ABSTRACT

Objective This study assessed healthcare seeking patterns of families of infants with circumcision-related morbidities and families of infants with acute illnesses in rural Ghana.

Design Two population-based cohort studies.

Setting Brong Ahafo Region of central rural Ghana.

Participants A total of 22,955 infants enrolled in a large population-based trial (Neovita trial) from 16 August 2010 to 7 November 2011 and 3141 infants in a circumcision study from 21 May 2012 to 31 December 2012.

Primary outcome Care seeking for circumcision-related morbidities and acute illnesses unrelated to circumcision.

Results Two hundred and thirty (8.1%) infants from the circumcision study had circumcision-related morbidities and 6265 (27.3%) infants from the Neovita study had acute illnesses unrelated to circumcision. A much lower proportion (35, 15.2%) of families with circumcision-related morbidities sought healthcare compared with families of infants with acute illnesses in the Neovita study (5520, 88.1%). More families sought care from formal providers (24, 69%) compared with informal providers (11, 31%) for circumcision-related morbidities. There were no obvious determinants of care seeking for acute illnesses or circumcision-related morbidities in the population.

Conclusions Government and non-government organisations need to improve awareness about the complications and care seeking needed for circumcision-related morbidities.

INTRODUCTION

Infant male circumcision is a common surgical procedure and is performed for cultural, religious and medical reasons. Approximately 90% of men aged under 12 weeks are circumcised in Ghana\(^1\) and much of West Africa.\(^2\)

We reported concerning high risk of circumcision-related morbidity (8.1%), following infant male circumcision in our community-based study in rural Ghana.\(^1\)

Overall, 53% of the complications were observed following circumcision performed by an informal provider (including village-based traditional circumcision providers) and 47% after circumcision performed by formal healthcare providers including doctors, nurses and medical assistants.\(^1\)

Appropriate healthcare seeking for infants with circumcision-related morbidities could minimise the occurrence of severe long-term and short-term morbidities. Studies conducted in rural Ghana have reported that poor women believe infant illnesses related to traditional practices are not meant to be managed in the hospital or clinic.\(^3\)–\(^5\)

However, no other data on care seeking for infant male circumcision-related morbidity in rural African areas are available. There are more studies that have examined the determinants of care seeking for acute infectious diseases and newborn complications in rural Africa.\(^6\)–\(^7\)

A recent study conducted among mothers and infants in Ghana identified poor healthcare seeking behaviour in families of infants with acute illness during the post-partum period. In this study, 29% and 54% of sick infants received healthcare within 2 and
14 days, respectively. Another Ghanaian study identified poverty and personal preferences as key determinants of poor care seeking behaviour by families of infants with illness. A study from Burkina Faso also linked traditional concepts of illness in Africa to delays in seeking professional medical care by families of infants with malaria. Distance to health facility, health provider attitude and inadequate supplies have also been reported as key determinants of delayed care seeking for malaria cases in infants in sub-Saharan African populations. However, it appears that there have been no studies which have compared health seeking behaviour between families of infants with circumcision-related morbidities and families of infants with acute illnesses that are not circumcision related.

The overall aim of this study was to assess healthcare seeking patterns of families of infants with circumcision-related morbidities and families of infants with other acute illnesses in rural Ghana. The primary objective was to investigate whether there were differences in the healthcare seeking patterns of families of infants with circumcision-related problems, including infants who died and families of infants with acute illnesses. The secondary objective was to assess the factors that influence care seeking patterns of families in the study area.

METHODS
Study design and setting
Data from two separate cohort studies in the same part of the Brong Ahafo Region of central Ghana were analysed separately and compared descriptively. The larger of the two cohorts includes data from a population-based trial of newborn vitamin A supplementation (Neovita trial), conducted between 16 August 2010 and 7 November 2011 and involving 22,955 mother–infant pairs; full details have been published previously. The smaller cohort was conducted between 21 May 2012 and 31 December 2012 and focused on circumcision. This was implemented to obtain additional observational data on births, cause-specific mortality and circumcision-related morbidity in the study area. Over the period from 2010 to 2012, 80% of the study population lived in rural settlements and 20% of mothers had no primary school education. Four major district hospitals and over 80 small health facilities provided healthcare services to the population. There were 30 doctors and 44 other formal health service providers (medical assistants and nurses) providing curative services in the four district hospitals at the time of the circumcision study. There were also approximately 120 informal care providers such as drug sellers, traditional healers and religious leaders in the study area.

