment starts with second or third generation of cephalosporins);
- Monotherapy, especially with narrow range antibiotics;
- Avoiding the use of aminoglycoside antibiotics;
- Unjustified antibacterial treatment; and
- Incorrect use of dosage and frequency of administering the drugs.

These problems can be resolved by widely introducing standard newborn patient management guidelines.

10% Glucose
10% glucose remains the first and foremost choice for fluid in infusion therapy of newborn infants. At the time of monitoring, nine health facilities (30%) did not have it. They use it in many locations, but not a solution prepared in factories or in pharmacies. They take 40% glucose and dilute it just before administering it. This is a dangerous practice that may lead to iatrogenic and technical mistakes. It is also worth mentioning that almost everywhere that the administration of infusion therapy is done with mistakes, fluids are generally administered in extremely small quantities and predominantly not by means of round-the-clock infusion. The lack of infusion pumps and relevant experience leads to infusion therapy being administered in unsystematic and incomprehensible ways.

40% Glucose
Glucose solutions with a concentration of more than 10% are used for treating persistent hypoglycemia. In recent times, more and more articles have been published in neonatology magazines in developed countries, according to which even small doses of orally administered concentrated glucose (mainly 20%) are rather effective for calming down or even mildly sedating newborn infants. Three maternity wards (10%) did not have 40% glucose; in the places where it existed, it was not used for its intended purpose.

Hemodez
Hemodez is available and is ready to be used if necessary in more than 60% of obstetric health facilities in the Marzes (nineteen maternity wards). It is a good sign that in a number of places they do not even remember the last time they used it in neonatal practice; however, there are also maternity wards where they had no doubts as to the effectiveness of hemodez.

Sulfocamphocain
For many years, this drug has been used in neonatal departments without any justified need. There are no scientifically justified studies to show its effectiveness in neonatal practice. Unfortunately, sulfocamphocain occupies a prominent position in drug cabinets in ten (33%) out of the thirty monitored health facilities in the Marzes. In some locations, neonatologists assured us that it is no longer used, but it nevertheless remained in circulation.
The monitoring revealed the following drugs being used unjustifiably, often abused and whose effectiveness in neonatal practice has not been proven: cocarboxylase, dexamethasone, magnesium sulfate, vicasol, dicinol, luminal, atropine, vitamins E, B_1, B_6, C and others. These drugs can be found in almost every case history of deceased or ill newborn infants.

Anticonvulsant Drugs
These drugs exist in every maternity ward (except Nairi Medical Center's maternity ward). The following problems related to anticonvulsant drugs were identified in the process of monitoring:

- Phenobarbital for parenteral administration, which is the number one anticonvulsant drug in neonatal medicine, is not registered in the country. Only the Ministry of Health is capable of addressing this problem quickly and properly. It is worth mentioning that vitamin K has the same status: it is considered indispensable and extremely necessary in neonatal medicine.
- Phenobarbital for peroral administration (luminal) is widely used (in some places even abused) in neonatal departments; the use of this drug makes no sense in emergency situations.
- In some maternity wards, magnesium sulfate is used as the mildest anticonvulsant drug. This has no connection with evidence-based medicine.

Peripheral Catheters, Umbilical Catheters and Winged Infusion Sets (Butterfly Needles)
At least one of these items necessary for intravenous injections exists in every maternity ward (except in Garni Health Center). Five maternity wards did not have peripheral catheters, while six maternity wards had umbilical catheters, but they were expired.
On the whole, the supplying of high-quality and affordable umbilical catheters to maternity wards is one of the most pressing problems in this area.

Other Disposable Supplies
Other disposable supplies are lacking in twelve maternity wards (40%), mostly in the same places that have no fluometers. Two maternity wards did not have disposable gastric lavages and suction catheters. Half of the thirty monitored maternity wards in the Marzes did not have tubes for intubation
The availability of saline solutions and IV administration sets in all of the monitored maternity wards can be considered satisfactory.

Laboratory Services and Testing

Laboratory services and tests available in the thirty monitored obstetric health facilities are presented in Table 4, Annex 2.

General Blood Tests are done in every maternity ward. The main problems related to this analysis are:

- In some maternity wards, blood tests are performed on the newborn infant's first day of life; such tests cannot be informative;
- There is a lack of confidence in the results of analysis.

Blood Glucose Level is also measured in every maternity ward. The main problems are:

- The strip method is available only in a limited number of maternity wards;
- Glucose level is measured mainly by biochemical method, which requires a rather large quantity of blood (1-3 ml). Technical difficulties in taking the blood, on the one hand, and the relatively large quantity of blood that is required for the test on the other hand, are obstacles in the performance of this important test;
- In a majority of maternity wards, neonatologists do not have a clear understanding of indications for this test. There are maternity wards that have never had a single hypoglycemia case. This evidences the technical difficulties in performing this test and systemic differences in diagnostics.

Whole Bilirubin and Fractions
Whole bilirubin is measured in 83% of maternity wards; it is measured by the biochemical method, which requires a rather large quantity of blood (about 3 ml), while test results are not always reliable. One has to acknowledge that this problem exists in developed countries as well, and it can only be resolved by introducing more modern equipment.
Very few places use WHO and other respectable international organizations' guidelines for diagnosing and treating hyperbilirubinemia. This is supported by significant differences in the numbers of hemolytic diseases in newborn infants reported by different maternity wards (Table 5, Annex 2).

Hemoculture and Sensitivity
Despite the fact that hemoculture is a golden standard in neonatal medicine and sensitivity tests are recommended for antibacterial treatment, these tests are not given practical importance in maternity wards in the Marzes. The main reasons are:

- A rather large quantity of blood is required (about 3 ml);

- Results become available rather late (in 6-7 days);
- Blood inoculation often produces a culture that is different from the one that caused the infectious process. This is evidenced by the fact that our results have almost nothing in common with international data.

We think it is necessary to pay proper attention to the introduction of hemoculture in neonatal practice, which is possible by means of sharing experiences and introducing modern technologies.

Ultrasound Examination

It is difficult to imagine modern neonatology without ultrasound examination of the brain and heart. This examination is available in 47% of the monitored maternity wards. However, it is carried out extremely rarely in practice. Usually, it requires a specialist from elsewhere to be invited to the facility.

