

Training traditional birth attendants in clean delivery does not prevent postpartum infection

ELIZABETH A GOODBURN,^{1,2} MUSHTAQUE CHOWDHURY,³ RUKHSANA GAZI,³ TOM MARSHALL² AND WENDY GRAHAM⁴

¹Centre for Sexual and Reproductive Health, John Snow Inc. (UK), London, UK, ²Maternal and Child Epidemiology Unit, London School of Hygiene and Tropical Medicine, London, UK, ³Research and Evaluation Division, Bangladesh Rural Advancement Committee (BRAC), Dhaka, Bangladesh and ⁴Dugald Baird Centre for Research on Women's Health, Maternity Hospital, Aberdeen, UK

Objective: To compare the maternal outcome, in terms of postpartum infection, of deliveries conducted by trained traditional birth attendants (TBAs) with those conducted by untrained birth attendants.

Methods: The study took place in a rural area of Bangladesh where a local NGO (BRAC) had previously undertaken TBA training. Demographic surveillance in the study site allowed the systematic identification of pregnant women. Pregnant women were recruited continuously over a period of 18 months. Data on the delivery circumstances were collected shortly after delivery while data on postpartum morbidity were collected prospectively at 2 and 6 weeks. All women with complete records who had delivered at home with a non-formal birth attendant (800) were included in the analysis. The intervention investigated was TBA training in hygienic delivery comprising the 'three cleans' (hand-washing with soap, clean cord care, clean surface). The key outcome measure was maternal postpartum genital tract infection diagnosed by a symptom complex of any two out of three symptoms: foul discharge, fever, lower abdominal pain.

Results: Trained TBAs were significantly more likely to practice hygienic delivery than untrained TBAs (45.0 vs. 19.3%, $p < 0.0001$). However, no significant difference in levels of postpartum infection was found when deliveries by trained TBAs and untrained TBAs were compared. The practice of hygienic delivery itself also had no significant effect on postpartum infection. Logistic regression models confirmed that TBA training and hygienic delivery had no independent effect on postpartum outcome. Other factors, such as pre-existing infection, long labour and insertion of hands into the vagina were found to be highly significant.

Conclusions: Trained TBAs are more likely to practice hygienic delivery than those that are untrained. However, hygienic delivery practices do not prevent postpartum infection in this community. Training TBAs to wash their hands is not an effective strategy to prevent maternal postpartum infection. More rigorous evaluation is needed, not only of TBA training programmes as a whole, but also of the effectiveness of the individual components of the training.

Introduction

In countries where resources are limited, maternal mortality is high and most deliveries take place at home, programmes for training traditional birth attendants (TBAs) have been promoted and initiated for the last decade or two.^{1,2} The rationale for these programmes has been the assumption that: TBAs are present at most home deliveries; TBAs can be trained to avoid harmful delivery practices and acquire beneficial ones; and TBAs can be trained to recognize complications of labour and make appropriate referrals. It is often stated, at least in project proposals, that training TBAs will result in a reduction of maternal and neonatal mortality, and morbidity. TBA training is frequently a major component of NGO projects and programmes, and some countries, with the backing of donors such as UNICEF, have embarked on the

large-scale training of TBAs. Bangladesh was one such country.^{3,4}

Although the implementation of TBA training has been given such prominence, and despite the fact that a significant amount of donor funds have been expended on this training, there have been surprisingly few published reports evaluating these programmes. One of the reasons for this is the need for very large study populations to demonstrate a fall in maternal mortality. Another reason is that it is difficult to measure many of the expected changes in behaviour as the behaviour, by its very nature, is difficult to observe. Most evaluations that have been done suggest that TBA training as a sole intervention does not significantly reduce maternal mortality, and that improvements are only likely to be observed when TBA training is linked to a strong referral system which includes

transport and effective obstetric services at the first referral level.⁵⁻⁷ Even where reductions in maternal mortality have been demonstrated, these reductions are modest. Cost-effectiveness exercises have demonstrated that TBA training is one of the most expensive strategies for preventing maternal deaths compared with several other interventions, including support for health centres, hospitals and family planning.⁸

One aspect of the claims for the beneficial effects of TBA training which has received the least attention, although it is usually mentioned along with maternal mortality, is the effect on maternal morbidity, partly because this is a neglected research area in itself, and partly because maternal morbidity is difficult to define and measure.⁹ On the one hand, there have been suggestions that while TBA training is a cost-ineffective strategy for reducing mortality, it might be more effective when related to morbidity.⁸ On the other hand, there are reports that effects on morbidity are unpredictable.¹⁰

