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BMJ 2002;325:1063  
doi:10.1136/bmj.325.7372.1063

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## Cross sectional, community based study of care of newborn infants in Nepal

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### Abstract

**Objective** To determine home based newborn care practices in rural Nepal in order to inform strategies to improve neonatal outcome.

**Design** Cross sectional, retrospective study using structured interviews.

**Setting** Makwanpur district, Nepal.

**Participants** 5411 married women aged 15 to 49 years who had given birth to a live baby in the past year.

**Main outcome measures** Attendance at delivery, hygiene, thermal care, and early feeding practices.

**Results** 4893 (90%) women gave birth at home. Attendance at delivery by skilled government health workers was low (334, 6%), as was attendance by traditional birth attendants (267, 5%). Only 461 (8%) women had used a clean home delivery kit, and about half of attendants had washed their hands. Only 3482 (64%) newborn infants had been wrapped within half an hour of birth, and 4992 (92%) had been bathed within the first hour. 99% (5362) of babies were breast fed, 91% (4939) within six hours of birth. Practices with respect to colostrum and prelacteals were not a cause for anxiety.

**Conclusions** Health promotion interventions most likely to improve newborn health in this setting include increasing attendance at delivery by skilled service providers, improving information for families about basic perinatal care, promotion of clean delivery practices, early cord cutting and wrapping of the baby, and avoidance of early bathing.

### Introduction

Although infant mortality has fallen in many developing countries over the past two decades, the rate of fall may be slowing.<sup>1</sup> One reason is the resistant contribution of neonatal mortality, which has remained fairly steady over this period.<sup>2,3</sup> For many mothers, health care during and after childbirth is virtually non-existent, and in 2000, an estimated 53 million women in developing countries gave birth without professional help.<sup>4</sup>

The World Health Organization guidelines for essential newborn care encompass cleanliness, thermal protection, initiation of breathing, early and exclusive breast feeding, eye care, immunisation, management of

illness, and the care of low birthweight infants.<sup>5</sup> For a mother and her family, this means preparing for birth, choosing a safe place for delivery, keeping the process clean, avoiding the cold, breast feeding early and exclusively, and understanding (and reacting to) potential danger signs. Our understanding of what happens at home and how to change behaviour is limited.

We are conducting a cluster randomised controlled trial on the effect of a community based participatory intervention to improve essential newborn care in Nepal. The trial involves 170 000 rural people in 12 pairs of village development committees in Makwanpur district. The aim of the present study was to describe newborn care practices quantitatively in the cohort of women recruited to the trial.

### Participants and methods

#### Setting

Nepal has a population of 23.4 million with more than 60 ethnic groups. The landscape tiers down from the Himalayas, through middle hills, to plains in the south.<sup>6</sup> The population is poor, and there are limited communications and infrastructure. The gross national product per head is about \$220 (£145, €223),<sup>7</sup> the human development index is 0.378,<sup>8</sup> life expectancy is 58 years, about 60% of adults are illiterate,<sup>7</sup> the total fertility rate is 4.8 in rural areas, and early marriage and adolescent pregnancy are common.<sup>9</sup>

Nepal's estimated neonatal mortality rate is 50/1000 live births and accounts for two thirds of the infant mortality rate (79/1000).<sup>9</sup> Less than half of pregnant women attend for any antenatal care,<sup>9-13</sup> and over 90% of births occur at home.<sup>9</sup> After marriage, women usually move into their husband's family home and their mother-in-law becomes the central female figures in their lives. They give birth at home in the company of female friends and family, and their mother-in-law often takes the lead in advising on birth, childcare, illness, and when and where to seek professional help.

Nepal introduced integrated primary health care in the late 1970s, with tertiary hospitals at the centre, zonal and district hospitals in the periphery, and a hierarchy of primary health centres, health posts, and subhealth posts in the community. The system suffers from unfilled posts, absenteeism, shortfalls in equip-

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ment and drugs, limited support to community based staff, and a lack of refresher training.<sup>14</sup>

#### *Makwanpur district*

Makwanpur district lies to the south of Kathmandu and has a population of nearly 400 000. It covers an area of 2500 km<sup>2</sup> and includes both hills and plains. Over much of the district access is difficult and villages are widely spread. Most residents are engaged in small scale agriculture. There are at least 15 ethnic groups, the largest of which is Tamang (a predominantly Buddhist, Tibeto-Burman group), followed by Brahmin and Chhetri (groups of Indo-Aryan origin).