Data collection
For the Neovita study, from August 2010 to November 2011, all births in the study area were reported to the trial team via a network of fieldworkers. Fieldworkers visited all families at home between 2 hours and 2 days after birth and interviewed the mother of the infant or the primary caregiver. Fieldworkers weighed the baby and asked the mother or the primary caregiver about: date of birth, site of birth, current address, distance to health facilities, sociodemographic characteristics and socioeconomic information (using an asset index). At the monthly surveillance visits, the families were asked by fieldworkers for detailed information on infant illness including start and end dates and healthcare seeking during infant illness. Due to time constraints, families were not asked exactly who they sought care from. The fieldworkers also asked the families who sought healthcare whether the infant was admitted to hospital. The fieldworkers next reviewed infant health records and checked for consistency with family’s report. The fieldworkers also collected data on the vital status of the baby (including if the baby was alive, dead or hospitalised).

The circumcision study included all male live-born infants who were born in the study population from May to December 2012 and were aged under 12 weeks. Follow-up visits were scheduled between 8 to 11 weeks postbirth and trained senior fieldworkers asked for consent to collect additional detailed data on: age at circumcision, site of circumcision and type of circumcision provider. The fieldworkers asked about circumcision morbidities and whether these morbidities had been confirmed by a trained health professional. Families were also asked if they sought care for circumcision-related morbidities and if they had been given advice about potential problems or care seeking. The fieldworkers also asked detailed information on the following: site of healthcare, type of healthcare provider, medicines prescribed, admissions and surgery. Consent to access the baby’s Neovita data including socioeconomic, sociodemographic and care seeking was obtained.

In both studies the fieldworkers were trained for 2 weeks in all study procedures prior to the commencement of the study. Inter-rater reliability was checked between all fieldworkers. We did not perform statistical evaluation of agreements between the fieldworkers and the study coordinator (GT). However, each fieldworker was supervised during two visits per month as part of the study scheduled and unscheduled supervisory visits. During these visits, GT and field supervisors observed the fieldworker interviewing mothers and examined infants and recorded findings independently. Recorded data were compared between the fieldworker and GT/field supervisor and used to provide feedback after the home visits and at weekly fieldworker meetings. The fieldworkers used standardised paper-based data collection tools (including a standardised list of closed-ended questions) for all interviews.

Study definitions
We defined a formal healthcare service as medical care provided at hospitals, clinics or health posts by professionally trained, licensed and regulated providers of medical services including: doctors, medical assistants, nurses or
pharmacists. An informal healthcare service was defined as care provided by untrained, unlicensed, unregulated private provider of care services including: drug sellers, traditional healers and religious leaders. Circumcision-related morbidities were defined as complications occurring during or after the circumcision procedure as reported by the primary caregiver including: excess skin removal or incision, excess bleeding, inadequate skin removal, infection, abnormal stream of urine, glans amputation, ulcer. Acute illnesses were defined as illnesses or injuries other than circumcision-related complications such as malaria, sepsis, acute respiratory tract infection or diarrhoea. A formal circumcision provider referred to professionally trained, licensed and regulated providers of medical services. This included: doctors, medical assistants or nurses. An informal circumcision provider was an untrained, unlicensed, unregulated private provider of medical services including: drug sellers, domestic staff, family members and Wanzams (village-based traditional circumcision providers).

Outcome
Our primary outcome was care seeking. In the circumcision study, we defined care seeking as the percentage of families of infants who sought care from either a formal healthcare provider or an informal care provider among families who reported of an infant having a circumcision-related morbidity after circumcision during the circumcision follow-up visits (occurred between 8 and 11 weeks postbirth). In the Neovita study, care seeking was defined as the percentage of families of infants with acute illnesses unrelated to circumcision who sought care outside the home of the infant as reported by caregivers during the Neovita infant follow-up visits (from 4 weeks up to 52 weeks of age).

Statistical analysis
Two hundred and thirty (8.1%) infants had circumcision-related morbidities and of these, only 35 (15.2%) families sought care. Thus, we reported care seeking patterns in our circumcised cohort only using simple proportions and descriptive analyses. Statistical analyses were used to assess care seeking patterns in the larger Neovita cohort of 22955 infants. Multivariable logistic regression models were constructed a priori to assess the association between care seeking patterns and morbidty risk and adjusted for the effect of important explanatory variables including: religion, maternal education level, maternal age, distance to health facility, site of delivery, sex, birth weight and income status. Adjusted ORs (aORs) and 95% CI were calculated. All analyses were conducted in STATA V.13.

Ethical issues
Ethical approvals were obtained from Ghana Health Service Ethical Review Committee, the institutional ethics committee of Kintampo Health Research Centre, the research ethics committee of London School of Hygiene and Tropical Medicine and the human research ethics committee of the University of Western Australia. Written informed consent was obtained from all the families of the circumcised male infants.