X-Ray Examination

X-ray examination is indispensable for differential diagnosis of respiratory disorders. It is required for any child that needs respiratory assistance. This examination is available in 47% of the monitored institutions. There is a need to increase the level of professionalism of the radiologists, especially in the area of neonatal diseases. This type of examination is also rarely used in maternity wards in the Marzes.

Cerebrospinal Fluid Analysis

This analysis is not done in any of the maternity wards.

Statistics

Having analyzed the aforementioned statistical data on newborn infants (Tables 6 and 7, Annex 2), the following observations have been made:

- The prematurity rate is very different in different maternity wards, which is difficult to interpret or explain in any way (the lowest is 1.8%, the highest is 14.5%, the average prematurity rate in the Marzes is 5.3%). Such differences may be caused by staff being unaware of international and clear standards of prematurity or not applying them. This is confirmed by the fact that, when one analyzes the weight categories of newborn infants (birth weight being a more objective criteria that is less dependent on other factors), the difference becomes less pronounced (the lowest rate of newborn infants under 2,500 grams is 2.7%, the highest is 15.4%).
- Indications for cesarean section are also different in different maternity wards in the Marzes (from zero to 16.8%, with an average of 9.2%). This difference in the cesarean section rate could probably be explained by the availability of specialists, the level of trust towards them, as well as the quality of neonatal services.
- Newborn infants' morbidity rates need to be examined carefully. The difference between the lowest and the highest morbidity rates in different maternity wards is thirty-fold, which obviously evidences non-standard approaches, incomprehensible diagnosis, lack of knowledge of a number of neonatal diseases and lack of knowledge of the basic elements of statistics.
- Interpreting the newborn infants' mortality rate is more difficult, because more newborn infants should be dying in maternity wards that have, at least, the minimal conditions for providing intensive care.
- The situation in terms of the ratio of perinatal vs. neonatal mortality is of particular concern. The ratio is 1:1, i.e. none of the infants who died in maternity wards in the Marzes survived the first week. Moreover, 70% of them died within the first twenty-four hours after their birth.

- The ratio of stillbirths vs. neonatal mortality provides certain information about the objectivity of statistics. It is worth noting that a low mortality rate is highly suspicious when it is accompanied by a high rate of stillbirths.
- The issue of transfers from maternity wards in the Marzes also needs to be examined comprehensively. On the one hand, transfers are encouraged by transfer criteria (e.g. an infant is subject to transfer if infection is diagnosed in the maternity ward); on the other hand, the lack of resources (equipment and staff) for treating newborn infants forces a transfer; finally, the fact that no financing is provided for intensive care of newborn infants fully justifies a transfer. The difference between maternity wards with the lowest and the highest numbers of transfers is twenty-five-fold, which is partially explained by the distance infants have to travel to be transferred to another institution.
- There are serious problems in the area of vaccination. This is especially true of Hepatitis B vaccination. Every fifth child born in the Marzes does not receive that vaccine.

Newborn Management Guidelines and Literature

In all the monitored Marzes, only the neonatologist in Noyemberyan Medical Center SCJSC used newborn management guidelines, and in that case only partially. All maternity wards in the Marzes, without exception, need clear newborn management guidelines that would not contradict WHO recommendations. The resolution of this problem could immediately have a huge positive impact.

The following are the main textbooks read by neonatologists in the Marzes:

- Shabalov, Neonatology, 1997 (in Russian);
- Gomella, Neonatology, 1994 (in Russian);
- Yacik, Guideline on Neonatology (in Russian);
- Resuscitation of Newborns (in Russian), American Academy of Pediatrics;
- Managing Newborn Problems, WHO, 2005;
- Ministry of Health and UNICEF. Essential Newborn Care and Breastfeeding: Module for Health Providers (in Armenian); and
- NOVA Project, Basic Principles of Newborn Care and Resuscitation (in Armenian).

Some of the aforementioned literature is outdated and does not contain elements of evidence-based medicine. The number of neonatologists using the internet and getting information from the internet is extremely low.

Breastfeeding

The practice of putting newborn infants to the breast and keeping them with their mothers for at least thirty minutes in the delivery room is mostly followed, although in about 40% of maternity wards this is not done properly. In particular, newborn infants are kept by their mothers breasts for less than thirty minutes, sometimes pacifiers are used in post-delivery departments, or newborn infants may be additionally fed with feeding bottles and teats (in 47% of maternity wards, giving newborn infants 5% glucose is a normal practice). However, more than 95% of the surveyed mothers did not say they gave their babies fluids or food other than breast milk. One possible exception is in cases of birth by cesarean section, where the mother is unable to breastfeed properly in the first day or at least in the first hours after birth. It is also worth mentioning that the doctor's role alone in the matter of breastfeeding is not sufficient. Starting from delivery rooms, nurses play an extremely important role in the matter of breastfeeding. However, nurses do not always rise to the occasion. In any case, rules of exclusive breastfeeding are followed in only 17% of maternity wards. 13% of maternity wards deviate from the rule of mothers and newborn infants being kept in the same room (doctors' rounds take place in intensive care rooms).

Compliance of the Organization and Implementation of Neonatology Services with Standards Developed by the RA Ministry of Health

There are some rather serious problems in this area. Despite the fact that almost 90% of maternity wards in the Marzes are aware of these standards, the impression is that not everyone has read them completely or, even worse, not everyone intends to follow them. For the sake of justice, it must be noted that the standards contain a number of controversial issues. There are some problems in regard to the receipt of birth certificates and registration certificates from polyclinics before discharge from maternity wards and their recording in newborn infants' case histories (in 17% of maternity wards, there are no registration certificates from polyclinics, and in 10% of maternity wards they are not always provided). 13% of maternity wards deviate to some extent from perinatal death registration rules. This was determined by comparing the reported numbers of perinatal deaths and perinatal death registration forms. However, the majority of maternity wards have serious problems with accurately filling out these forms. Problems are so numerous and sometimes even so strange that we do not find it appropriate to discuss them here. 40% of maternity wards make gross mistakes when filling out perinatal death forms; in another 33% of the cases there are some mistakes.
The working group simply recommends every maternity ward have a special person responsible for filling out perinatal death forms (it is assumed that they should receive appropriate training courses for this). These people will be in charge of monitoring the procedures for filling out these forms. In 30% of perinatal death cases, there is no autopsy performed at all; only 20% of maternity wards perform autopsies in 100% of perinatal death cases. In the majority of cases, the diagnosis complies with the clinical diagnosis. Nevertheless, it is worth mentioning that it is highly desirable to have clinicians participate in autopsies, have discussions with all interested parties and raise autopsies to a new qualitative level.