The district is geopolitically divided into 43 village development committees. Each committee has one government health institution (subhealth post, health post, or primary health centre). Perinatal care is provided from these facilities and the district hospital as well as by traditional birth attendants. Both service provision and uptake are patchy.

#### Study design

We conducted a cross sectional, descriptive study to collect information about most recent deliveries for women in Nepal. Married women of reproductive age (between 15 and 49 completed years on 15 June 2000) were eligible to enter a closed cohort. Chairs of the village development committees provided signed consent and all participants provided verbal consent to involvement. The study received ethical clearance from the Nepal Health Research Council, from His Majesty's Government Ministry of Health, Nepal, and from the ethics committee of the Institute of Child Health and Great Ormond Street Hospital for Sick Children, London.

We identified and mapped 28 376 households between September 1999 and June 2000. Each married woman of reproductive age was allocated a unique identification number and visited by the field team to complete an individual questionnaire, including questions about newborn care during any preceding birth. The questionnaire was developed over 18 months through 11 cycles of piloting, evaluation, and repeat piloting. Data were collected by 44 field interviewers between March and November 2001, supported by nine field coordinators and one senior officer. Questionnaires were checked and missed questions amended at source, at field centres, and at the central office. A tenth of interviews were observed by supervisory team members.

We entered data into a relational database management system in Microsoft SQL server 7.0, which also incorporated intrafield and interfield constraints. We examined frequencies and outliers through structured queries in the database environment. We also analysed proportions after exporting data to small Stata 5.0. We have rounded percentages to integers for presentation.

#### Results

We interviewed 25 702 women, of whom 24 295 had given birth at least once, 24 244 to a live baby. Because of concerns about the validity of recall over longer periods and the likelihood that practices have changed over time, we limited our analysis to the 5411 live births within the year before the start of the study. The

median age of respondents was 25.1 years (interquartile range 9.3 years).

#### Skilled attendance at delivery

In all, 4893 (90%) of women gave birth at home, either inside or in the courtyard (table 1). The district hospital accounted for 251 (5%) births. Six hundred and nineteen (11%) women gave birth alone. When an attendant was present, she was usually a family member or neighbour (4241, 78%), particularly the woman's mother-in-law (2178, 40%).

We grouped the birth attendants into skilled attendants (doctors, nurses, auxiliary nurse midwives, and health assistants), semiskilled (village health workers, maternal and child health workers, and female community health volunteers, who are not technically trained in delivery and newborn care), and traditional birth attendants (many of whom have received training in obstetric care). On this basis, skilled attendants covered 6% of births (334), semiskilled attendants covered less than 2% (96), and traditional birth attendants covered 5% (267). The coverage of any technical attendant was 12% (651 births).

#### Cleanliness and hygiene practices at childbirth

We asked the 4792 mothers who had help at the birth whether helpers had washed their hands before the birth of the baby. In all, 2729 (55%) women recalled that helpers had washed their hands, 1372 (28%) recalled that they had not done so, and 691 (14%) could not clearly remember. Clean home delivery kits are currently manufactured and distributed in Nepal. Each kit contains a plastic sheet, a clean razor blade, a cutting surface, soap, and cord ties. Every woman interviewed was shown such a kit: 461 (8%) had used one for their last delivery, 631 (12%) recognised the kit but had not used one, and 4319 (80%) did not recognise it.