RESULTS
From 16 August 2010 to 7 November 2011, 22955 infants comprising 11649 (50.8%) males and 11306 (49.3%) females were recruited into the Neovita trial (figure 1). A total of 4510 (19.7%) of the mothers were in the lowest socioeconomic quintile, 17581 (76.6%) delivered in a health facility and 7127 (31.1%) had no primary education (table 1).

From 21 May to 31 December 2012, 3141 male infants were recruited in the circumcision study (figure 2). Overall, 2850 (90.7%) of these infants were circumcised. We excluded three babies (0.1%) who had no socioeconomic or sociodemographic data. A total of 503 (16.0%) of mothers of acute illness were in the lowest income quintile; 2479 (78.9%) delivered in a facility and 601 (19.1%) had no primary education (table 2).

Acute illness and care seeking
A total of 6265 (27.3%) Neovita trial infants had an acute illness during the first year of life. There was little difference in the prevalence of acute illness by sex in the Neovita population; 3296 (28.3%) males and 2969 (26.3%) females (figure 1 and table 1). Healthcare was sought for 5520 (88.1%) Neovita trial infants with acute illness and 608 (11.0%) sought care compared with 1307 (87.7%) who delivered at home and 2678 (88.9%) who had more than primary school education compared with 1752 (86.2%) with no formal education (table 1).

A slightly lower proportion of families of female infants with acute illness (87.2%) sought care compared with families of male infants (88.9%) (aOR 0.95, 95% CI 0.73 to 0.99, p=0.039) (table 3). Surprisingly, there were no obvious differences in the prevalence of healthcare seeking related to levels of education (aOR 0.89, 95% CI 0.72 to 1.00, p=0.260), socioeconomic status (aOR 1.00, 95% CI 0.75 to 1.33, p=0.848), maternal age (aOR 1.15, 95% CI 0.89 to 1.48, p=0.131), site of delivery (aOR 1.01, 95% CI 0.83 to 1.24, p=0.886), distance to health facility (aOR 0.96, 95% CI 0.68 to 1.37, p=0.369) or birth weight (aOR 0.89, 95% CI 0.72 to 1.09, p=0.260) in the Neovita trial population (table 3).

Circumcision complications and care seeking
Of the 2847 circumcised male infants included in the circumcision analysis, 230 (8.1%) had confirmed morbidities related to circumcision and two died. Only 35 (15.2%) families of infants with circumcision-related
morbidity sought care and 3 (8.6%) were admitted to hospital (figure 2 and table 2).

The proportion of mothers aged less than 20 years who sought care for their infants with circumcision-related morbidity (3 (11.5%)) was slightly lower than mothers aged 30 years or more (14 (18.9%)). Healthcare seeking of mothers of infants with low birth weight was lower (1 (4.8%)) than mothers of infants with normal birth weight (34 (16.3%)) (table 2). There were no other obvious determinants of care seeking for circumcision-related morbidity.

**Type of provider**

In the circumcision study, of the 35 families of infants who sought care for circumcision-related morbidity, 20 (57.1%) infants were circumcised by an informal provider and 15 (42.9%) by a formal provider (table 4). Most families of infants circumcised by a formal provider also sought care from a formal provider for complications (13, 87.7%). In contrast, only 45% (9) families of infants circumcised by an informal provider also sought healthcare for circumcision-related morbidity from an informal healthcare provider (table 4).

A similar proportion of mothers in the lowest income quintile (4 (66.7%)) sought healthcare for circumcision-related morbidity from an informal care provider compared with mothers in the highest income quintile (2 (25.0%)), however, numbers were low in this analysis (table 4). A greater proportion of mothers who delivered their infants at home (5 (71.4%)) sought healthcare for circumcision-related morbidity from an informal care provider compared with mothers with health facility births (6 (21.4%)). The proportion of mothers who lived 10km or more from a health facility (2 (66.7%)) who sought healthcare for circumcision-related morbidity from an informal care provider was higher than those who lived within 1km from a health facility (3 (14.3%)). There were no data on type of healthcare provider available from the Neovita trial population.