Examination of Newborn Infants' Case Histories

There is no universally accepted methodology for filling out case histories for newborn infants. They are not always accurate, they do not always correspond to real processes, and sometimes they are filled out irresponsibly and in a slipshod way. In many maternity wards, diagnoses do not comply with International Classification of Diseases 10 (ICD 10); they are of template-like in nature, extremely unoriginal and very far from real diagnosis. Sometimes, these diagnoses have absolutely nothing to do with neonatology and look more like an obstetrics situation. The lack of standard protocols allows every department to use any arbitrary drug with any dosage and for any period of time. Treating healthy mature newborn infants is an extremely dangerous practice; such infants get drugs that they do not need and are discharged from maternity wards on the third or fourth day of their lives. There are especially serious problems in the deceased newborn infants' case histories that reveal more clearly the low level of professionalism, the shortage or complete lack of medical equipment and neonatologists' inability to take control over the situation.

Conclusions and recommendations

Conclusions

➢ *Structural Units*

None of the monitored health facilities have resuscitation and intensive care units for newborn infants.

Given the lack of separate resuscitation and intensive care units for newborn infants, newborn patients are treated in intensive care rooms. It is known that in such cases the cost of treating ill newborn infants is reimbursed from the total amount allocated by the state for obstetric services. In addition to the fact that this amount is significantly higher in second-level health facilities, there is also separate financing for treating ill newborn infants, as well as for treating infants in health facilities providing second-stage of care. Despite the fact that, at the moment, none of the intensive care rooms for newborn infants in all of the thirty monitored health facilities aspire to become separate units (departments), the issue of their financing needs to be reviewed. The working group believes that the financing of newborn infants' treatment in second-level obstetric health facilities only from the money allocated for obstetric services is a serious obstacle for the development of neonatal services in the Marzes.

➢ *Medical Staff*

a. Of the thirty assessed health facilities, fourteen (46.7%) have only one neonatologist, six facilities (20%) have two neonatologists each, two facilities (6.7%) have three neonatologists each, five facilities (16.7%) have four neonatologists each, one facility (3.3%) has five neonatologists and two facilities (6.7%) have six neonatologists each.
b. In twenty-two maternity wards (73%), there is no neonatologist on round-the-clock duty. In twenty maternity wards (67%) not every delivery takes place in the presence of a neonatologist.
c. 6% of neonatologists working in the Marzes are more than sixty years old, 29% are between fifty-one and sixty years old, 52% are between forty and fifty years old, and only 13% are less than forty years old.
d. Only three of the monitored thirty facilities have a full-time position of a nurse for intensive care room for newborn infants. In all the other maternity wards, post-delivery department nurses also cover intensive care rooms for newborn infants.
e. Only 43% of maternity wards have more than five nurses on duty in post-delivery departments. 10% of maternity wards have no pediatric nurses on duty at all.

Almost half of the maternity wards have only one neonatologist. His/her absence (vacation, end of working day, or illness) can have unpredictable consequences. It is difficult to provide quality neonatal services even with two neonatologists. Therefore, the working group believes that the optimal number of full-time neonatologists is three. This would make it possible to ensure a more or less satisfactory level of care, at least by means of home duty. In the capital, one neonatologist serves an average of 200 newborn infants per year; this number could be considered as a benchmark when deciding on the number of full-time neonatologists in the Marzes. On the whole, it is worth mentioning that this evident lack of specialists (especially high quality and experienced ones) is one of the most important reasons for a high infant mortality

rate. This is especially alarming, in the sense that persons of or near retirement age are a rather large group among the currently employed specialists.

➢ *Training*

a. Only sixty-nine neonatologists (52%) from the thirty health facilities have gone through training at the National Institute of Health in the last five years.
b. 13% of neonatologists have never gone through training or have done so more than ten years ago.
c. The majority (about 90%) of neonatologists working in maternity wards are not specialized in neonatology (have not participated in clinical internship).

Neonatology is one of the youngest, yet intensively developing branches of medical science, where evidence-based medicine plays an especially important role. Unfortunately, this has been ignored in the past and continues to be ignored in the present. The current training program and methodology are unable to meet the needs of modern neonatology; as a result, training loses its significance. The problem is even more serious in the case of specialists who are not specialized in neonatology or have not gone through training for a long period of time.

➢ *Availability of Equipment*

a. The lack of radiant heaters and suction equipment (in 33% and 10% of maternity wards, respectively) poses a direct threat to newborn infants' health.
b. In the majority of maternity wards (90%), phototherapy lamps have never been replaced, mainly because people are not aware that these lamps need to be changed, or there are no extra lamps.
c. In 56.7% of maternity wards, oxygenotherapy in intensive care rooms is done without fluometers, i.e. without appropriate control.
d. Two-thirds of maternity wards have no pulsoximeters; 23.3% have no incubators.
e. More than half of the maternity wards have laryngoscopes, but the working group found only one case history of a newborn infant where intubation was described.
f. Nasal tubes are lacking in twelve maternity wards (40%), mostly the same wards that do not have fluometers. Two maternity wards did not have disposable gastric lavages and suction catheters. Half of the thirty maternity wards in the Marzes did not have tubes for intubation.

It is difficult to underestimate the importance of the availability of proper equipment for improving the quality of neonatal services. However, it is only fair to point out that the statistics are not particularly reassuring even in maternity wards with a satisfactory level of available equipment. The working group believes that the availability of equipment alone is not sufficient for improving the quality of neonatal services. Providing the equipment should go hand in hand with improving the theoretical knowledge and practical skills of specialists. Only then can one expect positive results.

