Improving newborn and pediatric quality of care by strengthening access to safe use of oxygen, pulse oximetry, and infection prevention and control measures

NEPAL’S EXPERIENCE

**Context**

Nepal has significantly reduced under-five mortality in the last two decades, however progress is still needed: the neonatal mortality rate in 2019 was 20/1000 live births and the under-five mortality 31/1000 live births. The two most common causes of neonatal deaths in 2016 were respiratory and cardiovascular disorders, followed by respiratory distress syndrome, congenital pneumonia, and meconium aspiration syndrome. Acute respiratory infections remain a major health problem among under-five children and pneumonia is a leading cause of under-five deaths in Nepal (NDHS 2016).

Between September 2020 and June 2021, UNICEF, with support from USAID, collaborated with the Government of Nepal (GoN) Ministry of Health and Population (MOHP), the Perinatal Society of Nepal (PESON), and two hospitals in Nepal’s Province 2, Narayani and Janakpur hospital, to improve the quality of newborn and pediatric quality of care (QoC) with a focus, triggered by the COVID-19 pandemic, on strengthening access to and safe use of oxygen, and infection prevention and control.

The COVID-19 pandemic has strained Nepal’s weak health system and exposed existing gaps, with shortages of oxygen, ventilators, and essential medicines compounding frustrations of a depleted health workforce and causing secondary impacts on routine essential health care for women, newborns, and children.

**Efforts to improve quality of care**

In the past decade, the GoN has prioritized the improvement of QoC both at the primary and secondary health care levels. GoN has developed and implemented various quality improvement (QI) programs and tools including continuous monitoring. Some of the programs and tools that are currently being implemented include the health facility quality improvement initiative, minimum service standards, infection prevention and health facility waste management, national health care waste management, maternal and perinatal death surveillance and response, and simulation-based education. Although GoN does not have a national QI framework/strategy, there are quality improvement mechanism at health facilities and hospitals which oversee QI processes and monitor outcomes.

**Narayani and Janakpur hospitals**

Narayani and Janakpur hospitals are high volume, tertiary level referral hospitals in Province 2, providing neonatal care.
intensive care and pediatric care services as well as referral services to all eight districts under Province 2.

Baseline situation
A rapid baseline assessment was carried out in both hospitals which identified a number of quality gaps. In infrastructure and supplies, it was found that there was unavailability of critical equipment, including central oxygen supply, oxygen analyzers, Continuous Positive Airway Pressure (CPAP) machines, and pulse oximeters, as well as improper waste management. In terms of human resource capacity, there were training gaps on level II newborn care, pediatric emergency care, oxygen therapy, and infection prevention and control. For documentation and performance improvement, it was noted that there was poor functionality of the Maternal and Perinatal Death Surveillance and Review (MPDSR), with focus solely on adult mortality.

QI teams were in place in both hospitals with several QI initiatives ongoing, including a course on newborn care run by the Family Welfare Division (yet with limited attendance). With the support of UNICEF, the quality team has been using the point-of-care-quality-improvement (POCQI) approach, focusing mainly on neonatal care (resuscitation, sepsis management, kangaroo mother care) with an aim to expand the QI measures to the pediatric units. Simulation based training was used to provide in-situ training to the staff working in maternity and neonatal units.

The main oxygen source in both hospitals, which are lacking central oxygen supply, are oxygen cylinders, including for the newborn intensive care units (NICU) and, at Janakpur hospital, in the pediatric ward. Both hospitals were used as COVID-19 hospitals during the pandemic, partially utilizing the pediatric ward at Narayani hospital for COVID-19 patients and closing the NICU at Janakpur hospital for a period of time, and facing severe oxygen shortages.

The hospitals have established good coordination mechanisms with partners and with the MOHP. Besides the regular coordination meetings of the hospital management committee, Narayani hospital regularly coordinates with the district level Chamber of Commerce and Industry. The Chamber of Commerce and Industry has supported Narayani hospital in establishing and setting up a pediatric intensive care unit (PICU) by providing beds, ventilators, monitors, and oxygen piping. MOHP has been providing support to Narayani hospital in establishing an oxygen plant.

Key actions

Collaboration and coordination at federal and provincial level
UNICEF partnered with the PESON to provide overall coordination and technical insight under the leadership of the Family Welfare Division of the MOHP. UNICEF and PESON developed a national guideline on oxygen therapy for newborns and children, addressing areas such as identification and management of hypoxemia, sources and
delivery of oxygen, methods of oxygen delivery, and monitoring of children on oxygen therapy which is pending final approval. A guideline on Infection, Prevention and Control (IPC) at newborn and pediatric units was also developed and implemented.

