Original Research

Neonatal mortality and morbidity in the post-implementation period of a neonatal teaching program in provincial hospitals in Laos

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ABSTRACT

Objectives: Aim of this study was to analyze neonatal mortality and morbidity in the post-implementation period of a neonatal teaching program to examine a possible impact on neonatal outcomes.

Study design: This study is a retrospective data analysis of all neonatal patients treated in five provincial hospitals in Laos after implementation of a neonatal teaching program.

Methods: A simulation-based teaching program aims to have positive impact on the theoretical and practical skill of hospital staff in the field of newborn care. A comparison between pre-implementation and post-implementation data of newborns admitted to provincial hospitals in Laos was used to quantify the effect of repetitive teaching on neonatal outcomes.

Results: Neonatal mortality and morbidity as well as case fatality rates of infections and asphyxia decreased in the post-implementation period. In contrast, neonatal mortality rate as well as case fatality rate of prematurity increased. The total neonatal mortality rate increased in the post-implementation period.

Conclusions: The pre-implementation and post-implementation data enable longitudinal comparisons between hospitals and highlight the differences between hospitals concerning neonatal mortality and morbidity in provincial hospitals in Laos. These data can serve as a basis for an individual adaption of the teaching program to the unique requirements of each single hospital.

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Introduction

At the Millennium Summit in 2000, the United Nations declared eight Millennium Development Goals for the following 15 years.[1] One of the eight Millennium Development Goals concerned the health of children and planned to reduce child mortality by two-thirds relative to 1990.[2] Comparing the under-five-mortality rate of 1990 and 2015, a decline of 52% is apparent, decreasing from 90 to 43 deaths per 1000 live births. In 2015, six

million children died before reaching their fifth birthday, 47% of whom died during their first 28 days of life. Examining the proportion of neonatal deaths to under-five deaths over the years 1990—2015, the percentage of neonatal deaths has increased constantly from 40% in 1990 to 47% in 2015.[2,3] This relative increase in neonatal deaths as proportion of all under-five deaths is of particular importance and shows that only limited progress has been made reducing newborn deaths.[4] As a consequence, the United States together with UNICEF initiated in 2012 a new action plan 'A Promise Renewed', aiming at ending preventable child and maternal deaths.[5]

Improving the health care situation of neonatal patients in the People's Democratic Republic of Laos was the aim of a teaching program of a group of German neonatologists starting in 2013. Aim of the training program was to improve both theoretical and practical skills of medical staff treating newborn infants in provincial hospitals in Laos. The post-implementation data are used to examine a possible impact of the teaching program on neonatal outcomes.

Methods

Data for this study were collected in the five provincial hospitals with the highest neonatal mortality rate (NMR) within Laos. There are 18 provinces in Laos, each province has its own provincial hospital. This is the highest level of medical care available, only topped by treatment at the only university in Laos at Vientiane. The provincial hospitals with the highest NMR are located in Pakxan, Luang Namtha, Xamneua, Oudomxay, and Phonsavan.

Data about neonatal mortality and morbidity are not registered by the Health Management Information System in Laos. Therefore data were manually collected from hand-written records of the pediatric ward and the neonatal intensive care unit of the five provincial hospitals.

The data acquisition was carried out in July 2016. The study included all neonatal patients who had been treated since the initiation of the training program between October 2013 and June 2016. Information about reasons of diseases and deaths were gathered from hospital clinical documentation systems. Criteria for diseases were at the discretion of the treating pediatricians. As ultrasound was only available in a minority of cases, gestational age was mainly estimated on basis of the individual anamnesis.

From the obstetric ward, the number of deliveries and the number of preterm infants for the years 2013, 2014, 2015, and the months January to June in 2016 were registered.

Data of the current study are compared to pre-implementation data from 2010 to 2012. The descriptive statistics include mean, median, standard deviation, minimum, maximum, and the numbers of the parameters and groups tested. For correlation analysis, the Chi-square test was employed, calculating p and the confidence interval. $P < 0.05$ was considered to be statistically significant.

The study was approved by the ethical committee of the University of Duesseldorf. The permission for data collection was granted by the Ministry of Health in Laos.

The training program started in 2013 and is carried out up to two times a year in each of the selected provincial

hospitals.[6] The course is a EU-certified module of neonatology, covering besides resuscitation and examination the three main causes of neonatal mortality in low resource countries: prematurity, infection, and asphyxia, the latter being referred to by our laotian colleagues as intrapartum-related complications (IRCs).[7] Duration of the teaching was for three whole days in each provincial hospital and contains theoretical and practical lessons. Theoretical lessons included resuscitation of the newborn, examination, prematurity, infection, and news in obstetrics. Practical exercises covered resuscitation of the newborn with an emphasis on aeration of the lungs by the use of bag and mask, chest compressions and their coordination with ventilation, cannulation of the umbilical vein, the use of a simple bubble CPAP device, and diagnosis and drainage of pneumothorax.

Composition of the teaching groups differed from hospital to hospital. Invited were pediatricians, obstetricians, midwives, and nurses from both the specialties, obstetrics and pediatrics. Approximately 50% of participants came from the individual provincial hospital, the remainder from various district hospitals of the respective province. The number of participants varied between provincial hospitals from approximately 20 to 50.

Results

Data from obstetric wards

In general, the number of deliveries in the five provincial hospitals increased continuously over the years 2010—2015. The rising trend of 2010—2012 was sustained in the years 2013—2015.[8] This trend is consistent with the increasing number of deliveries in the corresponding provinces.[9,10,11] The percentage of deliveries in the provinces, which occurred in the provincial hospitals did not change significantly since 2013.[9,10]

Between October 2013 (10/2013) and June 2016 (06/2016), in total 897 of the 22,292 newborns in the five hospitals were delivered prematurely, which is defined as birth before 37 completed weeks of gestation.[12] Therefore 4% of all documented births in the five hospitals accounted for preterm births with a sharp decrease from 8.1% since 2010—2012.

Data from pediatric wards

Characteristics of all admissions

In total, 2216 neonatal patients have been admitted to a pediatric ward or neonatal intensive care unit from October 2013 to June 2016 in the five provincial hospitals (Table 1).

The average number of newborns admitted per month in the five provincial hospitals was 67.2 newborns in 10/2013—06/2016 which represents an increase of 45% since 2010—2012 (46.5 newborns admitted per month). In the study period 2010—2012, only 14 hospitalizations occurred in the provincial hospital Paksan and therefore these data have been excluded in the evaluation of the pre-implementation study. In contrast, between 10/2013 and 06/2016, in total 247 newborns were hospitalized in Paksan. Because of this now larger