

# POLICY BRIEF

## EXECUTIVE SUMMARY

In spite of the magnitude, knowledge about newborn mortality (<29 days of age) is very limited in resource poor settings like Vietnam.

We explored newborn morbidity and mortality in hospital (general and specialized pediatric care) and community settings in South Vietnam in 7 studies (total n=7468).

Prematurity, infection, asphyxia and congenital malformations are major causes of newborn mortality globally. However, three of these groups of vulnerable newborns seem to be underrepresented in the specialized hospital studied. In contrast, mild conditions were registered in almost a quarter of the patients. Further, the mortality rate was 5% in both the general and specialized hospital. Our findings suggest utilization of the specialized newborn care available may not be optimal.

In both hospitals, vital signs at admission were the most important pre-hospital predictors associated to death. Notably socio-demographic characteristics like gender, ethnicity and parental education were significant, once admitted to the hospitals.

Infection was a major problem in both study hospitals. In the general hospital, infections covered more than 90% of admissions. In the specialized hospital, blood infections were frequent and resistance towards antibiotic used was common. Further management of blood infections were among the most frequent potentially preventable in-hospital risk factors of death in the structured audit performed. We recommend strengthening of infection management including blood infection surveillance, hygiene improvement and scenario training. Further audit implementation should be considered.

In the newborn community cohort, the mortality rate was lower than expected at 0.003 %. All mothers delivered in health care facilities and 4 % needed special treatment. Another 4% became ill at home and initially sought help both in- and outside the public health care system. Half of these babies were admitted to hospital during their illness.

## INTRODUCTION

We explored newborn (age 0-28 days) morbidity and mortality prospectively in 12 months periods in 3 studies sites

\*Tertiary pediatric hospital in Ho Chi Minh City (5763 babies, mortality 5%)

\*Secondary general hospital in Dong Thap Province (1094 babies, mortality 5%)

\*Community birth cohort in Dong Thap Province (602 neonates 0,003%)

The 7 studies included:

\*Characterization of the newborn populations in all three settings three settings (I-III)

\*Examination, quantitatively and qualitatively, of predictors of death in the hospitals (I-II)

\*Investigation of blood infections in the pediatric hospital (I)

\*Implementation of Nitric Oxide treatment of respiratory failure in the pediatric hospital (I)

\*Description of newborn mortality and seeking behaviour in the community (III)

## **BACKGROUND**

Of the 4 million newborns ( $\leq 28$  days of age) dying annually, the vast majority die in developing countries. Most die of infections, prematurity, asphyxia and congenital malformations. Compared to the decrease in child mortality, achievements to reduce newborn mortality lag behind, globally and in Vietnam. An estimated 17,000 neonates die annually in Vietnam. The vast majority are likely to die in hospital settings, but the current knowledge about newborn morbidity and mortality is scarce.

## **RESULTS**

### **Tertiary pediatric hospital**

A. Description of the newborn population in the hospital (n=5763). Our findings indicate that prematurity, asphyxia and congenital malformations were significantly underrepresented in the hospital, compared to both Rigshospitalet and to the catchment population of the hospital. These conditions are known to be major causes of neonatal mortality. Further, almost a quarter of the neonates had mild conditions, which could probably have been treated sufficiently at lower levels. Newborn case fatality rate was 5%

B. We investigated pre-hospital predictors of death in the hospital among a vulnerable sub-group of newborns (n=2196). The predictors were socio-demography, pregnancy-delivery, neonatal history and clinical status at admission. Vital signs at admission were the most important risk factors examined. Notably, ethnicity, parental education and gender were not associated with death, once admitted to the hospital.

C. Newborns with infections of the blood (n=385) were examined. Most infections were late onset. The isolates resembled other resource poor settings. The blood infection related case fatality rate in the study population was 16% and Gram-negative infections carried the highest mortality. Antibiotic resistance was common.

D. Death cause and potentially avoidable in-hospital risk factors were investigated in newborns who died (n=235) or were expected to die (n=67, discharged alive after withdrawal-of-life-sustaining-treatment) in a structured audit procedure. Major causes were congenital malformations, infections, prematurity and asphyxia. Among the 85% of the 71 cases with a relatively good prognosis at arrival to the hospital, we identified 6 risk factors, which could be addressed without implementation of new technologies or major organizational changes. The risk factors were related to management of general danger signs, internal transfers, blood infection management, equipment, and family perception of prognosis.

