SHORT REPORT

Male biased mortality among 1–2 year old children in rural Malawi

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We performed a community based cohort study in rural Malawi and documented a twofold mortality risk among 1–2 year old boys compared to girls of the same age. Because of its potential implications for child survival programmes, further studies should investigate whether sex differences in childhood mortality are more widespread in Sub-Saharan Africa.

In most populations, there are some 5% more live births for boys than for girls.[1] This numerical difference usually decreases in infancy, because of higher mortality of boys during the neonatal and subsequent period.[2] In industrialised countries males often continue to be slightly more prone to death during the remainder of childhood.[3][4] In areas where child mortality remains high, sex differences in post-infant death rates are infrequently reported. Some Asian, North African, and Arab countries are an exception, but in the opposite direction: in these cases, post-infant mortality appears to be notably higher among girls.[4][5]

Whereas the consistent mortality gap in early life is believed to reflect inherent biological differences between the sexes,[2][5][6] subsequent variation is often attributed to behavioural factors.[3][7] Therefore, effective child survival programmes may need to address cultural aspects, especially prevailing sex preferences, in areas where over 1 year old boys and girls have unequal death rates. According to the current data, this issue need not be considered in Sub-Saharan Africa, the region of highest childhood mortality in the world, because sex biased mortality difference seems very uncommon.[5] Most information comes, however, from national surveys or censuses, which may give too crude a picture in countries with several ethnic groups and cultures. In such conditions, community based studies have better potential to reveal mortality variation.

METHODS

We carried out a prospective cohort study on child health in Lungwena, rural Malawi. After obtaining informed consent, 795 pregnant women attending a government clinic for antenatal care were enrolled. This cohort, including over 95% of all pregnant women in the area, was closely monitored until birth.[8] The delivery events were recorded by research assistants and the newborns were examined by a medical doctor. Subsequently, research assistants visited the homes monthly for 18 months and quarterly for another 18 months, to interview the guardians and to measure growth of the children. Immunisation data were collected from guardians and child health cards at each home visit and verified from health centre records. Causes of death were established by verbal postmortem examination technique.[9]
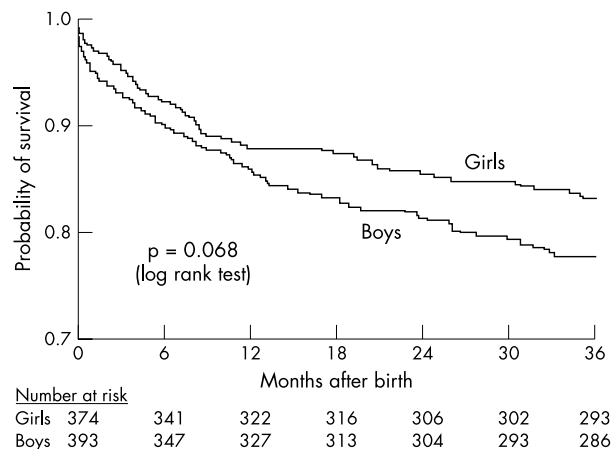

Figure 1 Sex specific childhood mortality in Lungwena, Malawi.

RESULTS

Only 14% of the participating women could read and write; subsistence farming formed the main occupation, and poverty was widespread.[8] At enrolment, the mean (range) duration of pregnancy was 24 (9–38) gestation weeks. Eighteen per cent of the mothers were HIV infected. Because of 18 twin pregnancies, the total number of fetuses was 813. Two mothers aborted before the 22nd gestational week, 36 babies were stillborn, and eight mothers and fetuses discontinued the follow up during pregnancy. Of the 767 live born infants, 44 (5.7%) were lost to follow up during the first three years of life. The sex ratios (male:female) of live borns and those who died before birth were 1.05 and 1.19, respectively. For children in follow up at 12 months of age, coverage for BCG, third polio, third DPT (diphtheria, pertussis, and tetanus), and measles immunisation was 97%, 92%, 89%, and 66% for boys and 98%, 91%, 89%, and 66% for girls. At two years, measles vaccine coverage was 79% and 78% for boys and girls, respectively.