**Infrastructure improvement**

UNICEF provided support to the hospitals in repairing and upgrading components of their oxygen supply. Janakpur hospital strengthened its piping system for oxygen in the pediatric unit ensuring all pediatric beds were equipped with oxygen, originating from cylinders via a manifold system. In addition, UNICEF procured and supplied equipment required for oxygen therapy in neonatal and pediatric units of both hospitals, including oxygen concentrators, pulse oximeters, oxygen analyzers and CPAP machines for both the neonatal and pediatric wards.

To improve infection prevention, Narayani hospital constructed handwashing stations for patients and their families.

**Capacity building**

Capacity building of facility staff was targeted to the NICU, pediatric unit, and pediatric emergency unit. Over a period of 12 weeks, using a shift schedule, more than 45 staff members were trained. Training included facility based integrated management of neonatal and childhood illness (IMNCH), level 2 NICU packages, diagnosis and management of hypoxemia, use of pulse oximeters and CPAP, use of concentrators and cylinders, as well as proper handwashing, equipment cleaning, and IV site management in neonates and young children. The training was very well received, and pre- and post- testing of the participants showed a significant increase in knowledge. The average score of the participants was found to be 40% in pre-test and 70% post-test.

A follow up training and onsite coaching was conducted for a total of 40 health workers (19 in Janakpur and 21 in Narayani hospital). A mentoring checklist was introduced to assess 9 core skills on a regular basis: 1) using pulse oximeters; 2) oxygen administration; 3) using oxygen concentrators; 4) general handling of oxygen cylinders; 5) CPAP preparation; 6) hand washing; 7) putting on sterile gloves; 8) skin preparation; and 9) equipment cleaning processes.

**Reporting and documentation**

Through continuous advocacy and support for improved documentation, there is now regular reporting from sick newborn care units. There are limited efforts on improving reporting from pediatric units which need to be further strengthened. UNICEF will continue collaborating with the GoN to improve the overall reporting of neonatal and pediatric quality care.

**Impact**

Improving oxygen supply and capacity in safe oxygen use ensured that 100% of newborns and children in need now receive timely oxygen therapy.
• There has been significant increase in newborn and pediatric beds equipped with oxygen as compared to baseline.

• More than 45 health workers (doctors and nurses) were trained on diagnosis and management of hypoxemia.

• Oxygen therapy record keeping has improved significantly.

• During the period of implementation, 935 neonates and 1500 children under five were admitted across the two hospitals, of which more than 200 required and successfully received oxygen therapy.

Challenges

The COVID-19 infection in Province 2 had a major impact on the implementation of this initiative, mainly due to prioritization of the COVID-19 response, including in maternity and pediatric units, and the transformation of pediatric into COVID-19 wards as well as absenteeism of health workers due to COVID-19. Some of the trainings of health worker staff had to be conducted virtually, which limited the effectiveness of the practical skills demonstrations.

Another challenge is related to the regular reporting of cases and interventions at neonatal and pediatric care units. While some indicators are captured in the Health Management Information System, there is an urgent need to establish an advanced reporting system for pediatric care.
Opportunities and lessons learned

The initiative helped to align federal and provincial levels and both hospitals around expanding existing QoC initiatives beyond maternal/newborn to pediatric care units. Although Nepal has a long history of implementing community-based integrated management of childhood illness, pediatric care in secondary and tertiary settings has not been standardized, lacking established mechanisms for monitoring and reporting. The initiative was a milestone towards this endeavor.

In response to the COVID-19 pandemic and the further anticipated impact on children, the GoN has prioritized strengthening pediatric intensive care units. The experience from this initiative will be instrumental in informing the government in expanding quality pediatric care within and beyond the two hospitals. The oxygen therapy training material has been used to inform the development of a pediatric critical care training resource package.

The initiative built basic capacity of health workers in safe use of oxygen in newborns and children. Continued follow up and mentoring are needed to maximize the benefit of the training on the new equipment, as well as the engagement of biomedical engineers to ensure proper maintenance of oxygen equipment.

Sustainability and next steps

UNICEF Nepal was able to leverage relationships with professional organizations such as the Perinatal Society of Nepal, and the MOHP to establish training and on-site coaching which will continue beyond the initiative. Training materials and tools developed can be scaled to additional sites. To further improve oxygen access, the provincial government now has allocated funds to establish oxygen plant in Janakpur hospital.

The government of Nepal, with support from UNICEF, WHO, and other partners, is working on a guideline and training package for case management of children with COVID-19. The learnings and tools from this initiative, including on safe use of oxygen, have been important to inform these ongoing efforts.

Further reading/resources

Breathing life into newborn and pediatric care

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