➢ *Availability of Drugs and Disposable Supplies*

a. Antibacterial treatment is noted for its aggressiveness and for being insufficiently justified, as well as for the prevalence of monotherapy and avoiding the use of aminoglycosides.
b. A number of essential medications, such as Vitamin K, parenteral Phenobarbital, simply do not exist in maternity wards; instead, drug cabinets are full of medications that are unacceptable in neonatal practice.
c. Nine of the monitored institutions (30%) did not have 10% glucose.

Such practices are caused by a low level of theoretical knowledge, lack of awareness of new developments in medical science and a general lack of information. The working group believes the problem should be resolved by introducing standard disease management guidelines.

➢ *Laboratory Services and Testing*

a. No cases of hypoglycemia are diagnosed in practice; therefore, hypoglycemia remains untreated.
b. In 2008, 40% of maternity wards did not report a single case of hemolytic disease in newborn infants.
c. Hemoculture and sensitivity tests are not given practical importance in maternity wards in the Marzes, because none of the 100 examined case histories contained such test results.
d. X-ray examination of newborn infants is impossible in 53% of the monitored maternity wards. Even in other maternity wards, where it is available, x-ray examination is rarely done, and there is a shortage of qualified specialists.
e. No maternity ward does examination of spinal fluid.

There is an extremely serious problem with the measuring of bilirubin levels. The vast majority of maternity wards do not use the strip method of measuring glucose levels. In both cases, the reason lies in the methodology that it is technically difficult to apply (the methods require about 3ml of blood), and there is little confidence in the accuracy of test results because the used equipment and chemicals are long outdated. Some rather informative tests are not performed at all; on one hand, this has to do with the lack of appropriate specialists, while on the other hand they are unaware of the tests' importance.

➢ *Statistics*

a. The lowest reported prematurity rate was 1.8%, the highest was 16%. The average prematurity rate in the Marzes was 5.3%. This can be explained by staff being unaware of international and clear standards of prematurity or not applying them.
b. Indications for cesarean section are probably also different in different maternity wards in the Marzes (from 0% to 16.8%).
c. The difference between the lowest and the highest morbidity rates in different maternity wards is thirty-fold.
d. None of the infants who died in maternity wards in the Marzes survived the first week. Moreover, 70% of them died within the first twenty-four hours after their birth.
e. The difference between maternity wards with the lowest and the highest numbers of transfers is twenty-five-fold, which is partially explained by the distance infants have to travel to be transferred to another institution.
f. Every fifth child born in the Marzes does not receive a Hepatitis B vaccine.

The almost ten-fold difference in prematurity rates in different maternity wards (the international standard being 6-7%) can be explained by staff being unaware of international and clear standards of prematurity or not applying them. The difference is more pronounced (thirty-fold) in morbidity rates, which obviously evidences non-standard approaches, incomprehensive diagnosis, unawareness of a number of neonatal diseases and lack of knowledge of the basic elements of statistics. The difference in the frequency of cesarean sections can probably be explained by the availability or lack of appropriate specialists, confidence towards them and the quality of neonatal services. The rate of infant mortality within twenty-four hours after birth is yet another very clear indication of the disastrous state of neonatal services in the Marzes.

➢ *Newborn Management Guidelines and Literature*

Only one of the thirty maternity wards in the Marzes uses newborn management guidelines, but only partially. The number of neonatologists using the internet and getting information from the internet is extremely low.

There is no doubt about the need for standard guidelines for neonatal disease management. They ensure uniform application of vital measures/activities, facilitate mutual understanding among specialists, minimize iatrogenic errors, and ensure consistency and continuity of treatment. Normally, such guidelines are developed on the basis of relevant WHO recommendations adapted to local conditions. Teaching these guidelines and introducing them in practice, using them in daily work, as well as giving up treatments that are not included in such guidelines would make it possible to achieve significant progress within a short period of time.

➢ *Breastfeeding*

a. In 47% of maternity wards, giving newborn infants 5% glucose is a normal practice.
b. About 40% of maternity wards do not properly follow the practice of putting newborn infants to their mothers' breasts and keeping them with the mothers for at least thirty minutes in the delivery room.
c. 13% of maternity wards deviate from the rule of mothers and newborn infants being kept in the same room (doctors' rounds take place in intensive care rooms).

In many maternity wards, the requirement of exclusive breastfeeding and keeping mothers and infants in the same room is followed only formally, many mothers are not informed about these requirements or are "instructed" about them only before inspections.

➢ *Organizational standards and newborn case histories*

1. In 17% of maternity wards, there are no registration certificates from polyclinics, and in 10% of maternity wards they are not always provided.
2. 13% of maternity wards deviate, to some extent, from perinatal death registration rules. 40% of maternity wards make gross mistakes when filling out perinatal death forms; in another 33% of the cases, there are some mistakes.
3. In 30% of perinatal death cases, there is no autopsy performed at all. Only 20% of maternity wards perform autopsies in 100% of perinatal death cases.
4. There is no universally accepted methodology for filling out case histories for newborn infants. In a significant number of maternity wards, diagnoses do not comply with ICD 10, and they are template-like in nature.

There are many cases of failure to perform postmortem examination in perinatal death cases. This is often caused by inconsistency on the part of medical personnel. As a result, the real causes of perinatal mortality remain unidentified, which has an effect on statistics and on the development of proper tactics to address the problem. The problem is exacerbated by mistakes in filling out perinatal death forms.

Recommendations

Regionalization and Financing

- Provide financing to the best obstetric medical institutions for the treatment of ill newborn infants, as long as these institutions meet certain requirements and have successfully passed a probation period of at least one year.
- Establish three regional neonatal centers (third-level neonatal departments) within maternity wards or pediatric hospitals in cities that are farthest away from Yerevan.

Ensure that all maternity wards have at least two neonatologists within the next years.

- Create incentives for neonatologists and even leading specialists working in Yerevan to work in the Marzes.
- State-financed contract-based clinical internships on neonatology requiring post-diploma (post-graduate) specialization, free of charge or at a significant discount, with a requirement to work at least five years in a Marz.
- Pediatricians taking one year to specialize in neonatology, free of charge or at significant discount, with a requirement to work at least five years in a Marz.