The umbilical cord was cut with a razor blade in 3017 (56%) births (table 2), although in only 1787 (33%) could the blade be reliably described as clean. A

**Table 1** Place of birth and attendance at delivery for women having a live birth in past year

|                                       | No (%) of women (n=5411) |
|---------------------------------------|--------------------------|
| <b>Place of birth:</b>                |                          |
| Inside home                           | 4352 (80)                |
| Yard of home                          | 541 (10)                 |
| Hospital                              | 251 (5)                  |
| Shed, field, or workplace             | 182 (3)                  |
| Private clinic                        | 12 (0.2)                 |
| Other                                 | 73 (1)                   |
| <b>Birth attendant*:</b>              |                          |
| Doctor                                | 84 (2)                   |
| Nurse                                 | 240 (4)                  |
| Auxiliary nurse midwife               | 50 (1)                   |
| Health assistant (or comparable)      | 39 (1)                   |
| Trained traditional birth attendant   | 212 (4)                  |
| Untrained traditional birth attendant | 56 (1)                   |
| Maternal and child health worker      | 50 (1)                   |
| Village health worker                 | 8 (0.1)                  |
| Female community health volunteer     | 40 (1)                   |
| Mother-in-law                         | 2178 (40)                |
| Other family member                   | 2371 (44)                |
| Neighbour                             | 1617 (30)                |
| No attendant                          | 619 (11)                 |
| Other                                 | 366 (7)                  |

\*More than one attendant may have been present.

**Table 2** Hygiene practices at delivery

|   | No (%) of births (n=5411) |
|---|---------------------------|
| Instrument used for cutting umbilical cord: |                           |
| New or boiled blade                         | 1787 (33)                 |
| Sickle or wood knife                        | 1947 (36)                 |
| Old unboiled blade                          | 1230 (23)                 |
| Household knife                             | 314 (6)                   |
| Other                                       | 44 (1)                    |
| Unknown                                     | 89 (2)                    |
| Dressing applied to umbilical stump:        |                           |
| Nothing                                     | 3970 (73)                 |
| Oil   | 994 (18)                  |
| Disinfectant                                | 116 (2)                   |
| Turmeric                                    | 9 (0.2)                   |
| Cloth                                       | 15 (0.3)                  |
| Mud   | 9 (0.2)                   |
| Other                                       | 156 (3)                   |
| Unknown                                     | 142 (3)                   |
| Cloth for wrapping the baby:                |                           |
| Old washed cloth                            | 3803 (70)                 |
| Old unwashed cloth                          | 1385 (26)                 |
| New washed cloth                            | 79 (1)                    |
| New unwashed cloth                          | 18 (0.3)                  |
| Unknown                                     | 126 (2)                   |

**Table 3** Practices related to maintenance of the warm chain for newborn infants

|                           | No (%) of births (n=5411) |
|---------------------------|---------------------------|
| Heating of birthplace:    |                           |
| None                      | 1182 (22)                 |
| Before birth              | 546 (10)                  |
| After birth               | 2831 (52)                 |
| Throughout                | 852 (16)                  |
| Time to wrapping of baby: |                           |
| ≤5 min                    | 240 (4)                   |
| ≤10 min                   | 672 (12)                  |
| ≤30 min                   | 3482 (64)                 |
| ≤1 hour                   | 5102 (94)                 |
| ≤6 hours                  | 5400 (100)                |
| Time to bathing of baby:  |                           |
| ≤15 min                   | 1808 (33)                 |
| ≤30 min                   | 3904 (72)                 |
| ≤1 hour                   | 4992 (92)                 |
| ≤6 hours                  | 5361 (99)                 |

household sickle was used in about a third of births. Sickles are not generally sterilised by heat or other means for this purpose. Once the cord had been cut, the umbilical stump was usually left undressed (73%). The most common application was oil (18%). Nearly all newborn infants were wrapped in used pieces of cloth. In three quarters of cases the cloth had been washed and dried in advance (table 2).

### Thermal control

Given that most births occurred at home, usually indoors, we asked about the use of a fire to heat the birth room. There was some form of heating in 3683 (68%) rooms after the baby had been delivered (table 3), and in 1398 (26%) rooms the fire was laid for the labour. The time taken to wrap the baby was prolonged. Only 3482 (64%) had been wrapped within half an hour, rising to 5102 (94%) within an hour. Almost all babies had been bathed within six hours of birth, three quarters within the first half hour, and 92% (4992) within an hour (table 3).

