

# Determinants and risk factors of neonatal mortality in the Gaza Strip, occupied Palestinian territory: a case-control study

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**Background** The infant mortality rate (IMR) per 1000 livebirths had fallen from 86 in 1970 to 69 in 1975, 43 in 1980, and 33 in 1985 in the Gaza Strip, occupied Palestinian territory. The slowing of this decline was due to an increase in neonatal mortality rate. In 2009, according to data from the Palestinian Ministry of Health, IMR in the Gaza Strip was 21.5 per 1000 livebirths. 73% of infant deaths were in neonates, with about 62% occurring in the early neonatal period (first week of infant life) and about 38% in the late neonatal period. We therefore ascertained risk factors related to neonatal mortality in the Gaza Strip.

**Methods** In a population-based, case-control study, 220 mothers of deceased neonates (cases) and 495 mothers of surviving babies (controls) were interviewed by female researchers using a structured questionnaire based on WHO's verbal autopsy questionnaire that was adjusted to the Palestinian context. Inclusion criteria for the cases were singleton newborn infants who died in the neonatal period (1–28 days after birth) in 2008. Two controls were matched for each case on the basis of sex, locality, and nearest 1 week of childbirth. Exclusion criteria were twins, stillbirths, infants born after 28 days, and neonates whose parents travelled from the Gaza Strip. Gathered data were entered into SPSS (version 11.5), grouped according to the variables, and analysed with multilevel logistic regression to assess differences in exposures between surviving and deceased neonates. The variables were socioeconomic background, maternal age, schooling, type of marriage of the parents, health status during pregnancy, parity, history of previous child death in the family, birth spacing, gestational age during delivery, type and place of delivery, neonatal birthweight directly after delivery, and effect of health service delivery on the outcome of birth and other conditions related to neonatal survival and death in the Palestinian context. Risk was reported as odds ratio (ORs) with 95% CIs and p values ( $p < 0.05$  was judged significant). An official letter of approval to undertake the research was obtained from the Helsinki Committee, Gaza Strip. Written informed consent was obtained from all participants.

**Findings** The risk of neonatal mortality was higher in the offspring of mothers in a consanguineous marriage (122 [55%] of 220) than in controls whose mothers were not in a consanguineous marriage (225 [46%] of 494; OR 1.49, 95% CI 1.08–2.04;  $p = 0.014$ ). Cases whose mothers had more than four dependants were at a higher risk than were controls whose mothers had fewer dependants (173 [79%] of 220 vs 147 [30%] of 494; 1.56, 1.07–2.27;  $p = 0.05$ ). Risk of death was higher for neonates born to mothers with a history of domestic violence during pregnancy than for controls whose mothers did not have this risk (48 [22%] of 220 vs 74 [15%] of 493; 1.58, 1.05–2.36;  $p = 0.02$ ). Newborn babies of mothers who attended fewer than four antenatal sessions during pregnancy had a risk of dying that was almost twice that of those whose mothers attended four or more times (21 [10%] of 219 vs 26 [5%] of 492; 1.99, 1.04–3.45;  $p = 0.03$ ). The risk of neonatal death increased greatly in premature babies than in babies born at term (78 [35%] of 220 vs 20 [4%] of 494; 13.04, 7.71–22.07;  $p = 0.0001$ ). The risk of neonatal mortality was higher in babies with a low birthweight than in those with a normal birthweight (96 [44%] of 219 vs 39 [8%] of 493; 9.08, 5.95–13.85;  $p = 0.001$ ) and was higher in the offspring of mothers with a history of neonatal death (80 [36%] of 220 vs 67 [14%] of 495; 4.26, 2.93–6.18;  $p = 0.0001$ ). The odds of mortality in babies who were unconscious after delivery was higher than in those who were conscious (31 [14%] of 220 vs five [1%] of 495; 16.07, 6.15–41.95;  $p < 0.0001$ ). The risk of death in neonates who were breastfed within the first hour of delivery was much lower than in those who were not breastfed in the first hour (56 [70%] of 80 vs 463 [95%] of 487; 0.12, 0.06–0.22;  $p < 0.0001$ ).

**Interpretation** Neonatal mortality in the Gaza Strip increases with mother's consanguinity, number of dependants, domestic violence during pregnancy, and suboptimum access to antenatal care, and the prematurity, low birthweight, and health of the neonate directly after delivery. A programme of sociocultural and economic approaches is needed, with improvement of the health-care services during pregnancy and the perinatal period to reduce neonatal mortality in the Gaza Strip.

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#### Contributors

IEA, YA, and MA contributed to the study design. IEA supervised data gathering and entry. IEA and YA did the data analysis. MA and IEA interpreted the data. All authors approved the final version of the Abstract.

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**Conflicts of interest**

We declare that we have no conflicts of interest.

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