Enhance training opportunities, particularly for regional health providers, and revise the content and modality of training courses

- On-site training, which would entail leading specialists being sent to Marzes for two weeks to work in a local maternity ward with the local staff. This training would focus on learning the standard guidelines for patient management and practical skills. Advantages of such training are:
    a) It focuses on special problems of the specific institution that are resolved more precisely and in greater detail with joint efforts;
    b) The time available for work is no longer strictly limited, there is an opportunity for longer and more detailed conversations and discussions, as well as an opportunity to manage patients together;
    c) The local neonatologist does not have to leave his/her workplace
    d) Training can take place in two neighboring maternity wards at the same time; and
    e) Obstetricians and mid-level medical staff are also involved in the training process.
- The financial/technical aspect of training must also undergo drastic changes, payments must be in line with the trainees' real income, and the obstetric health facility must have its share in the payment.
- The procedure and frequency of trainings must be clear; training must really serve to improve the specialists' theoretical knowledge and practical skills, and truly increase the professionalism of neonatologists.
- A clear and modern regular training program for neonatologists should be developed by joint efforts of the National Health Institute's neonatology department and the working group; people and specific departments responsible for the implementation of this training program should be clearly identified.
- Considering the fact that in two-thirds of maternity wards within the Marzes it is not possible to ensure a neonatologist's presence during every delivery, as well as the alarming rate of infant mortality within twenty-four hours after birth (the vast majority of these deaths are caused by an insufficient level of primary resuscitation of newborn infants in delivery rooms), it is extremely important to improve the theoretical knowledge and practical skills of pediatric nurses. Essentially, this is a separate and coordinated program. In addition to educating pediatric nurses during on-site training of neonatologists, all pediatric nurses from the Marzes should to undergo two-week

trainings in Yerevan maternity wards that provide third level obstetric services (one nurse from each department may be away from work at one time).

Establishes Intensive Neonatal Care Units at all regional maternities with essential equipment and supplies. The working group recommends addressing the issue of availability of equipment and supplies in maternity wards phase by phase.

- Phase One (equipment is relatively cheap)
  - Fluometers;
  - Oxygen hoods;
  - Glucometers;
  - Electronic scales;
  - Phototherapy lamps; and
  - Radiant warmers in all maternity wards.
- Phase Two
  - Incubators;
  - Radiant warmers for intensive care rooms;
  - Pulsoxymeters; and
  - Infusion pumps.

It is desirable to have Continuous Positive Airway Pressure (CPAP) machines in maternity wards with more than 1,000 deliveries per year.

Provide the necessary drugs and disposable supplies.

- Register the following extremely necessary drugs in the Republic of Armenia:
  - Vitamin K; and
  - Phenobarbital (parenteral).
- Find permanent supply source of nasal tubes and umbilical catheters and provide them to all maternity wards.

Revise standards on laboratory tests and examinations.

The following tests and examinations should be mandatory in all second-level obstetric health facilities:

- General blood test and leukoformula;
- Blood glucose level;
- Whole bilirubin;
- Hemoculture and sensitivity; and
- Chest x-ray examination.

Develop and introduce standardized and updated recording and reporting system.

- Establish a full-time position in every maternity ward for a person who would be responsible for collecting statistics (monthly and annual) and filling out perinatal mortality forms.
- This person should monitor the compliance of diagnoses with ICD 10, as well as compliance with standards developed by the RA Ministry of Health.
- Ensure a centralized collection of statistics from all maternity wards by one of the cheapest and most available electronic communication means (to be installed in every maternity ward).

Introduce standard guidelines and protocols for neonatal care and management of neonatal diseases.

- Introduce newborn infant management guidelines developed by UNICEF's recommendation and approved by the RA Ministry of Health in all second-level health facilities and partially in third-level health facilities.
- Organize seminars to study the guidelines.
- Develop similar guidelines for obstetricians.

Promote and monitor breastfeeding and the rooming-in practices.

- Provide future mothers with literature (brochures) on breastfeeding during prenatal care.
- The RA Ministry of Health should organize regular inspection visits to monitor breastfeeding practices.

Develop organizational standards.

- Improve knowledge of neonatologists' on the standards developed by the RA Ministry of Health.
- Organize comprehensive discussions to review a number of obstetrics-related issues in the standards.
- Require all practices to be brought into compliance with the standards.
- Ensure that an autopsy is performed in every single case of perinatal death; in exceptional cases, a pathologist should visit the maternity ward and perform the autopsy there.

Develop and introduce newborn infants' case history forms.

- Develop a new format for newborn infants' case histories that would meet modern neonatology requirements.
- Develop and introduce clear methodology for filling out case histories (terminology, procedures for filling out forms, etc.).
- Develop and introduce new, clear and standardized forms required in neonatal practice and submit them to the RA Ministry of Health for approval.

Annex 1

List of visited healthcare facilities

- Aragatsotn marz
  1. Ashtarak Medical Center SCJSC
  2. Aparan Medical Center SCJSC
  3. Talin Medical Center SCJSC
- Ararat marz
  4. Artashat Medical Center SCJSC
  5. Ararat Hospital SCJSC
  6. Masis Medical Center SCJSC
  7. Vedi Maternity Ward SCJSC
- Armavir marz
  8. Armavir Medical Center SCJSC
  9. Vagharshapat Maternity Ward SCJSC
  10. Metsamor Medical Center SCJSC
- Gegharkunik marz
  11. Gavar Maternity Ward SCJSC
  12. Martuni Maternity Ward SCJSC
  13. Sevan Hospital SCJSC
- Lori Marz
  14. Vanadzor Hospital Complex #1 SCJSC
  15. Spitak Medical Center SCJSC
  16. Stepanavan Medical Center SCJSC
- Kotayk marz
  17. Hrazdan Maternity Ward SCJSC
  18. Abovyan Maternity Ward SCJSC
  19. Nairi Medical Center SCJSC
  20. Garni Health Center SCJSC
- Shirak marz
  21. Gyumri Maternity Ward SCJSC
  22. Akhuryan Mother and Child Health Center SCJSC
  23. Artik Mother and Child Healthcare Center SCJSC
- Syunik marz
  24. Kapan Medical Center SCJSC
  25. Goris Medical Center SCJSC
  26. Sisian Medical Center SCJSC
- Vayots Dzor marz
  27. Yeghegnadzor Medical Center SCJSC
  28. Vayk Medical Center SCJSC
- Tavoush marz
  29. Ijevan Hospital SCJSC
  30. Noyemberyan Medical Center SCJSC