E. We investigated implementation of Nitric Oxide treatment of respiratory failure in newborns admitted to intensive care (n=50). 78% responded to the treatment and 68% survived. Further, causes, monitoring, side effects and costs were examined.

### **Secondary general hospital (preliminary results)**

In this hospital all newborns (n=1094) admitted to pediatric care (internally (from obstetric care) / externally) were enrolled, of which 5% died. 20 % were premature and more than 90% were diagnosed with infections. In 1/3 of all ambulance transportations to the hospital, deterioration of the newborn was reported. Among pre-hospital predictors of death, grouped in socio-demography, pregnancy-delivery, neonatal history and clinical status at admission vital signs at admission were among the most important risk factors examined. Notably, ethnicity, parental education and gender were not associated with death, once admitted to the hospital.

### **Community** (preliminary results)

Among 609 newborn babies from in the catchment area of 5 commune health posts, 1/3 of the mothers had less than secondary schooling. 3% of the families were ethnic minorities and 12% were classified as poor by the People's Committee. All mothers delivered in health care facilities, 95% at term and in 93% the baby was crying at birth and 4 % needed special treatment. Another 4% became ill at home and initially sought help at pharmacy, private hospital and high level hospital, half of the babies were admitted to hospital during their illness. Newborn mortality rate was 0.003% and less than expected.

## **CONCLUSIONS**

In conclusion, our studies contribute to the understanding of newborn morbidity and mortality in South Vietnam, through prospective observational studies of populations in community and general and specialized pediatric hospital care, including in 7468 newborns in total.

Prematurity, asphyxia and congenital malformations were likely to be underrepresented at the specialized hospital, compared to Rigshospitalet and catchment population. These conditions are known to be major causes of death. Mortality rate in both hospitals were 5%.

Among pre-hospital predictors of death, vital signs at admission were the most important in both general and specialized pediatric hospital care. Gender, ethnicity and parental education were not associated to neonatal hospital death

Blood infections in the specialized hospital resembled other resource limited settings. They were frequent, pathogenic and antibiotic resistance common

Major causes of death in the specialized hospital were prematurity, asphyxia and congenital malformations. We identified 6 potentially avoidable risk factors among newborns with a relative good prognosis at admission, which could be addressed without implementation of new technologies or major organizational changes. The risk factors included infection management.

In the community studied, both newborn morbidity and mortality seemed to be less of a problem than expected.

## **IMPLICATIONS**

*Implications for clinical practice*

Improve early hospital management

Strengthening transportation internally/externally (equipment, training)

Register vital signs regularly at admission

Develop guidelines for specialist consultation (transport, delivery room, emergency room)

Strengthen infection management

Diagnose validation, hygiene, surveillance, update of guidelines and scenario training

Consider implementation of Nitric Oxide in specialized pediatric care to treat respiratory failure

Complete audit cycle

Establish audit group to investigate possible interventions addressing risk factors identified

Consider regular structured audit as part of clinical management

#### *Implications for organization*

Increase access to specialized care for vulnerable groups

Improve utilization of existing specialized care

Upgrade lower levels

Unite pediatric care in one administrative unit within hospitals

Emergency room, newborn care and intensive care

Provide obstetric and pediatric care in the same hospitals

#### *Implications for future research*

Prioritize research agenda agreed by stakeholders

clinicians, public health staff, researchers and policy makers.

Investigate population based neonatal mortality rates

Develop a clinical risk score focusing on early warning signs

Investigate the burden of symptomatic blood stream infections in hospital and community settings

Evaluate the audit procedure and its effect including medical technology evaluation

## **RECOMMENDATIONS**

On the bases of our studies we recommend:

#### *Clinical practice*

- 1) Improve early hospital management
- 2) Strengthen infection management
- 3) Consider mortality audit implementation

#### *Organization*

- 4) Increase access to specialized care for vulnerable groups
- 5) Unite pediatric care in one administrative unit within hospitals
- 6) Provide obstetric and pediatric care in the same hospitals

#### *Research*

- 7) Develop a prioritized research agenda agreed
- 5) Develop clinical risk score focusing on early warning signs