**DISCUSSION**

There appeared to be substantial differences in healthcare seeking in families with infants experiencing circumcision-related morbidities and those with other acute illnesses in the Brong Ahafo Region of central rural Ghana. A much lower proportion (15.2%) of families of infants with circumcision-related morbidities sought healthcare compared with families who had an infant with an acute illness in the larger Neovita population (88.1%). However, the proportion of hospital admissions in infants of families who sought healthcare was almost the same (11% in the Neovita study and 9% in the circumcision study). There was some indication that mothers of low birthweight infants had poorer care seeking for circumcision-related morbidities than mothers of infants with...
Table 1 Characteristics of families and infants who sought care for acute illness in the Neovita trial

| Characteristics                      | Neovita study population | Neovita trial infants with acute illness | Neovita trial infants with acute illness whose families sought care |
|--------------------------------------|--------------------------|------------------------------------------|-------------------------------------------------------------------|
|                                      | n=22955                  | n=6265 (27.3%)                           | n=5520 (88.1%)                                                    |
| Religion                             |                          |                                          |                                                                   |
| Christian                            | 15979                    | 4314 (27.0%)                             | 3820 (88.5%)                                                      |
| Muslim                               | 5511                     | 1566 (28.4%)                             | 1357 (86.7%)                                                      |
| Traditional Africa/none              | 1465                     | 385 (26.3%)                              | 343 (89.1%)                                                       |
| Missing data                         | –                        | –                                        | –                                                                 |
| Mother's highest educational level   |                          |                                          |                                                                   |
| None                                 | 7127                     | 2009 (28.2%)                             | 1752 (86.2%)                                                      |
| Primary                              | 4236                     | 1241 (29.3%)                             | 1088 (87.7%)                                                      |
| Secondary                            | 11578                    | 3013 (26.0%)                             | 2678 (89.9%)                                                      |
| Carer did not know                   | 14                       | 2 (14.3%)                                | 2                                                                 |
| Income status of household           |                          |                                          |                                                                   |
| 1 (Lowest)                           | 4510                     | 1316 (28.2%)                             | 1147 (87.2%)                                                      |
| 2                                    | 4550                     | 1297 (28.5%)                             | 1147 (88.4%)                                                      |
| 3                                    | 4583                     | 1274 (27.8%)                             | 1130 (88.7%)                                                      |
| 4                                    | 4644                     | 1212 (26.1%)                             | 1063 (87.7%)                                                      |
| 5 (Highest)                          | 4668                     | 1166 (25.0%)                             | 1033 (88.6%)                                                      |
| Missing data                         | –                        | –                                        | –                                                                 |
| Maternal age (years)                 |                          |                                          |                                                                   |
| Less than 20                          | 2646                     | 760 (28.7%)                              | 658 (86.6%)                                                      |
| 20–29                                | 12041                    | 3269 (27.1%)                             | 2900 (88.7%)                                                      |
| 30 or more                           | 8239                     | 2228 (27.0%)                             | 1954 (87.7%)                                                      |
| Carer did not know                   | 30                       | 8 (26.7%)                                | 8                                                                 |
| Site of delivery                     |                          |                                          |                                                                   |
| Health facility                      | 17 581                   | 4775 (27.2%)                             | 4213 (88.2%)                                                      |
| Home                                 | 5374                     | 1490 (27.7%)                             | 1307 (87.7%)                                                      |
| Missing data                         | –                        | –                                        | –                                                                 |
| Distance to health facility          |                          |                                          |                                                                   |
| <1 km                                | 13 880                   | 3657 (26.3%)                             | 3234 (88.4%)                                                      |
| 1–4.9 km                             | 5285                     | 1497 (28.3%)                             | 1324 (88.4%)                                                      |
| 5–10 km                              | 2950                     | 752 (25.5%)                              | 646 (85.9%)                                                      |
| 10 km or more                        | 1197                     | 359 (30.0%)                              | 316 (88.0%)                                                      |
| Missing data                         | –                        | –                                        | –                                                                 |
| Birth weight                         |                          |                                          |                                                                   |
| Less than 2.5 kg                     | 3592                     | 998 (27.8%)                              | 867 (86.9%)                                                      |
| 2.5 kg or greater                    | 19361                    | 5267 (27.2%)                             | 4653 (88.3%)                                                      |
| Missing data                         | –                        | –                                        | –                                                                 |
| Sex                                  |                          |                                          |                                                                   |
| Male                                 | 11 649                   | 3296 (28.3%)                             | 2931 (88.9%)                                                      |
| Female                               | 11 306                   | 2969 (26.3%)                             | 2589 (87.2%)                                                      |

Normal birthweight infants. There were no other clear determinants of healthcare seeking for acute illnesses or circumcision-related morbidities in our study populations. A study conducted in Nigeria also reported lower healthcare seeking by families of male infants with circumcision-related morbidities compared with infants with...
other health problems.\textsuperscript{15} Other studies have suggested that poor care seeking behaviour after circumcision can be due to family expectations that complications will heal without any intervention,\textsuperscript{15,16} poor recognition of illness,\textsuperscript{5,17,18} poor recognition of severity of illness\textsuperscript{5,19–21} and beliefs that some infant illnesses are not meant to be treated in hospitals.\textsuperscript{3,5}