Annex 2

Table 1. Number of pediatric nurses

Maternity ward	Duty nurse	Day time nurse
Abovyan	10	1
Akhouryan	4	0
Ashtarak	5	0
Aparan	4	0
Ararat	4	1
Artik	4	1
Armavir	8	1
Artashat	6	1
Garni	0	0
Gavar	5	1
Gyumri	4	1
Goris	4	1
Yeghegnadzor	4	0
Talin	5	1
Ijevan	5	0
Kapan	6	0
Hrazdan	5	1
Masis	8	1
Martouni	4	1
Mecamor	4	0
Nairi	5	1
Noyemberyan	4	0
Sisian	3	0
Spitak	4	0
Stepanavan	0	1
Sevan	5	0
Vagharshapan	18	2
Vayk	0	1
Vanadzor	4	1
Vedi	6	0

Table 2. Availability of basic equipment in delivery room

		Radiant heater	Electronic scale	Mechanical scale	Suction equipment	Wall thermometer
Abovyan		+	-	+	+	+
Akhouryan		+	+	+	+	+
Ashtarak		-	-	+	+	+
Aparan		-	-	+	+	-
Ararat		+	-	+	+	+
Artik		+	-	+	+	+
Armavir		-	-	+	+	-
Artashat		+	-	+	+	+
Garni		-	-	+	-	+
Gavar		+	-	+	+	-
Gyumri		+	+	+	+	+
Goris		+	-	+	+	+
Yeghegnadzor		+	-	+	+	-
Talin		-	-	+	+	-
Ijevan		+	-	+	+	-
Kapan		+	-	+	+	+
Hrazdan		+	+	+	+	+
Masis		-	+	-	+	+
Martouni		+	-	+	+	+
Metsamor		-	-	+	+	-
Nair		-	-	-	-	-
Noyemberyan		+	-	+	+	-
Sisian		-	-	+	+	-
Spitak		+	-	+	+	-
Stepanavan		+	-	+	+	-
Sevan		-	-	+	+	+
Vagharshapat		+	-	+	-	+
Vayk		+	-	+	+	-
Vanadzor		+	-	+	+	-
Vedi		+	-	+	+	+
Total	Number of facilities short of the equipment	10	26	2	3	14
	Percentage of facilities short of the equipment	33%	87%	7%	10%	47%

Table 3. Availability of basic equipment in newborn intensive care room

		Centralized oxygen	Oxygen container	Oxygen concentrator	Fluometer	Oxygen hood	Apparatus for artificial respiration	Radiant warmer	Infant incubator	Infusion pump	Phototherapy lamp	Suction pump	Pulsoxymeter	Electronic scale	Mechanical csale	Resuscitation bag
Garni		-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Nairi		-	-	-	-	-	-	-	-	-	-	-	-	-	+ 1	+ 1
Metsamor		-	+	-	-	+ 1	-	-	-	-	-	-	-	-	+ 1	+ 1
Armavir		-	+	-	-	-	-	-	+ 1	+ 1	-	-	-	-	+ 1	+ 1
Sevan		-	+	-	-	-	-	-	+ 2	+ 1	-	-	-	-	+ 1	+ 1
Noyemberyan		-	+	-	-	-	-	+ 1	-	-	-	+ 1	-	-	+ 1	+ 1
Goris		-	-	+ 1	-	-	-	+ 1	-	-	-	-	+ 1	-	+ 1	+ 1
Vayk		-	-	-	-	-	-	-	-	-	-	-	-	-	+ 2	+ 1
Ararat		-	+	-	-	-	-	-	+ 4	+ 2	+ 1	-	-	-	+ 2	+ 1
Aparan		-	+	-	-	-	-	-	+ 1	-	-	-	-	-	+ 1	+ 2
Sisian		-	+	-	-	-	-	+ 1	+ 1	-	+ 1	-	-	-	+ 1	+ 2
Talin		-	-	-	-	-	-	+ 1	+ 2	+ 1	-	+ 1	+ 1	-	+ 1	+ 2
Masis		-	+	-	-	-	-	-	+ 1	+ 1	+ 1	+ 1	+ 1	-	+ 1	+ 2
Vagharshapat		-	-	+ 1	-	-	-	-	+ 1	-	-	-	-	-	+ 1	+ 3
Ashtarak		-	+	-	-	-	-	-	+ 2	-	-	-	-	-	+ 2	+ 4
Abovyan		-	-	+ 1	-	-	-	-	-	+ 1	+ 1	+ 1	-	-	+ 1	+ 5
Artashat		-	-	+ 1	-	-	-	+ 3	+ 1	-	-	+ 2	-	-	+ 1	+ 5
Yeghegnadzor		-	+	+ 1	+ 1	-	-	+ 1	+ 1	-	-	-	-	-	-	+ 1
Ijevan		-	-	+ 1	+ 1	-	-	-	+ 1	+ 1	+ 1	-	-	-	+ 1	+ 2
Artik		-	+	+ 1	+ 1	+ 1	-	+ 1	+ 3	+ 2	+ 1	+ 1	+ 1	-	+ 1	+ 2
Vanadzor		-	-	+ 1	+ 1	-	-	+ 3	+ 2	-	-	+ 1	-	-	+ 2	+ 2
Kapan		-	+	+ 1	+ 1	+ 1	-	+ 1	+ 1	-	+ 2	-	+ 1	+ 1	+ 1	+ 4
Vedi		-	+	-	+ 1	-	-	+ 1	+ 2	+ 1	+ 1	+ 1	-	-	+ 1	+ 5
Gyumri		+	-	-	+ 1	+ 4	-	+ 2	+ 3	-	+ 1	+ 1	+ 1	+ 1	-	+ 1
Hrazdan		+	-	-	+ 1	+ 1	-	-	+ 3	+ 1	-	-	+ 1	-	+ 1	+ 1
Spitak		+	+	-	+ 1	-	-	+ 2	+ 2	-	-	+ 1	-	-	+ 1	+ 4
Stepanavan		-	-	+ 1	+ 1	-	+ 3	+ 1	+ 3	+ 1	-	+ 1	+ 1	-	+ 1	+ 1
Martuni		+	-	+ 1	+ 2	-	+ 1	-	+ 2	-	+ 1	+ 1	-	-	+ 1	+ 2
Gavar		-	+	+ 1	+ 3	-	-	+ 4	+ 2	+ 2	+ 1	+ 1	+ 3	-	+ 1	+ 5
Akhouryan		+	-	-	+ 3	-	-	+ 1	+ 3	+ 4	+ 1	-	+ 2	-	+ 1	+ 4
Total	Number of facilities short of the equipment	25	14	18	17	25	28	15	7	17	18	17	20	28	3	1
	Percentage of facilities short of the equipment	83	47	60	57	83	93	50	23	57	60	57	67	93	10	3