One of the expected beneficial effects of training TBAs is that their improved hygienic practices will prevent postpartum infection in the mother (as well as the baby). TBAs are taught, as part of their training, to practise 'three cleans': 'clean hands', 'clean surface' and 'clean cord' (see Figure 1).^{11,12}

In 1992 and 1993 the Bangladesh Rural Advancement Committee (BRAC), a large, internationally recognized local

NGO, in collaboration with the London School of Hygiene and Tropical Medicine (LSHTM), undertook a prospective study of postpartum maternal morbidity in a rural area of Bangladesh.^{13,14} The design of this study made it possible to evaluate events at delivery, including the training status of the birth attendant, in terms of morbid outcomes in the mother.

Methods

A total of 2099 pregnant women were identified in the study area over a period of 18 months. Mothers were visited within 5 days of the birth at which time a detailed history of the birth was obtained from relatives present at the delivery. Follow-up visits were made at 2, 6 and 12 weeks postpartum by lay health workers who recorded details of symptoms since the last visit and made a brief physical examination. Women found to be ill during the study were assisted in obtaining treatment at local NGO and government health facilities.

The study area was one in which BRAC had supported TBA training, following government guidelines but using its own trainers. As part of the delivery history, mothers and their relatives were asked the identity and status of the principle birth attendant (the person who assisted the delivery of the baby). If the principal birth attendant was claimed to be a TBA, her name was checked against the BRAC records to verify her training status. TBAs not on this list were assumed to be untrained. Some deliveries were conducted by relatives,



Figure 1. Traditional birth attendant training diagrams

and as the distinction between relatives and untrained TBAs is often vague, these were grouped together. The majority of deliveries (96.9%) took place at home and only a small number of deliveries (6.5%) were conducted by health professionals.

Data on self-reported symptoms were used to measure the period prevalence of postpartum maternal infection at 2 and 6 weeks postpartum. Infection was deemed to be present if two or more of the following symptoms were reported: lower abdominal pain; fever; foul smelling discharge. (Although a formal medical assessment was not possible, the presence of these symptoms would usually be considered diagnostic by most field-level health workers.)

Details of hygiene behaviours by the birth attendant were used to determine if the delivery was 'clean'. To count as 'clean' a delivery had to have: 'hands washed with soap', a 'clean surface' and 'clean treatment of the umbilical cord'.

Data was also collected on a number of other factors which could have a potential association with maternal infection including: background characteristics of the women such as gravidity, age and socioeconomic status; health status during pregnancy such as nutritional status and symptoms of reproductive tract infection; and delivery events such as prolonged rupture of membranes, prolonged labour and birth practices.

After exclusion of women who had delivered in a health facility or with a formally trained health worker and cases with incomplete data, 800 women had a complete data set comprising registration interview, antenatal interview, and three postpartum interviews at 0-5 days, 2 weeks and 6 weeks. These cases were analyzed to assess the proportion of cases with infection and to determine the effect of the presence of a trained TBA at the delivery. A logistic regression model was constructed to determine the relative importance of other factors on postpartum infection.

Results

Overall, the period prevalence of infections according to the stated criteria was 29.6% (237) at 2 weeks and 8.6% (69) at 6 weeks. These prevalences in the selected sample were very close to the levels found in the population as a whole (28.3 and 7.3%, respectively). Nearly half (32) of the cases identified at 6 weeks were persistent. Forty-two percent of deliveries had been attended by untrained TBAs and 58.0% by trained TBAs.

Trained TBAs were more than twice as likely as the untrained TBAs to perform a 'clean' delivery. (Some untrained TBAs adopted this behaviour from having seen or heard about it within the community.) There were no significant differences between the two groups regarding manipulation of the baby during delivery, and active removal of the placenta but trained TBAs were significantly more likely to insert their hands into the mothers vagina (Table 1).

The significantly higher frequency of clean delivery in the group of trained TBAs might give rise to the expectation that

infection would be lower in the mothers delivered by this group. However, we were not able to demonstrate any relationship between the training status of the TBA and outcome in terms of symptoms of maternal infection (Table 2).