Interestingly, the proportion of hospital admissions after care seeking was almost the same in the Neovita and circumcision populations (11\% of infants with acute morbidities whose families sought care were hospitalised and 9\% of infants with circumcision-related morbidities whose families sought healthcare were also hospitalised). This indicates that families may not be seeking care for many circumcised infants in our study area with morbidities that do require hospital admission and specialised hospital care. Overall, hospital admission rates were similar to a recently published study from Ghana that reported rates of 9\% to 18\%.\textsuperscript{22}

The determinants of care seeking for acute illness have been reported in low-income and middle-income countries.\textsuperscript{5,23,24} However, few studies have reported population-based data on the care seeking patterns of families with infants who experience circumcision-related morbidities and acute illness. There was some indication that mothers of low birthweight infants had poorer care seeking for circumcision-related morbidities (5\%) than mothers of infants with normal birthweight infants (16\%) though numbers were small. These findings are similar to other studies that reported poor care seeking for acute illness\textsuperscript{25} and vaccination\textsuperscript{26} in families of low birthweight infants. We found no evidence that other socioeconomic and sociodemographic factors influence families’ care seeking behaviour for circumcision-related morbidity and acute illness in our population. These findings contrast with that of other earlier studies from Ghana\textsuperscript{5,22,26,27} and Bangladesh\textsuperscript{28} that reported higher care seeking for infants with acute illness by richer families and mothers with higher educational levels. This indicates that healthcare seeking behaviour for acute illness may be improving over time in rural Ghana.
Table 2  Characteristics of families and infants who sought care for morbidity in the circumcision study

| Characteristics                      | Circumcision study population | Circumcised infants | Circumcised infants with morbidity | Circumcised infants with morbidity whose families sought care |
|--------------------------------------|-------------------------------|---------------------|----------------------------------|---------------------------------------------------------------|
|                                      | n=3141                        | n=2850* (90.7%)     | n=230 (8.1%)                    | n=35 (15.0%)                                                   |
| Religion                             | Christian                     | 2234                | 2048 (91.7%)                    | 172 (8.4%)                                                    | 24 (14.0%)                                                   |
|                                      | Muslim                        | 727                 | 666 (91.6%)                     | 49 (7.4%)                                                     | 9 (18.4%)                                                    |
|                                      | Traditional Africa/none       | 171                 | 129 (75.4%)                     | 9 (7.0%)                                                      | 2 (22.2%)                                                    |
|                                      | Missing data                  | 9                   | 7 (77.8%)                       | –                                                             | –                                                            |
| Mother's highest educational level   |                               |                     |                                 |                                                               |                                                               |
|                                      | None                          | 601                 | 512 (85.2%)                     | 50 (9.8%)                                                     | 6 (12.0%)                                                    |
|                                      | Primary                       | 1619                | 1481 (91.5%)                    | 127 (8.6%)                                                    | 21 (16.5%)                                                   |
|                                      | Secondary                     | 913                 | 850 (93.1%)                     | 53 (6.2%)                                                     | 8 (15.1%)                                                    |
|                                      | Carer did not know            | 8                   | 7 (87.5%)                       | –                                                             | –                                                            |
| Income status of household           |                               |                     |                                 |                                                               |                                                               |
|                                      | 1 (Lowest)                    | 503                 | 387 (76.9%)                     | 28 (7.2%)                                                     | 6 (21.4%)                                                    |
|                                      | 2                             | 608                 | 532 (87.5%)                     | 41 (7.7%)                                                     | 4 (9.8%)                                                     |
|                                      | 3                             | 676                 | 628 (92.9%)                     | 47 (7.5%)                                                     | 9 (19.1%)                                                    |
|                                      | 4                             | 725                 | 687 (94.8%)                     | 62 (9.0%)                                                     | 8 (12.9%)                                                    |
|                                      | 5 (Highest)                   | 629                 | 613 (97.5%)                     | 52 (8.5%)                                                     | 8 (15.4%)                                                    |
|                                      | Missing data                  | 0                   | 3 (0.1%)                        | –                                                             | –                                                            |
| Maternal age (years)                 |                               |                     |                                 |                                                               |                                                               |
|                                      | Less than 20                  | 360                 | 319 (88.6%)                     | 26 (8.2%)                                                     | 3 (11.5%)                                                    |
|                                      | 20–29                         | 1603                | 1458 (91.0%)                    | 130 (8.9%)                                                    | 18 (13.8%)                                                   |
|                                      | 30 or more                    | 1170                | 1066 (91.1%)                    | 74 (6.9%)                                                     | 14 (18.9%)                                                   |
|                                      | Carer did not know            | 8                   | 7 (87.5%)                       | –                                                             | –                                                            |
| Site of delivery                     |                               |                     |                                 |                                                               |                                                               |
|                                      | Health facility               | 2479                | 2292 (92.5%)                    | 196 (8.6%)                                                    | 28 (14.3%)                                                   |
|                                      | Home                          | 650                 | 549 (84.5%)                     | 34 (6.2%)                                                     | 7 (20.6%)                                                    |
|                                      | Missing data                  | 12                  | 6 (50.9%)                       | –                                                             | –                                                            |
| Distance to health facility          |                               |                     |                                 |                                                               |                                                               |
|                                      | <1 km                         | 1545                | 1444 (93.5%)                    | 110 (7.6%)                                                    | 21 (19.1%)                                                   |
|                                      | 1–4.9 km                      | 801                 | 741 (92.5%)                     | 77 (10.4%)                                                    | 7 (9.1%)                                                     |
|                                      | 5–10 km                       | 484                 | 400 (82.6%)                     | 27 (6.8%)                                                     | 3 (11.1%)                                                    |
|                                      | 10 km or more                 | 231                 | 186 (80.5%)                     | 14 (7.5%)                                                     | 3 (21.4%)                                                    |
|                                      | Missing data                  | 80                  | 76 (95.0%)                      | 2 (2.6%)                                                      | 1 (50.1%)                                                    |
| Birth weight                         |                               |                     |                                 |                                                               |                                                               |
|                                      | Less than 2.5 kg              | 255                 | 214 (83.9%)                     | 21 (9.1%)                                                     | 1 (4.8%)                                                     |
|                                      | 2.5 kg or greater             | 2886                | 2633 (91.2%)                    | 209 (7.9%)                                                    | 34 (16.3%)                                                   |
|                                      | Missing data                  | 0                   | –                               | –                                                             | –                                                            |

