

## Brief Report

# Implementation and Evaluation of a Neonatal Educational Program in Rural Nepal

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### Summary

A needs assessment at Tansen Mission Hospital established gaps in knowledge, skills and attitudes of health professionals, contributing to the high neonatal mortality in Nepal. This study was designed to implement and evaluate the effectiveness of an educational program in Newborn Care, using best evidence teaching methods and content. Pre intervention, an audit of newborn care practices and documentation was performed using a structured checklist. Intervention consisted of four teaching sessions each involving short lectures and interactive skills stations. Post intervention, participant satisfaction, knowledge, competence and performance were evaluated. In 80 per cent of responses ( $n=30$ ), participants evaluated the program as very good or excellent. Matched pair pre and post education MCQ scores compared knowledge, with significant improvement in all groups (nurses, doctors and community health workers). Competence was evaluated by an Objective Structured Clinical Examination with mean scores ( $\pm$ SD) ranging from 65 per cent (7.0) to 87 per cent (7.3). Performance was examined by pre and post-intervention audit of records. Significant changes in practice included a 100 per cent increase in measuring length and head circumference, charting percentiles and documentation of structured history and examination in the Newborn Care Notes. Administration of vitamin K at birth increased by 71 per cent, assessment of hypoglycaemia risk by 94 per cent and those at risk of hypoglycaemia having a blood sugar level measured increased by 58 per cent. These results led to consideration of appointment of a postgraduate educator. Even with limitations in educating and implementing change in a resource limited rural setting, a short, interactive education program can have positive educational outcomes and can change practice. Sustainability is dependant on staff employing continuing education.

### Introduction

There has been a global trend towards decreased childhood mortality, however the neonatal mortality rate (NMR) in developing countries is still alarmingly high [1]. In Nepal since 1987, the NMR has increased from 40 per cent to 60 per cent of the total infant mortality rate (IMR). The IMR has decreased whilst the NMR has remained unchanged [2].

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The United Nations Development Program 2004 calculated the Human Development Index for Nepal as 0.504 with a rank of 140 out of 177 [3]. Statistics are ascertained from health surveys as vital registration does not exist. The burden of neonatal mortality is great with an official NMR from the Ministry of Health of 39/1000. Nepal has the third highest rate of low birth weight (27 per cent), predominantly full term babies with reduced intrauterine growth [2]. Only 11 per cent of births are attended by a skilled health attendant, with skills ranging from 12 days training for traditional birth assistants to fully qualified specialist doctors.

Evidence based interventions such as drying and keeping an infant warm after delivery, immediate breast feeding, clean cord care procedures and early recognition and intervention in asphyxiated babies has lead to a decreased neonatal mortality rate in low income countries [4]. In addition to poor neonatal care, major underlying causes include poverty,

maternal malnutrition, poor maternal education, poor infrastructure, difficult geography and political instability. Nepal has a female adult literacy rate of 26 per cent and 27 per cent of women have a BMI < 18.5. One in seven women is under 145 cm tall. Anaemia is present in 75 per cent of pregnant mothers. The capacity of health systems to respond to the needs of mothers and their newborns is inadequate and access to health services is limited. There is lack of trained staff in the primary health care centres and district hospitals. This is worse in the poorer rural hill-region villages where the burden of neonatal death is the greatest.

Tansen lies in the Palpa district in rural Nepal. The mission hospital is a referral centre for 5 million people in the Western Region and is accessible by road. The hospital has 131 beds, with 1200–1300 deliveries annually. A needs assessment established gaps in educational knowledge and skills in Newborn Care that contribute to morbidity and mortality in this setting. Unsatisfactory practices included poor standard of neonatal examination, poor understanding of the care of low birth weight babies, lack of assessment of neonatal hypoglycaemia and lack of routine administration of vitamin K. Satisfactory practices with proven level 1 or level 2 evidence for reducing mortality in newborns included newborn resuscitation, thermal management, encouraging exclusive breast feeding for 6 months and clean delivery [4].

The aim of this study was to develop, implement and evaluate an educational program in Newborn Care, to empower the junior doctors, nurses and community health workers to look after newborns and hence decrease morbidity and mortality in the hospital and the region. The education program's effectiveness was evaluated by auditing practices before and after the educational program, participants undergoing pre and post education testing and evaluation of participant satisfaction.

An evidence based model was used, with a four-tiered evaluation, based on positive health outcomes in a National Perinatal Strategy in Macedonia, a low income, central European country [5]. The reduction in neonatal mortality in Macedonia was largely due to a targeted educational program, using a validated method, SCORPIO, (Structured Clinically Objective Referenced Problem-oriented, Integrated and Organised) of small group interactive teaching and learning [6].