The absence of a demonstrable association between training and the occurrence of postpartum infection, despite the observation that trained TBAs were by and large putting their training into practice, led to the postulation that the 'clean' delivery intervention itself was having an insignificant effect, and indeed, this was found to be the case (Table 2). It seemed possible that other birth practices of trained TBAs (for example, hand insertion), or unrelated factors such as the presence of pre-existing infection, were influencing the development of infection, thus cancelling out any beneficial effect from hygiene practices.

In order to explore the likely determinants of infection in this population, possible risk factors for infection were identified in the data set (Table 3). SPSS/PC+ Version 5.0 was used to select variables from this group and to construct a logistic regression model. Variables with significance $p > 0.1$ were eliminated. The selected variables were then used to create a final model.

The logistic regression model for infection at 2 weeks (Table 4) shows that a foul vaginal discharge during pregnancy [a symptom of reproductive tract infection (RTI)] and insertion of hands into the vagina during labour are both highly significant independent risk factors. A long second stage was also significant. Primigravidity was protective. Neither training of

Table 1. Training of birth attendant and delivery practices

	Untrained TBA (%) (n = 336)	Trained TBA (%) (n = 464)	p
Practised 'three cleans'	19.3	45.0	<0.00001
Actively manipulated baby	21.5	17.9	NS
Actively removed placenta	22.3	26.3	NS
Inserted hands in vagina	42.0	52.6	0.00378

NS = not significant.

Table 2. Period prevalence of infection by category of birth attendant and 'clean' delivery

	n	% of women reporting symptoms of infection	
		0-2 weeks	2-6 weeks
Untrained TBA	336	30.7	7.1
Trained TBA	464	28.9	9.7
		NS	NS
Not 'clean' delivery	526	30.0	9.7
'Clean' delivery	274	28.8	6.6
		NS	NS

NS = not significant.

Table 3. Variables tested for inclusion in logistic regression model

Women's characteristics	Health status in pregnancy	Delivery events
Age Gravidity Socioeconomic status Literacy	Foul vaginal discharge MUAC < 219 mm	Premature rupture of membranes (>24 h) Long second stage of labour (>1 h) Insertion of hands in vagina Use of 'three cleans' Category of birth attendant

the birth attendant nor 'clean' delivery practices were significant.

The logistic regression model for infection at 6 weeks (Table 5) also shows foul vaginal discharge during pregnancy as a highly significant independent risk factor. In this case a long second stage, though not hand insertion, was also highly significant. Poor nutritional status in pregnancy also had a significant effect. As for infection at 2 weeks, neither training of the birth attendant nor 'clean' delivery practices were significant.

Discussion

In this area of rural Bangladesh, where BRAC had undertaken training of TBAs, utilization of trained TBAs was reasonably high. This made comparisons of birth practices and the outcome of deliveries undertaken by trained and untrained TBAs possible.

Table 4. Logistic regression model for infection reported at 2 weeks postpartum

Variables selected	Odds ratio	Significance (p)
<i>Characteristics</i>		
Gravidity		
Primigravida	0.60	0.0203
2-4 (r)	1.00	
5 +	0.88	NS
Pregnancy		
foul vaginal discharge	2.56	0.0001
Delivery		
long second stage	1.97	0.0365
hand put in vagina	1.93	0.0001

NS = not significant.

Table 5. Logistic regression model for infection reported at 6 weeks postpartum

Variables selected	Odds ratio	Significance (p)
<i>Characteristics</i>		
Pregnancy		
foul vaginal discharge	2.93	0.0006
MUAC < 119 mm	1.89	0.0199
Delivery		
long second stage	3.87	<0.0001

The data show that trained TBAs certainly performed better according to the criteria used than did the untrained. Forty-five percent of the trained TBAs were practising 'clean' delivery compared with less than 20% of their untrained colleagues. However, considering that BRAC training is carefully conducted and that systematic follow up and supervision is the norm, this level could be considered disappointing. It is also of concern that a harmful practice, insertion of hands into the vagina, was more common in trained TBAs. It might be expected that in areas where the Government has undertaken TBA training and in which training and supervision may not be as good, adoption of desirable practices as a result of training might be even lower.

Despite improved performance, the presence of a trained TBA was of no advantage in terms of the development of postpartum infection as defined in this study. Indeed, 'clean' delivery itself gave no advantage and the variables for birth attendant training and for 'clean' delivery were independently rejected from both the logistic regression models.

