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Early neonatal death: A challenge worldwide

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A B S T R A C T

Early neonatal death (ENND), defined as the death of a newborn between zero and seven days after birth, represents 73% of all postnatal deaths worldwide. Despite a 50% reduction in childhood mortality, reduction of ENND has significantly lagged behind other Millennium Developmental Goal achievements and is a growing contributor to overall mortality in children aged <5 years. The etiology of ENND is closely related to the level of a country's industrialization. Hence, prematurity and congenital anomalies are the leading causes in high-income countries. Furthermore, sudden unexpected early neonatal deaths (SUEND) and collapse have only recently been identified as relevant and often preventable causes of death. Concomitantly, perinatal-related events such as asphyxia and infections are extremely relevant in Africa, South East Asia, and Latin America and, together with prematurity, are the principal contributors to ENND. In high-income countries, according to current research evidence, survival may be improved by applying antenatal and perinatal therapies and immediate newborn resuscitation, as well as by centralizing at-risk deliveries to centers with appropriate expertise available around the clock. In addition, resources should be allocated to the close surveillance of newborn infants, especially during the first hours of life. Many of the conditions leading to ENND in low-income countries are preventable with relatively easy and cost-effective interventions such as contraception, vaccination of pregnant women, hygienic delivery at a hospital, training health care workers in resuscitation practices, simplified algorithms that allow for early detection of perinatal infections, and early initiation of breastfeeding and skin-to-skin care. The future is promising. As initiatives undertaken in previous decades have led to substantial reduction in childhood mortality, it is expected that new initiatives targeting the perinatal/neonatal periods are bound to reduce ENND and provide these babies with a better future.

1. Introduction

As the deadline for the Millennium Developmental Goals approaches, the related achievement of a significant reduction in maternal and child mortality from 1990 to 2013 has been widely acknowledged (Fig. 1). Laudable as these results are, it is striking that the reduction of neonatal mortality rates (death before 28 days after birth) has lagged remarkably compared with post-neonatal mortality rates (death between 28 days and 5 years of age). Hence, whereas post-neonatal death has been reduced by 56%, neonatal mortality rates have only reached 40%. Of all the 2.8 million newborn infants who die worldwide each year during the neonatal period, 73% do so during the first week after birth (early neonatal deaths, ENND) [1–3] (Fig. 2). Therefore, deaths in the newborn period and especially ENND are increasingly contributing to overall infant mortality at age <5 years [4–8]. This is illustrated, for example, in countries such as Brazil, Ghana, and Uganda, where post-neonatal infant mortality has been largely reduced through better coverage of primary care, vaccinations, and nutritional programs. However, interventions improving perinatal mortality have been less widely implemented. It could be considered that the first week of life is the most critical for a neonate, with 36% of deaths (one million) occurring in the first 24 h after birth, 37% (one million) in the early neonatal period, and 27% (0.8 million) between days 7 and 27 of life, as reported in 2013 [9–11]. Maternal and early neonatal deaths and stillbirths are closely linked: almost half of all maternal deaths, stillbirths, and early neonatal deaths occur during

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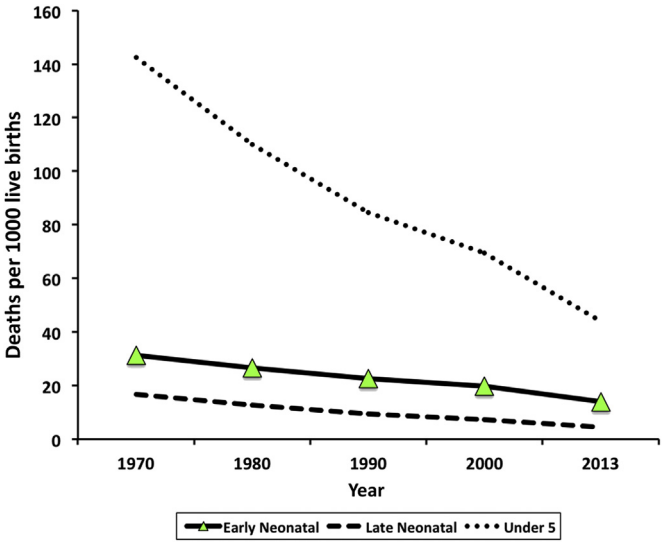

Fig. 1. Childhood mortality at age <5 years has undergone a considerable reduction in the period from 1990 to 2013 according to the World Health Organization. However, early (<7 days after birth) and late (7–28 days after birth) neonatal mortalities have undergone a lesser reduction [1].