## Methods

### *Pre intervention*

Over a 6-week period prior to the educational program, an audit of Newborn Care practices and documentation was performed using a structured

check list. Newborn data included details of pregnancy, delivery, vital signs, gestational age and percentiles.

### *Intervention*

Four, 90 minute teaching sessions on Newborn Care were given, involving short lectures and interactive skills stations using the SCORPIO model adapted to the setting of one teacher. Topics covered included Newborn examination (A "Newborn Care Notes" proforma was introduced to encourage the staff to document the examination, percentiles and note important details in the record), Management of low birth weight babies, Identification and management of common congenital malformations and conditions, Hypoglycaemia, Bleeding and Jaundice. Each teaching session had aims and objectives derived from evidence based protocols sourced from World Health Organisation guidelines [7] and the RPA Department of Newborn Care protocols [8].

### *Assessment and evaluation*

The assessment and evaluation of the education program consisted of four levels. These were participant satisfaction, assessment of knowledge, competence and performance.

Participant satisfaction with the education was measured using a Likert scale and was collected anonymously. Presentation technique, content, relevance to work, ease of understanding, opportunity for interaction, tutor support and feedback were evaluated. Opportunities were given to express how the education sessions could be improved.

Knowledge was tested by pre and post-education multiple choice questions (MCQs). A pool of 30 multiple choice questions relating to the learning topics was generated. Fifteen questions were randomly selected for the pre-test and post test. Competence in skills was examined by a post education Objective Structured Clinical Examination [9]. This consisted of 8 stations, with several parts to some stations. The OSCE was marked according to a structured score sheet. Performance was assessed by a post education audit of Newborn Care practices for 6 weeks using a structured checklist.

### *Statistical analysis*

The random selection of MCQs was performed using the Microsoft excel random number generator program. Calculations of mean and standard deviation of scores were performed using Microsoft Excel. The *p* values for comparing paired pre- and post-test MCQ scores were calculated using the Wilcoxon Signed Ranks Test, rather than a paired *t* test (low numbers) and pre and post intervention administration of vitamin K was calculated using a  $\chi^2$  test using SPSS with *p* < 0.05 considered significant.

## Results

A total of 236 babies notes were audited during this study. A summary of their epidemiology is seen in Table 1. Participants ( $n=30$ ) completed an evaluation scale and rated the program and all of its components as very good or excellent in over 80 per cent of responses (Table 2). Pre- and post-test multiple choice question scores were compared. Matched pairs of pre- and post-test scores showed significant improvement in all groups ( $p<0.05$ ) (Table 3). The results of the Objective Structured Clinical Examination ( $n=22$ ) showed mean score ( $\pm$ SD) was 76 per cent (14.7) overall, for junior doctors

87 per cent (7.3), nurses 65 per cent (7.0) and community health nurses 70 per cent (21.4).

With regards to performance, all babies had their weight, gestational age, vital signs, nature of delivery and Apgar scores documented both pre- and post- the educational intervention. There were however some significant changes post-education in the areas of measurement and plotting of percentiles, recognition and appropriate management of babies with hypoglycaemia and administration of vitamin K at birth. Significant changes in practice in Newborn Care are documented in Table 4.

TABLE 1  
*Descriptive epidemiology of consecutive in-hospital births*

	Pre intervention ( $n=115$ )	Post intervention ( $n=121$ )
Sex Male %	52	53
Female %	48	47
GA <37 weeks %	19	13
Ave weight (g)	2757	2762
Low birth weight (<2500 g) %	30.4	24.8
LBW with GA <37 weeks %	48.5	38.7
Post natal deaths (0–7days)	0	2
Number of stillbirths	5	3
Average length	Not measured	48.6 cm
Average head circumference	Not measured	33.7 cm
Rate of LSCS	18.2%*	8.3%
Rate of vacuum delivery	10.4%	3.3%

\*Annual Caesarian section rate average (1999–2003) – 14.2%.