These findings suggest that the problem is not merely that TBAs are failing to put their training into practice, or even that the training inadvertently increases the use of unsafe practices such as hand insertion. The implication is that one of the major intervention components of their training (the 'three cleans') itself is ineffective in preventing postpartum infection. Considering the impact which improved hygiene practices are thought to have had on puerperal sepsis in developed countries,¹⁵ and considering the strong beliefs held by many TBA trainers in the benefits of training TBAs in hygienic practices, these findings may seem surprising.

However, it is clear from the results that the most potent risk factor for postpartum infection is likely to be a pre-existing RTI. Other studies in rural Bangladesh have found a high prevalence of RTIs¹⁶ and microbiological studies in other countries have demonstrated strong associations between pre-existing RTIs and postpartum infection.¹⁷ The finding that primigravida were less likely to experience postpartum infection than multi-gravidae may be associated with this finding, as women of higher parity may be more at risk of RTI through their husbands than the recently married. These findings suggest that community detection and treatment of RTIs in pregnancy may have the potential to improve maternal morbidity and that research to evaluate this intervention would be worthwhile.

Long and difficult labour and the insertion of hands (which

may be associated with delivery complications) may be potent factors for introducing or exacerbating existing infection whether or not the delivery includes the 'three cleans'. It may also be that practising a 'clean' delivery in itself does not prevent infection in an environment where every surface is contaminated. Information on the length of time between the act of hand washing and the delivery was not collected, but unless the TBA washes her hands immediately before touching the mother's genitalia, there is likely to be ample opportunity for recontamination. There is evidence from studies of diarrhoea transmission that the act of hand washing under conditions in rural Bangladesh is more a symbolic act than an effective action to prevent infection in a generally contaminated environment.¹⁸

Nutritional factors were identified as a possible determinant of postpartum infection. Poorly nourished women, who may also have micronutrient and vitamin deficiencies, may be at special risk of developing infections postpartum and these factors will not be affected directly by hygienic practices at delivery or training of the birth attendant.

Whatever the determinants of postpartum infection, this study strongly suggests that training TBAs using the current protocols in Bangladesh (and other countries), which emphasize hygiene behaviours, cannot necessarily be expected to prevent postpartum infection.

In the light of this finding, questions must be asked. If the current training of TBAs, even when undertaken by conscientious NGOs, is ineffective in preventing one of the major maternal morbidities despite expectations to the contrary, what should we expect to be achieved by TBA training? What interventions of proven effectiveness could TBAs be trained to perform reliably? The authors believe that much of the enthusiasm for TBA training is based not only on a rather idealistic view of benefits that can be achieved by programmes which include TBA training, but also on flimsy evidence for the effectiveness of some of the standard interventions which form the core of this training.

A far more rigorous approach to the evaluation of TBA training programmes needs to be adopted. Such evaluation should not be confined to process indicators and general reductions of maternal and perinatal mortality.¹⁹ They should include special attention to the specific outcomes which particular interventions are expected to achieve.²⁰ These outcomes, for instance maternal morbidity, are frequently mentioned, but almost never measured.

Although it would be premature to recommend discontinuing TBA training altogether, policy makers might also consider that the use of scarce resources to support an under-evaluated strategy, which may not be cost-effective, could be diverting the attention of donors, governments, NGOs and others from interventions for which there is some evidence of effectiveness in reducing maternal deaths, for example, the training of community midwives,²¹ and support for referral and essential obstetric services at first-level referral facilities.²² TBAs play a key role in the communities in which they are active and provide essential social and psychological support for the

pregnant women in their care. It is essential that the interventions they are trained to provide are supported by stronger evidence.