### Breast feeding

Ninety nine per cent (5362) of women had breast fed. A taste of clarified butter (ghee), sugar, or honey was sometimes given before feeding began (12%), but 85% of women said that the first feed given to their newborn infants was breast milk (table 4). Breast feeding was started within an hour of birth for 63% and within six hours for 91%. Breastfeeding rates were about 99% at one week. Colostrum was discarded before the first feed in 2416 cases (45%); foremilk was discarded at every subsequent feed in 3696 (69%).

### Ethnic group comparison

The ethnic composition of respondents was Tamang 3825 (65%), Brahmin or Chhetri 948 (17%), other Tibeto-Burman groups 413 (8%), and other artisanal groups 522 (10%). Although the general findings were similar for all groups, there were some minor differences. Tamang people tended to be poorer, to be engaged in agriculture, and to live further away from amenities. Tamang women were more likely to give birth outdoors and to cut the cord with a sickle and less likely to be attended by a service provider. This was also true of artisanal castes. Newar and Brahmin or Chhetri groups tended to be better off. They were more likely to deliver at a hospital, to be attended by health service providers, and to use clean home delivery kits and clean blades. They were less likely to give birth alone. Two ethnic differences were striking: Brahmin and Chhetris were much more likely to give a taste of sweet food as the first feed (513/948 v 435/5563 others; risk ratio 15.4, 95% confidence interval 1.6 to 1.9), whereas Tamangs and women from artisanal castes were more likely to discard first colostrum and subsequent foremilk (2969/4014 v 727/1348; risk ratio 1.4, 1.3 to 1.4).

### Discussion

Our study has shown that use of a skilled birth attendant and uptake of government primary care services for childbirth and newborn care are uncommon in rural Nepal, hygiene is often compromised, and traditional practices expose newborn infants to a risk of hypothermia. However, early breastfeeding rates are better than expected and colostrum is only partially discarded.

**Table 4** Type and timing of first feed

|                               | No (%) of infants (n=5411) |
|-------------------------------|----------------------------|
| Infant's first feed:          |                            |
| Mother's milk                 | 4601 (85)                  |
| Ghee, sugar, or honey         | 670 (12)                   |
| Breastmilk from another woman | 30 (1)                     |
| Cows' or buffaloes' milk      | 19 (0.4)                   |
| Formula                       | 11 (0.2)                   |
| Oil                           | 8 (0.1)                    |
| Other                         | 22 (0.4)                   |
| Unknown                       | 50 (1)                     |
| Time to first breast feed:    |                            |
| ≤15 min                       | 159 (3)                    |
| ≤30 min                       | 950 (18)                   |
| ≤1 hour                       | 3403 (63)                  |
| ≤6 hours                      | 4939 (91)                  |
| ≤12 hours                     | 5017 (93)                  |
| ≤24 hours                     | 5157 (95)                  |
| >24 hours or never            | 254 (5)                    |

The interpretation and generalisability of the findings might be limited by recall bias. To avoid this, we confined our analysis to pregnancies that had occurred in the past year. There was, in fact, hardly any difference if the period was extended to three years. The findings are also consistent with those of qualitative research carried out in the same population.<sup>15</sup>

#### Assistance with childbirth

The high proportion of home births is consistent with the findings of previous studies.<sup>9-10</sup> We took care to establish that, in most cases, home meant a room in the house rather than an outside area or another construction such as a cattle shed, a confusion that has been highlighted previously.<sup>16-17</sup> The status of a woman's mother-in-law means that she is the most likely person to help during pregnancy, labour, and the postpartum period.

Attendance by trained service providers was extremely limited for both skilled government health staff (6%) and traditional birth attendants (5%), confirming previous findings.<sup>9-10-12-16</sup> Maternal and child health workers, identified by policy makers as potential key attendants, were present at less than 1% of deliveries, and it will therefore be a huge task to increase their coverage. Likewise, the small proportion of births attended by traditional birth attendants implies that assumptions about indigenous practices may be optimistic. Efforts to work with mothers-in-law and other family members may yield higher dividends in the short term.

We should be aware that 11% of women gave birth alone. This echoes previous findings,<sup>9</sup> highlights the gender inequity that underpins many discussions of health, and may imply that childbirth is of limited urgency within a range of family concerns. In the longer term, efforts to strengthen outreach midwifery services should be a major priority. This will require a change in investment policy for reproductive health services and, given low levels of attendance by skilled health staff, may require years of investment to reduce mortality at a population level.