Table 4. Availability of laboratory services and tests

		Blood group and rhesus	General blood test	Leucoformula	Blood glucose level	Whole bilirubin	Bilirubin fractions	General protein	Creatinine	C-reactive protein	Hemoculture	Sensitivity	Cerebrospinal fluid analysis	Ultrasound examination	X-ray examination
Abovyan		+	+	+	+	+	+	+	+	+	+	+	-	+	-
Akhouryan		+	+	+	+	+	+	+	+	+	-	-	-	-	-
Aparan		+	+	+	+	+	+	+	+	+	-	-	-	-	-
Ararat		+	+	+	+	+	+	-	-	+	-	-	-	-	-
Artashat		+	+	+	+	+	+	-	-	+	+	+	-	-	-
Artik		+	+	+	+	+	+	+	+	+	-	-	-	-	+
Ashtarak		+	+	+	+	-	-	-	-	-	-	-	-	-	+
Vagharshapat		+	+	+	+	+	-	-	-	+	-	-	-	-	-
Yeghegnadzor		+	+	+	+	+	+	-	-	-	-	-	-	+	+
Garni		+	+	+	+	-	-	-	-	-	-	-	-	-	-
Gavar		+	+	+	+	-	-	-	-	-	-	-	-	+	-
Gyumri		+	+	+	+	+	-	-	-	-	-	-	-	-	-
Goris		+	+	+	+	+	+	+	+	+	-	-	-	+	+
Hrazdan		+	+	+	+	+	+	-	-	-	-	-	-	+	-
Ijevan		+	-	-	+	+	+	-	-	-	-	-	-	-	+
Kapan		+	+	+	+	+	+	+	+	+	-	-	-	+	+
Martouni		+	+	+	+	+	-	+	+	+	-	-	-	+	-
Masis		+	+	+	+	+	+	+	+	+	+	+	-	+	-
Metsamor		+	+	-	+	+	+	-	-	+	-	-	-	-	-
Nairi		+	+	+	+	+	-	+	-	-	-	-	-	-	-
Noyemberyan		+	+	-	+	+	+	-	-	-	-	-	-	+	+
Sevan		+	+	+	+	+	+	+	+	+	-	-	-	-	+
Sisian		+	+	+	+	+	-	-	-	-	-	-	-	+	+
Spitak		+	+	+	+	+	+	-	-	-	-	-	-	-	+
Stepanavan		+	+	-	+	+	-	-	-	-	-	-	-	+	+
Talin		+	+	+	+	+	+	-	-	-	-	-	-	-	-
Vayk		+	+	+	+	+	+	+	-	-	+	+	-	+	+
Vanadzor		+	+	+	+	+	+	+	+	+	-	-	-	+	+
Vedi		+	+	+	+	-	-	-	-	-	-	-	-	-	-
Armavir		+	-	-	+	-	-	-	-	-	-	-	-	-	-
Total	Number of facilities where the test is not conducted	0	2	5	0	5	13	18	20	16	26	26	30	17	17
	Percentage of facilities where the test is not conducted	0	7%	17%	0	17%	43%	60%	67%	53%	87%	87%	100%	57%	57%

Table 5. Number/% of registered cases of hemolytic diseases and hypoglycemic syndrome in newborns

Facilities	hemolytic diseases in newborn		Hypoglycemic syndrome	
	Number of registered cases in 2007	%	Number of registered cases in 2007	%
Abovyan	3	0,2	0	0
Akhouryan	0	0	0	0
Aparan	0	0	0	0
Ararat	0	0	0	0
Artashat	0	0	0	0
Artik	3	0,5	10	1,6
Ashtarak	0	0	0	0
Vagharshapat	2	0,2	0	0
Yeghegnadzor	3	0,8	1	0,3
Garni	0	0	0	0
Gavar	1	0,1	0	0
Gyumri	1	0,1	0	0
Goris	2	0,3	0	0
Hrazdan	5	0,5	0	0
Ijevan	0	0	0	0
Kapan	4	0,8	0	0
Martouni	0	0	0	0
Masis	7	0,5	0	0
Metsamor	10	1,8	0	0
Nairi	0	0	0	0
Noyemberyan	3	0,7	0	0
Sevan	1	0,2	0	0
Sisian	7	1,9	0	0
Spitak	14	4,2	0	0
Stepanavan	1	0,3	2	0,6
Talin	0	0	0	0
Vayk	0	0	1	0,5
Vanadzor	8	0,5	0	0
Vedi	6	0,7	0	0
Armavir	0	0	0	0