TABLE 2  
*Summary of participant evaluation responses using Likert Scale (n = 30)*

	Very good or excellent (%)	Average (%)	Poor or below average (%)
Presentation technique	97	3	0
Content	93	7	0
Relevance to work	80	20	0
Ease of understanding	87	13	0
Opportunity for interaction	87	13	0
Tutor support and feedback	100	0	0

TABLE 3  
*Matched pair results of pre and post test multiple choice questions*

	Pre test mean score % ( $\pm$ SD)	Post test mean score % ( $\pm$ SD)	Average improvement %	$p$ value
Hospital nurses ( $n=7$ )	63 (8.5)	84 (10.1)	21	0.03
Junior doctors ( $n=10$ )	67 (14.7)	83 (8.5)	17	0.01
Community health nurses ( $n=6$ )	47 (6.0)	77 (9.2)	30	0.02
Total ( $n=23$ )	60 (13.7)	81 (9.3)	21	<0.001

TABLE 4  
*Significant changes in practice of newborn care*

Parameter measured	Pre intervention % (n = 115)	Post intervention % (n = 120)
Newborn care notes (history, exam etc)	Nil	100
Length measured	Nil	100
Head circumference measured	Nil	100
Percentiles charted	Nil	100
Vitamin K given at birth	24.5	95.8
Hypoglycaemia risk assessed	0.9	95.0
BSL measured where at risk of hypoglycaemia	0.9	59.1

### Discussion

For countries in transition, the decrease in less than five years childhood mortality is associated with an increase in the proportion due to neonatal deaths. It is estimated that 38 per cent of all under 5 years deaths occur in the first month of life. Decreasing the under 5 years mortality by 2/3 by 2015 is the fourth Millennium Development Goal [10]. This has recently been targeted by the WHO, with a greater educational focus and publication of a short text on Newborn Care [7]. Save the Children have published a more practical text with the same approach [11].

Evidence of effective community-based interventions in low income countries have been summarised recently. This revealed a paucity of community-based data for many interventions being considered for neonatal health programs and highlighted the need for further research and evaluation of these interventions [12].

There are enormous needs for improvement in newborn care in low income countries where the neonatal mortality is so unacceptably high. This study was conducted in a hospital situation, which is not representative of the general population of mothers and newborns in Nepal. Nevertheless, at one point in the health system we have demonstrated that gains can be made by an evidence-based educational approach. Education directed at this secondary/tertiary level hospital is relevant to district hospitals and community and village referral patterns, there being little point in referral unless outcomes are better at this point in the health system.

This paper reports that even in resource limited areas of the world, interactive, small group, low cost, evidence-based education programs in low income countries over short periods of time can improve neonatal care. Better education can translate to behavioural change and improved clinical practice. The results of this observational study provide the impetus to design large randomised trials with a greater variety of outcomes and thus afford greater certainty for wider implementation if supported by higher levels of evidence.

Specific health outcomes were not measured in this study as follow up of healthy babies was not feasible due to lack of perceived need, financial and geographical constraints. Recent data however using this approach in Macedonia has translated to a decrease in early neonatal mortality rate by 36 per cent [5].

The dramatic increase in the number of newborns receiving vitamin K at birth was encouraging. There is no data on the incidence of Haemorrhagic Disease of the Newborn in Nepal. However, a recent study was performed in the Hanoi province in Vietnam where bleeding due to vitamin K deficiency is a major health problem, with a reported incidence of 100/100 000 births and a high mortality [13]. This reported data indicate that routine vitamin K prophylaxis would significantly reduce infant morbidity and mortality.

Performance was improved as a result of the education program. Assessing babies for hypoglycaemia increased by over ninety percent, however of the babies identified as at risk of hypoglycaemia only 59 per cent of them had their blood sugar level measured. Due to financial constraints, staff were reluctant to test clinically well babies even if they were identified as being at risk of hypoglycaemia. This lack of resources affects the sustainability of the improvements that are gained by increased awareness of problems.

This education program proved successful in increasing both knowledge and competence in the participants. The improvement in knowledge was seen in an average of 20 per cent improvement in MCQ scores. Facilitators of change included the support of senior medical and administrative staff and enthusiastic response by staff to learn ways to improve newborn care, as evidenced by the positive evaluation of the teaching program and requests for further teaching sessions.

The main barrier to change was a distinct lack of perception of the disease burden in the community. Without a perception of a problem, there is little incentive to adapt to changes. This barrier could be targeted by training doctors and nurses in a setting where there is evidence-based neonatal care focussed on outcomes.

Limitations in undertaking this study included limited time, technology and resources. Communication was difficult as trained translators were not available. The population of babies that were included in the study were not representative of the community as they were selected by the fact that they were born in a hospital. However community nurses were included and most responsive to the program as evidenced by the results.

The sustainability of a project such as this is essential to its positive effect. Sustainability of these changes is dependant on ongoing education and assessment of competence and performance. This is envisaged by employing a professional nurse educator to continue education, encourage implementation of evidence based protocols and audit newborn practices. Future work is proposed to reassess the impact of the educational intervention after 12 months.

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