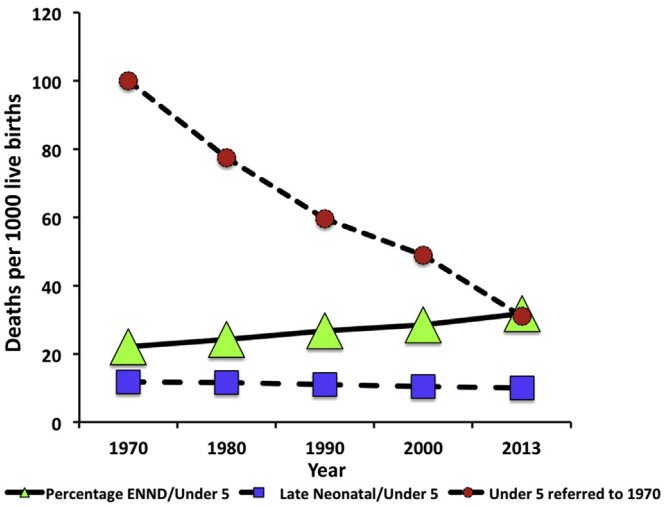

Fig. 2. The deaths of children aged <5 years have considerably reduced since 1970 while the proportion of early neonatal deaths has increased. That is why ENNDs currently represent a higher percentage of the total deaths at age <5 years than in 1970 [1–3].

the critical 48 h window comprising labor and delivery (Fig. 3). This underscores the need for an integrated intrapartum approach to saving the lives of both mother and newborn [5,8,12].

The leading causes of neonatal death globally in 2013 were related to (i) prematurity-associated complications, (ii) birth-related complications such as birth asphyxia or trauma, and (iii) infections such as neonatal sepsis, pneumonia, tetanus, and diarrhea. However, global estimates do not take into account variations between countries. Thus, in high-income countries the rate of neonatal deaths caused by congenital anomalies plays a significant role, whereas the role of other causes, especially infections, is lower [13]. Sudden unexpected early neonatal deaths (SUEND) or sudden unexpected postnatal collapse (SUPC) is a rare event, but it has attracted attention in the epidemiological studies of high-income countries as a relevant cause of ENND [14–17]. On the other hand,

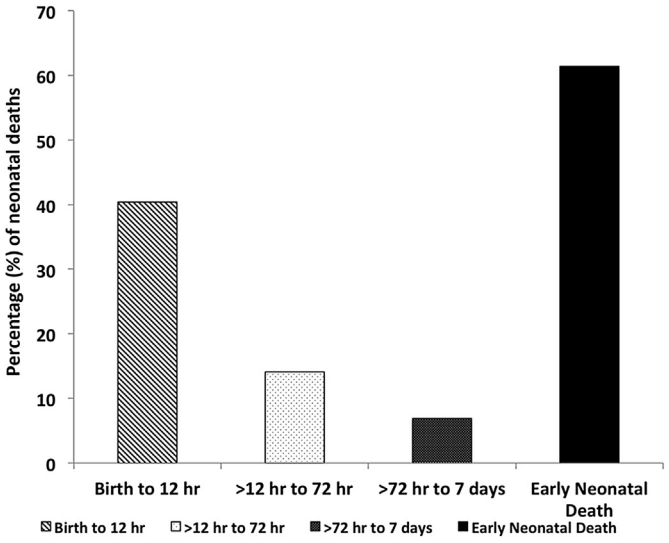

Fig. 3. Early neonatal deaths (ENND) that refer to deaths of babies <7 days after birth represent a notable percentage of deaths occurring within the first 28 days after birth (neonatal period). Most of these deaths occur within the first 12 h after birth, revealing the importance of perinatal events in the etiology of ENND [9–13].

information about SUEND in low-income countries is almost non-existent (Table 1).

Here we aim to present epidemiologic data, describe the etiologic factors contributing to ENND in both low-income and high-income countries, and describe initiatives to reduce early neonatal mortality.

2. Standardized definitions

Classification of a child's life into well-defined and globally accepted periods is essential for the standardization of health care objectives. First, it is important to set forth the most widely employed definitions in the scientific literature regarding the epidemiology of ENND.

The neonatal period, which has been defined by the World Health Organization (WHO) as “beginning at birth and ending at 28 completed days of life” [9], is recognized as the most vulnerable time in an infant's life. WHO has also defined neonatal death as “deaths among live births during the first 28 completed days of life [,]” which can be further sub-divided into early neonatal death (deaths between 0 and 7 completed days of birth) and late neonatal deaths (deaths after 7 days to 28 completed days of birth) [1,2]. Distinguishing between stillbirth and live birth/early neonatal death is often difficult, especially in low-income countries.

A “live birth” is defined as the complete expulsion or extraction of the product of human conception which shows signs of life independent of the duration of pregnancy [9]. Moreover, after expulsion, the infant caregivers have to assess whether the baby breathes spontaneously and/or shows other signs of life such as a beating heart, pulsation of the umbilical cord, or definitive movement of voluntary muscles. The concept of “live birth” does not refer to the status of the umbilical cord or the placenta. Hence, the baby can be still attached to the cord or the cord can be clamped and/or cut while the placenta is still attached to the uterus or has been expulsed; independently of these circumstances, the baby born is considered a live birth. Importantly, heartbeats must be distinguished from transient cardiac contractions, and respiratory movements must be distinguished from transient respiratory efforts or gasps.

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