Table 6. Basic statistical data on newborn infants

	Absolute numbers														%	
	Neonates	Stillbirths	Premature	<2500 g	<1500 g	< 1000 g	Cesarean sections	Sick newboms	Sick premature newborns	Neonatal deaths	Early neonatal deaths	<24 hours deaths	Deaths of premature newborns	Referrals	BCG	HepB
Garni	88	0	4	6	1	1	0	1	1	0	0	0	0	1	95	83
Aparan	193	1	28	19	0	0	22	51	25	0	0	0	0	10	86	86
Vayk	204	2	4	7	0	0	7	22	2	0	0	0	0	6	98	88.2
Spitak	331	5	53	43	6	2	24	57	20	5	5	3	3	9	82.5	81
Stepanavan	343	3	23	21	2	0	14	75	18	2	2	1	0	5	91.3	62.9
Ararat	352	3	12	26	1	0	9	76	12	3	3	3	2	7	92.9	77.8
Sisian	360	2	11	17	0	0	20	44	5	2	2	2	0	1	98.3	98.3
Yeghegnadzor	376	4	16	27	0	0	45	46	4	1	1	0	0	3	93.1	89.6
Noyemberyan	418	7	15	22	1	0	61	54	13	1	1	1	1	3	96.9	96.9
Nairi	436	3	12	12	0	0	13	33	6	2	2	2	1	2	96.8	96.8
Talin	444	7	12	12	0	0	34	32	9	1	1	1	1	6	96.6	96.6
Ashtarak	489	3	15	28	5	0	10	41	10	0	0	0	0	6	99	99
Ijevan	502	2	30	30	3	0	74	21	1	3	3	0	1	1	90.8	91
Kapan	532	6	23	32	3	0	74	53	23	6	6	6	5	9	86.1	86.1
Sevan	536	9	23	45	1	0	68	47	20	4	4	1	2	3	89.6	59
Metsamor	556	6	32	32	3	0	27	50	20	1	1	1	1	6	96.4	41.4
Goris	575	1	25	25	0	0	61	172	19	3	3	?	1	15	85.7	93.6
Artik	641	7	34	60	0	5	52	83	17	9	9	5	8	5	96.3	83.8
Gavar	695	6	62	71	3	1	57	68	26	6	6	2	6	5	94	84.5
Artashat	749	35	41	57	8	1	79	87	21	3	3	1	2	19	90.3	81.3
Vedi	818	17	15	24	8	1	53	78	7	4	4	3	3	10	96.6	94.1
Gyumri	946	22	107	146	21	5	161	329	103	10	10	10	10	48	90.6	90.6
Hrazdan	1048	13	68	97	6	1	58	128	48	9	9	7	4	16	95	68.5
Armavir	1071	6	39	54	4	0	67	62	20	4	4	4	3	3	97.4	97.4
Martouni	1074	9	69	69	4	1	72	96	48	5	5	4	4	8	96.1	70
Akhouryan	1086	7	52	64	23	11	162	61	29	11	11	11	11	7	91.6	91.3
Vagharshapat	1194	15	49	49	17	1	41	164	35	9	9	6	8	13	88.1	83.2
Masis	1497	18	85	111	7	0	192	102	26	5	5	1	2	29	91.2	82.4
Abovyan	1563	13	70	70	21	4	240	94	52	6	6	6	6	29	97.2	89.2
Vanadzor	1680	23	72	120	14	1	117	245	49	14	14	10	12	27	92.7	83.6
Total	**20797**	**255**	**1101**	**1396**	**162**	**35**	**1914**	**2472**	**689**	**129**	**129**	**91**	**97**	**312**		

Table 7. Basic statistical data on newborn infants

	Premature %	<2500 g. %	<1500 g. %	Morbidity %	Morbidity among prematures %	Mortality ‰	Stillbirth/Neonatal death	Deaths within 24h/neonatal deaths	Referrals %	Cesarean sections %
Garni	4,5	6,8	1,1	1,1	25	0	-	-	1,1	0
Aparan	14,5	9,8	0	26,4	89	0	-	-	5,2	11,4
Vayk	2	3,4	0	10,8	50	0	-	-	2,9	3,5
Spitak	16	13	1,8	17,2	38	15	1	0,6	2,7	7,2
Stepanavan	6,7	6,1	0,6	21,9	78	6	1,5	0,5	1,5	4,1
Ararat	3,4	7,4	0,3	21,6	100	9	1	1	2,0	2,6
Sisian	3,1	4,7	0	12,2	45	6	1	1	0,3	5,5
Yeghegnadzor	4,3	7,2	0	12,2	25	3	4	0	0,8	11,9
Noyemberyan	3,6	5,3	0,2	12,9	87	2	7	1	0,7	14,4
Nairi	2,8	2,8	0	7,6	50	5	1,5	1	0,5	3,0
Talin	2,7	2,7	0	7,2	75	2	7	1	1,4	7,6
Ashtarak	3,1	5,7	1	8,4	33	0	-	0	1,2	2,0
Ijevan	6	6	0,6	4,2	3	6	0,7	0	0,2	14,8
Kapan	4,3	6	0,6	10	100	11	1	1	1,7	13,9
Sevan	4,3	8,4	0,2	8,8	87	7	2,3	0,25	0,6	12,5
Metsamor	5,8	5,8	0,5	9	63	2	6	1	1,1	4,8
Goris	4,3	4,3	0	30	76	5	0,3	?	2,6	10,7
Artik	5,3	9,4	0	12,9	50	14	0,8	0,55	0,9	8,1
Gavar	8,9	10,2	0,4	9,8	42	9	1	0,33	0,7	8,2
Artashat	5,5	7,6	1,1	11,6	51	4	12	0,33	2,5	10,2
Vedi	1,8	2,9	1	9,5	47	5	4,3	0,75	1,2	6,4
Gyumri	11,3	15,4	2,2	34,8	96	11	2,2	1	5,1	16,8
Hrazdan	6,5	9,3	0,6	12,2	71	9	1,4	0,78	1,5	5,5
Armavir	3,6	5	0,4	5,8	52	4	1,5	1	0,3	6,3
Martouni	6,4	6,4	0,4	8,9	70	5	1,8	0,8	0,7	6,7
Akhouryan	4,8	5,9	2,1	5,6	56	10	0,6	1	0,6	14,9
Vagharshapat	4,1	4,1	1,4	13,7	71	8	1,7	0,67	1,1	3,4
Masis	5,7	7,4	0,5	6,8	31	3	3,6	0,2	1,9	12,8
Abovyan	4,5	4,5	1,3	6	74	4	2,2	1	1,9	15,4
Vanadzor	4,3	7,1	0,8	14,6	68	8	1,6	0,71	1,6	7
Total	**5,3**	**6,7**	**0,8**	**11,9**	**63**	**6**	**2,0**	**0,71**	**1,5**	**9,2**