*Three circumcised infants had no socioeconomic and demographic data due to field worker error.

Overall, we found that more families sought care for a circumcision-related morbidity from formal (68.6%) than informal (13.4%) healthcare providers. Unsurprisingly, most families of infants circumcised by a formal provider also sought care from a formal provider for complications. However, fewer families of infants circumcised by an informal provider sought care from an informal provider (45%) than a formal provider (55%). These findings differ from another published study from Kenya{16} which reported families of male infants who were circumcised by an informal provider were twofold less likely to seek care for a circumcision-related morbidity from a formal...
### Table 3 Predictors of care seeking behaviour in the Neovita trial population

| Characteristics                  | Neovita study population n=22955 | Neovita trial infants with acute illness n=6265 (27.3%) | Neovita trial infants whose families sought care n=5520 (88.1%) | Unadjusted OR | p Value | Adjusted OR* | p Value |
|----------------------------------|-----------------------------------|--------------------------------------------------------|---------------------------------------------------------------|---------------|---------|-------------|---------|
| **Religion**                     |                                   |                                                        |                                                              |               |         |             |         |
| Christian                        | 15979                             | 4314 (27.0%)                                           | 3820 (88.5%)                                                 | 1.00          | 0.121   | 1.00        | 0.195   |
| Muslim                           | 5511                              | 1566 (28.4%)                                           | 1357 (86.7%)                                                 | 0.84 (0.70 to 1.00) | 0.86 (0.72 to 1.03) |
| Traditional Africa/none          | 1465                              | 385 (26.3%)                                            | 343 (89.1%)                                                  | 1.06 (0.76 to 1.47) | 1.10 (0.79 to 1.55) |
| Missing data                     | –                                  | –                                                      | –                                                             |               |         |             |         |
| **Mother's highest educational level** |                                   |                                                        |                                                              |               |         |             |         |
| None                             | 7127                              | 2009 (28.2%)                                           | 1752 (86.2%)                                                 | 0.89 (0.73 to 1.09) | 0.89 (0.72 to 1.10) |
| Primary                          | 4236                              | 1241 (29.3%)                                           | 1088 (87.7%)                                                 | 0.85 (0.72 to 1.01) | 0.84 (0.69 to 1.03) |
| Secondary                        | 11578                             | 3013 (26.0%)                                           | 2678 (88.9%)                                                 | 1.00          | 0.174   | 1.00        | 0.260   |
| Carer did not know               | 14                                | 2 (14.3%)                                              | 2                                                             |               |         |             |         |
| **Income status of household**   |                                   |                                                        |                                                              |               |         |             |         |
| 1 (Lowest)                       | 4510                              | 1316 (29.2%)                                           | 1147 (86.6%)                                                 | 0.87 (0.69 to 1.11) | 1.00 (0.75 to 1.33) |
| 2                                | 4550                              | 1297 (28.5%)                                           | 1147 (86.4%)                                                 | 0.98 (0.77 to 1.26) | 1.07 (0.82 to 1.39) |
| 3                                | 4583                              | 1274 (27.8%)                                           | 1130 (88.7%)                                                 | 1.01 (0.79 to 1.30) | 1.08 (0.83 to 1.39) |
| 4                                | 4644                              | 1212 (26.1%)                                           | 1063 (87.7%)                                                 | 0.92 (0.72 to 1.18) | 0.95 (0.74 to 1.22) |
| 5 (Highest)                      | 4668                              | 1166 (25.0%)                                           | 1033 (88.6%)                                                 | 1.00          | 0.714   | 1.00        | 0.848   |
| Missing data                     | –                                  | –                                                      | –                                                             |               |         |             |         |
| **Maternal age (years)**         |                                   |                                                        |                                                              |               |         |             |         |