References

- Belsey MA. Traditional birth attendants: a resource for the health of women. *International Journal of Gynaecology and Obstetrics* 1985; **23**: 247-8.
- Leedam E. Traditional birth attendants. *International Journal of Gynaecology and Obstetrics* 1985; **23**: 249-74.
- Amin R, Khan AH. Characteristics of traditional midwives and their beliefs and practices in rural Bangladesh. *International Journal of Gynaecology and Obstetrics* 1989; **28**: 119-25.
- Voluntary Health Services Society. Papers and Proceedings on the Seminar on TBA Training, 22-23 Oct 1989. Shahnaz S, Islam N (eds). Dhaka: VHSS, 1989.
- Greenwood AM, Bradley AK, Byass P et al. Evaluation of a primary health care programme in the Gambia. I. The impact of trained traditional birth attendants on the outcome of pregnancy. *Journal of Tropical Medicine and Hygiene* 1990; **93**: 58-66.
- Jordan B. Cosmopolitan obstetrics: some insights from the training of traditional midwives. *Social Science and Medicine* 1988; **28**: 925-44.
- Araujo G, Araujo L, Janowitz B, Wallace S, Potts M. Parteras tradicionales en la atención obstétrica del noreste de Brasil. *Bol. Oficina. Sanit. Panam.* 1984; **96**: 147-59.
- Maine D. *Safe Motherhood Programs: options and issues*. Centre for Population and Family Health, School of Public Health, Faculty of Medicine. New York (NY): Columbia University, 1991.
- Campbell O, Graham W. *Measuring maternal mortality and morbidity: levels and trends*. London School of Hygiene and Tropical Medicine, London, UK, 1990.
- Smith J, Fortney J, Coleman N, Graft-Johnson J, Blumhagen D. *The impact of TBA training on the health of mothers and newborns in Brong-Ahafo, Ghana*. Arlington (VA): Family Health International, 1997.
- Hossain MA, Huq MDN, Alam MM. *The Role of Trained Traditional Birth Attendants (TBAs) in Safe Delivery Practices in Rural Bangladesh*. Dhaka: NIPORT, 1989.
- Bangladesh Rural Advancement Committee. *TBA Training Manual*. Dhaka: BRAC, 1987.
- Goodburn EA. A prospective study of maternal morbidity related to delivery and the puerperium in Bangladesh. PhD Thesis. London University, UK, 1997.
- Goodburn EA, Chowdhury M, Gazi R, Marshall T, Graham Karim F. *Maternal morbidity in rural Bangladesh: an investigation into the nature and determinants of maternal morbidity related to delivery and the puerperium*. Dhaka: BRAC, 1994.
- Loudon I. *Death in childbirth*. Oxford: Clarendon Press, 1992.
- Wasserheit J, Harris J, Chakraborty J. Reproductive tract infections in a family planning population in Bangladesh. *Studies in Family Planning* 1989; **20**: 69-80.
- Plummer FA, Laga M, Brunham RC. Postpartum genital tract infections in Nairobi, Kenya: epidemiology, etiology, and risk factors. *Journal of Infectious Diseases* 1987; **156**: 92-8.
- Zeitlyn S, Islam F. The use of soap and water in two Bangladeshi communities: implication for transmission of diarrhoea. *Reviews of Infectious Disease* 1991; **13**(Suppl 4): 259-64.
- UNFPA. Support to Traditional Birth Attendants. *Evaluation Report*, 12. New York: UNFPA, 1997.
- Ross D. Does training TBAs prevent neonatal tetanus? *Health Policy and Planning* 1986; **1**: 89-98.
- Fauveau V, Stewert K, Khan SA, Chakraborty J. Effect on mortality of community-based maternity care programme in rural Bangladesh. *The Lancet* 1991; **338**: 1183-6.
- Maine D, Akalin M, Chakraborty J, Francisco A, Strong M. Why did maternal mortality decline in Matlab? *Studies in Family Planning* 1996; **27**: 179-87.

Biographies

Elizabeth Goodburn, MBBCh, Ph.D., is currently Reproductive Health Advisor for John Snow International, UK. She is also a Visiting Lecturer attached to the Maternal and Child Epidemiology Unit of the London School of Hygiene and Tropical Medicine (LSHTM). The study described in this paper was undertaken while seconded as an LSHTM Research Fellow to work in the Research and Evaluation Division of BRAC in Bangladesh.

Mushtaque Chowdhury is Director of the Research and Evaluation Division, Bangladesh Rural Advancement Committee (BRAC), Dhaka, Bangladesh.

Rukhsana Gazi is a Research Medical Officer in the Research and Evaluation Division, Bangladesh Rural Advancement Committee (BRAC), Dhaka, Bangladesh.

Tom Marshall is a Senior Lecturer in Medical Statistics in the Maternal and Child Epidemiology Unit in the LSHTM. He has worked in the area of evaluating maternal health interventions, and been involved in a variety of other epidemiological projects in reproductive health, and maternal and child health in developing countries.

Wendy Graham is Professor of Obstetric Epidemiology at the University of Aberdeen, where she is the Director of a women's health research unit. Her specialist interest is reducing maternal mortality and morbidity in developing countries, with a particular emphasis on improving the evidence-base for safe motherhood.

Correspondence: Elizabeth Goodburn, JSI (UK), 2nd floor, Block B, Highgate Studios, 53-79, Highgate Road, London NW5 1TL, UK.