#### Hygiene and warmth

Infection may account for up to 40% of neonatal mortality.<sup>18</sup> Particular concerns at birth are a clean place; a clean surface; cleanliness of the hands of attendants; clean cord tying, cutting, and dressing; and clean and dry wrapping of the baby (also a factor in avoiding hypothermia). Only half the attendants were said to have washed their hands. Clean home delivery kits were unfamiliar to most mothers (80%) and were used by only 8% (slightly higher than previously described<sup>10</sup>). The use of razor blades to cut the cord is positive, although their cleanliness was suspect in two thirds of cases. Similarly, it is encouraging that 73% of umbilical stumps were not dressed, a higher percentage than previously estimated.<sup>10</sup> The means of cutting the cord may not be as important a risk factor for infection as the means of subsequent dressing.<sup>19</sup>

Neonatal hypothermia has been described in Nepal<sup>20</sup> and is a focus for essential newborn care.<sup>21</sup> The common view of pregnancy as a hot state and the postpartum period as a cold one<sup>22-23-15</sup> ensures that mothers and their babies are kept warm in the puerperium<sup>24</sup>; we found that 68% of rooms were heated after labour. Unfortunately, this is counterbalanced by the practice

#### What is already known on this topic

Most births in rural south Asia occur at home

Neonatal mortality has remained fairly constant in developing countries despite falling infant mortality

#### What this paper adds

Only 6% of births in rural Nepal took place in the presence of a skilled attendant

Cord cutting implements were often unclean and drying and wrapping of newborn infants was usually delayed

99% of babies were breast fed, 92% of them within six hours of birth, and colostrum was generally given

Interventions need to focus on educating women about hygiene, encouraging early wrapping, and delaying bathing of newborn babies

of waiting for the placenta to deliver before cutting the umbilical cord and wrapping the baby<sup>15</sup> and by the tendency to bathe the baby so soon after birth.

#### Infant feeding

One area where traditional practices seem healthy is breast feeding. Almost all mothers breast fed their infants and use of formula was minimal. Moreover, 63% of babies had been fed in the first hour, considerably more than the 16% described in another study.<sup>10</sup> This positive finding has implications for nutrition, prevention of infection, and thermal control and should be supported wholeheartedly. Prolactals were given to less than 15% of infants. Our qualitative work suggests that the usual practice is to give a taste of non-breastmilk food on the end of a finger, and only once. About half of women who breast fed (45%) discarded a substantial amount of colostrum before the first feed, and two thirds (69%) expressed a little foremilk at every subsequent feed. Probably, these practices do not justify intervention in rural Nepal, although the prevalence of these practices may vary in other south Asian communities.

#### Implications

Our study has identified important information about newborn care practices in rural Nepal that will assist in planning health interventions to change behaviour. In terms of public health and population attributable risk, the findings suggest that some changes would be particularly beneficial. These include increasing skilled attendance at births, improving hygiene at delivery, reducing delays in wrapping the baby, and delaying bathing. Interventions to reduce the use of prolactals and stop women discarding colostrum and foremilk are likely to have a smaller effect.

We thank the many individuals in Makwanpur district who gave their time generously and the field staff of the MIRA (Mother Infant Research Activities) Makwanpur team, without whom the study would have been impossible. We also thank the Makwanpur district development committee and the village development committee members for their active and continuing support; and the MIRA executive committee in Kathmandu.

Contributors: DO wrote the first draft of the paper and contributed to the study design and collection of field data. KT, DS, and BS contributed to the study design, collection of field data and analysis, and criticised later drafts of the paper. NM contributed to the study design and analysis, and criticised later drafts of the paper. MM and HS contributed to the design of the study and criticised drafts of the paper. DM and AC contributed to the design of the study and supervision of the field programme, and criticised drafts of the paper. Ananta Manandhar and Ashish Shrestha designed the database and helped with the design of the data entry and analysis process. DO and AC will act as guarantors.

Funding: British Government Department for International Development, Unicef Nepal, and the Division of Child and Adolescent Health, World Health Organization, Geneva.

Competing interests: None declared.

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(Accepted 28 June 2002)