| Less than 20                     | 2646                              | 760 (28.7%)                                            | 658 (86.6%)                                                  | 1.00          | 0.208   | 1.00        | 0.131   |
| 20–29                            | 12041                             | 3269 (27.1%)                                           | 2900 (88.7%)                                                 | 1.22 (0.96 to 1.54) | 1.23 (0.97 to 1.57) |
| 30 or more                       | 8239                              | 2228 (27.0%)                                           | 1954 (87.7%)                                                 | 1.11 (0.87 to 1.41) | 1.15 (0.89 to 1.48) |
| Carer did not know               | 30                                | 8 (26.7%)                                              | 8                                                             |               |         |             |         |
| **Site of delivery**             |                                   |                                                        |                                                              |               |         |             |         |
| Health facility                  | 17 581                            | 4775 (27.2%)                                           | 4213 (88.2%)                                                 | 1.00          | 0.595   | 1.00        | 0.886   |
| Home                             | 5374                              | 1490 (27.7%)                                           | 1307 (87.7%)                                                 | 0.95 (0.80 to 1.14) | 1.01 (0.83 to 1.24) |
| Missing data                     | –                                  | –                                                      | –                                                             |               |         |             |         |
| **Distance to health facility**  |                                   |                                                        |                                                              |               |         |             |         |
| <1 km                            | 13 880                            | 3657 (26.3%)                                           | 3234 (88.4%)                                                 | 1.00          | 0.278   | 1.00        | 0.369   |
| 1–4.9 km                         | 5285                              | 1497 (28.3%)                                           | 1324 (88.4%)                                                 | 1.00 (0.83 to 1.21) | 0.99 (1.82 to 1.20) |

Continued
CONCLUSIONS

Our study has implications for policy and programme development. Infant male circumcision is commonly practised in many parts of Sub-Saharan Africa, including the Brong Ahafo Region of central rural Ghana. A much lower proportion of families with infants seeking care for acute illnesses was reported than for the overall Neovita study population. The findings from this study indicate that infant male circumcision is commonly practised, but potentially dangerous, practice. Circumcision carries a triple burden of high prevalence, high morbidity load and poor care seeking. Community-led communication campaigns to promote and improve awareness of this practice are needed. The findings from this study also highlight the importance of understanding the type of care provider sought for acute illnesses, as this may influence health seeking patterns.

The most important limitation to our study was the small sample size in our circumcision cohort due to the low level of care seeking for acute illness. However, we were able to statistically compare care seeking patterns in the circumcision cohort with those in the total study cohort. This was done by using family-level recall of health service usage which could have led to some episodes of care being under-reported in the circumcision cohort. However, both families and data collectors were blinded to the study hypothesis and our trained fieldworkers reviewed infant health records and checked for consistency with a family’s report. The Neovita study lacked data on the type of provider care was sought from. However, the population-based nature of the data on whether care was sought from healthcare providers was used as a proxy for care seeking patterns. Understanding the type of care provider sought for acute illnesses may be important in the future.

The proportion of families seeking healthcare in our study was very high (88.1%), close to the time of conducting the Neovita study. The proportion of families seeking healthcare was highest for acute illness (51.9%), followed by diarrhea (25.2%) and fever (19.5%). Care seeking for acute illness was also highest for acute illness in rural populations in Kenya, 21 47% in Nigeria, 30 and 27% in Vietnam. 31 The high healthcare seeking patterns for acute illnesses seen in our study population may be due to recent communications and promotion of care seeking by the local government district health management teams. However, that these communications do not appear to have influenced care seeking for circumcision-related morbidity. The population-based nature of the data on whether care was sought from healthcare providers was used as a proxy for care seeking patterns. Understanding the type of care provider sought for acute illnesses would be important to investigate in the future.