One hundred infants and forty seven 1–2 year olds died during follow up, resulting in infant and under 3 year mortality rates of 136 and 202 deaths/1000 live births, respectively. As shown in fig 1, mortality was higher among boys than girls immediately after birth, but not during the subsequent 6–8 months. Between 9 and 35 months of age, there was a notable excess of male mortality (relative risk 1.9, 95% CI 1.0 to 3.0, p = 0.04, Cox regression). The finding could not be associated with any confounding variable. When controlled for maternal age (<20/20+ years) and HIV status (ELISA +/−), family wealth (dichotomous score), distance between home and the local health centre (<5/5+ km), immunisation with BCG (vaccinated/unvaccinated at 2 months), third polio, third DPT (+/− at 6 months), and measles (+/− at 12 months) vaccine, as well as incidence of moderate wasting (time dependent), 9–35 month old boys still had a 2.0-fold risk of dying compared to girls of the same age (95% CI 1.4 to 2.6, p = 0.03, Cox regression).

Excess male mortality was noticed, both among offspring to HIV infected women (relative risk (RR) 2.3, 95% CI 0.8 to 6.7) as well as among babies born to uninfected mothers (RR 1.7, 95% CI 0.9 to 3.2). Sample size, however, was too small for statistical confidence (p = 0.12 for both).

The cause of post-infancy death was established in 46/47 cases: diagnoses included malnutrition (n = 14), malaria or anaemia (n = 10), respiratory infections (n = 6), diarrhoea (n = 4), possible accident (n = 1), and other diseases (n = 11). HIV infection was considered a contributing factor in seven deaths and an underlying malnutrition in another seven.

DISCUSSION

At least three biological factors—malnutrition, immunisations, and accidents—have been associated with male biased mortality among infants and older children, respectively.[2 4 10 11] The prevalence of underweight, stunting, or wasting was also in the current study site constantly higher among boys than girls (K Maleta et al, unpublished observation). Furthermore, close to one half of the deaths were malnutrition associated. However, the sex difference in mortality was not significantly affected by the adjustment of analysis for the incidence of moderate wasting, other forms of malnutrition (not shown), or children's anthropometrical measurements at 9 months of age (not shown). Thus, malnutrition might have explained a part, but not the majority of the sex specific mortality trends among 1–2 year old children. Accident related deaths were infrequent and did not account for the difference.

Studies from West Africa have previously suggested that the female/male mortality ratio among >9 month old children may be affected by the type and coverage of measles immunisation in the population. When the high titre Edmonston–Zagreb vaccine was used in rural Senegal, female/male mortality ratio was 1.33, compared to 1.04 when no immunisations were given and 0.67–0.79 when Schwarz standard measles vaccine was in wide use.[10 11] In the present study area, the coverage for standard measles vaccine was relatively good, both among boys and girls. Our results are thus compatible with those from Senegal and might reflect sex specific differences in vaccine effects. It should be noted, however, that in our study there was a trend for male biased mortality both among children vaccinated before 12 months (RR 2.0; 95%CI 1.0 to 4.2), those vaccinated after 12 months (RR 1.8; 95%CI 0.2 to 19.9), as well as unvaccinated children (RR 1.5; 95%CI 0.6 to 3.6, Cox regression).

One further theoretical possibility is that differences in health seeking during acute illnesses or malnutrition contributed to the results in Lungwena, in the same way as they have been associated with excess female mortality in several other surroundings and male biased child mortality in a few societies.[3 7] Because of matrilineal family organisation and land inheritance, girls in Lungwena stay near their parents for their whole life whereas boys move away to marry. The girls could thus provide social security for their guardians—that is, higher yields for parental "investment", which may lead to preferential care of young females in the society. Evidence for such a gender preference model has previously been accumulated, both for non-human species and in human societies.[7 12] The comparable immunisation coverage among boys and girls speaks, however, against major gender preference in the current study area.

A notable sex bias in post-infant child mortality has previously been identified only rarely in Sub-Saharan Africa.[5 7] As indicated by our study, the phenomenon can be found if community level research methodology is utilised. It is therefore possible that some national mortality figures from Sub-Saharan Africa mask male biased mortality in some subcultures and female biased mortality in others. Because a large difference might significantly affect the strategies for promoting child health, further efforts are warranted to investigate the true prevalence of sex biased mortality in Malawi and elsewhere in Sub-Saharan Africa.

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