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## Table 4  Type of healthcare provider for circumcision-related morbidity

| Characteristics                              | Circumcised infants whose families sought care | Type of healthcare provider for circumcision morbidity |
|----------------------------------------------|-----------------------------------------------|------------------------------------------------------|
|                                              | n=35                                          | Formal provider | Informal provider* |
|                                              |                                               | 24 (68.6%)   | 11 (31.4%)         |
| Religion                                     |                                               |               |                      |
| Christian                                    | 24                                            | 17 (70.8%)    | 7 (29.2%)           |
| Muslim                                       | 9                                             | 6 (66.7%)     | 3 (33.3%)           |
| Traditional Africa/none                      | 2                                             | 1 (50.0%)     | 1 (50.0%)           |
| Missing data                                 | –                                             | –            | –                    |
| Mother’s highest educational level           |                                               |               |                      |
| None                                         | 6                                             | 2 (33.3%)     | 4 (66.7%)           |
| Primary                                      | 21                                            | 15 (71.4%)    | 6 (28.6%)           |
| Secondary                                    | 8                                             | 7 (87.5%)     | 1 (12.5%)           |
| Carer did not know                           | –                                             | –            | –                    |
| Income status of household                   |                                               |               |                      |
| 1 (Lowest)                                   | 6                                             | 2 (33.3%)     | 4 (66.7%)           |
| 2                                            | 4                                             | 2 (50.0%)     | 2 (50.0%)           |
| 3                                            | 9                                             | 7 (77.8%)     | 2 (22.2%)           |
| 4                                            | 8                                             | 7 (87.5%)     | 1 (12.5%)           |
| 5 (Highest)                                  | 8                                             | 6 (75.0%)     | 2 (25.0%)           |
| Carer did not know                           | –                                             | –            | –                    |
| Maternal age (years)                         |                                               |               |                      |
| Less than 20                                  | 3                                             | 3             | –                    |
| 20–29                                        | 18                                            | 11 (61.1%)    | 7 (38.9%)           |
| 30 or more                                   | 14                                            | 10 (71.4%)    | 4 (28.6%)           |
| Carer did not know                           | –                                             | –            | –                    |
| Site of delivery                             |                                               |               |                      |
| Health facility                              | 28                                            | 22 (78.6%)    | 6 (21.4%)           |
| Home                                         | 7                                             | 2 (28.6%)     | 5 (71.4%)           |
| Missing data                                 | –                                             | –            | –                    |
| Distance to health facility                  |                                               |               |                      |
| <1 km                                        | 21                                            | 18 (85.7%)    | 3 (14.3%)           |
| 1–4.9km                                      | 7                                             | 3 (42.9%)     | 4 (57.1%)           |
| 5–10km                                       | 3                                             | 1 (33.3%)     | 2 (66.7%)           |
| 10km or more                                 | 3                                             | 1 (33.3%)     | 2 (66.7%)           |
| Missing data                                 | 1                                             | 1             | –                    |
| Type of circumcision provider                |                                               |               |                      |
| Formal provider                              | 15                                            | 13 (86.7%)    | 2 (13.3%)           |
| Informal provider                            | 20                                            | 11 (55.0%)    | 9 (45.0%)           |
| Missing data                                 | 0                                             | –            | –                    |
| Birth weight                                 |                                               |               |                      |
| Less than 2.5 kg                              | 1                                             | –             | 1 (100.0%)          |
| 2.5kg or greater                             | 34                                            | 24 (70.6%)    | 10 (29.4%)          |
| Missing data                                 | –                                             | –            | –                    |

*Informal care provider included drug sellers, traditional healers and religious leaders.
awareness of the burden, consequences and solutions needs to increase. This requires the involvement of community leaders and other stakeholders and include behaviour change communication strategies.

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Competing interests None declared.

Patient consent Detail has been removed from this case description/these case descriptions to ensure anonymity. The editors and reviewers have seen the detailed information available and are satisfied that the information back up the case the authors are making.

Ethics approval Ethical approvals were obtained from Ghana Health Service Ethical Review Committee, the institutional ethics committee of Kintampo Health Research Centre, the research ethics committee of London School of Hygiene and Tropical Medicine and the human research ethics committee of the University of Western Australia.

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Data sharing statement The dataset analysed during the current study is available from the corresponding author on reasonable request and with permission of KME.

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