The Challenge of Improving Perinatal Care in Settings with Limited Resources. Observations of Midwifery Practices in Mozambique

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ABSTRACT

The aim of this study was to observe and analyse midwifery care routines related to asphyxia and hypothermia during the perinatal period and to investigate the effect of an in-service education program. A direct non-participant pre– and post–intervention observation study of midwifery a performance during childbirth was conducted at a labour ward in Maputo. The observed groups consisted of 702 and 616 midwifery-attended deliveries. Examination was also conducted of the partographs (702 vs. 616). The quality of midwifery care related to prevention and early detection of asphyxia and hypothermia was found to be inadequate and the intervention had no significant effect upon the midwives' performances. This could be attributed to the quality of the intervention itself or to failure of implementing managerial decisions such as transfer of partograph documentation from obstetricians to midwives. Change in professional performance does not automatically follow awareness of evidence-based midwifery practices, but requires behavioural change, which may be more difficult to achieve. (*Afr J Reprod Health* 2006; 10[1]:47-61)

RÉSUMÉ

Le défi de l'amélioration de soin périnatal dans les cadres qui disposent des ressources limitées. Constatation à l'égard des pratiques des sages-femmes au Mozambique Cette étude avait pour objectif d'observer et d'analyser les soins de routine rendus par des sages-femmes quant il s'agit de l'asphyxie et de l'hypothermie au cours de la période périnatale et d'étudier l'effet d'un programme d'une formation continue. Un étude d'observation non-participante de l'avant et d'après intervention de la performance des sages-femmes pendant l'accouchement a été menée au sein d'une salle d'accouchement à Maputo. Le groupe observé était composé de 702 et 616 des accouchements dont s'occupaient les sages-femmes. On a également étudié les partographies (702 vs 616). On a découvert que la qualité du soin rendu par les sages-femmes qui sont liés à la prévention et au dépistage précose de l'asphyxie et de l'hypothermie était peu adéquate et que l'intervention n'avait pas d'effet important sur la performance des sages-femmes. Ceci peut être attribué à l'échec de la mise en oeuvre des décisions au niveau de la gestion tel le transfer de la documentation de la partographie des obstétriciens aux sages-femmes. Une modification au niveau de la performance professionnelle ne suit pas automatiquement la conscience des pratiques des sages-femmes fondées sur l'évidence, mais exige une modification au niveau du comportement, qui sera peut-être plus difficile à accomplir. (*Rev Afr Santé Reprod* 2006; 10[1]:47-61)

KEY WORDS: *Perinatal care, midwives, hypothermia, asphyxia.*

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Introduction

Birth asphyxia and hypothermia are common underlying causes of excessive perinatal morbidity and mortality, and represent a major health challenge in many low-income countries[1 2] According to the World Health Organization (WHO), 98% of perinatal deaths occur in settings with limited resources and reflects the complex socio-cultural and economic situation of each country[3]. However, perinatal asphyxia and hypothermia, conditions that are directly linked to quality of care during childbirth, can be drastically reduced with improved midwifery performances, which is furthermore regarded as a cost-effective strategy to promote neonatal health[4] Exemptions have to be made for infants with extremely low birth weight, who due to physiological problems are prone to suffer more both from asphyxia and hypothermia[3]. Buchmann, *et. al.* found that poor foetal monitoring, failure to interpret the signs of foetal distress and failure to respond to indications of poor progress of labour heavily contributed to asphyxia-related perinatal mortality in South Africa[5]. Moreover, poor midwifery practices and insufficient knowledge related to care of the newborn infant such as performing thermal control, drying and wrapping and early initiation of breastfeeding have been found in various settings [2 5 6].

Quality of perinatal care, which includes the intrapartum and immediate newborn period, can be achieved in resource-poor countries as many preventive measures to reduce perinatal morbidity and mortality are simple and cost effective[3]. The skin-to-skin contact methodology, for instance, [7 8] is cost-free and proved to effectively accelerate metabolic adaptation and presumably increase the well being of the newborn[1]. Lack of oxygen, which is a common logistic problem in many low-income countries[3], may be circumvented by using room air for ventilating, which has proven effective in treating newborn asphyxia[9].

In 1997 the Intensive Care Unit (ICUN) at Maputo Central Hospital (HCM) had approximately 4,000 admissions of which 75 percent were transfers from the HCM labour ward. With a total of 16,780 deliveries (1997), this implies that around 18 percent of all newborns were transferred to the ICUN and the major reasons for transfer were low birth weight, asphyxia, infection and suspicion of neurological complications or cerebral haemorrhage. The perinatal mortality was in 1997 moreover reported to be 63/1,000, a situation that prompted the HCM management in collaboration with the Karolinska Institute to initiate a research project aimed at studying perinatal midwifery care. The aim of this study was thus to observe perinatal midwifery care routines and analyse the use of the partograph at HCM before and after an in-service education program.

The study was approved by the local research committee at the Department of Obstetrics and Gynaecology at HCM in Mozambique as well as by the Ethical Research Committee at the Karolinska Institute in Stockholm, Sweden.

Design And Methodology

Setting

The study took place in Maputo (capital of Mozambique) where approximately 2 million inhabitants reside. The major health facility in Maputo city is the HCM, which caters to the majority of risk deliveries and obstetric emergencies. Despite the existence of several peripheral delivery units (PDUs), HCM also attends to numerous low-risk deliveries. In 1997, when this study was planned, HCM had 3,307 (19.5%) Caesarean sections. The rather high Caesarean rate can be explained by the fact that HCM was the only hospital in Maputo performing this procedure and functioned as the national referral maternity hospital. The labour ward employed a total of 33 maternal health nurses with three years of education, who in this study are referred to as midwives. The midwives worked in teams, which organisationally consisted of six members but in reality the teams were

often reduced to four members. The labour ward had several working stations, such as the admission room, the 'dilatation room', the delivery room and the surgery, all of which required the presence of a midwife. Each shift lasted for 12 hours, and the workload as well as the responsibility was generally described as extensive, particularly during nightshifts when few physicians were on duty.

Study design and data collection

A pre– and post-intervention study applying the direct non-participant observation design was conducted at the HCM labour ward. This methodology has previously been used by one of the investigators (KC) in both affluent and poor countries. The pre- and post-intervention groups consisted of 702 and 616 women in labour respectively, and comprised of consecutive midwifery attended deliveries.

Data collection took place during the cool period April-July 1999 and the warm period, October-November 2000. Four midwives, trained as research assistants, observed and registered the performance of midwifery practices on an observation protocol including 69 variables related to

(i) the admission,
(ii) the later period of the first stage of labor,
(iii) the second stage of labour and
(iv) the immediate newborn period. Experts in perinatal health and midwifery developed the observation protocol, ensuring that major elements of evidence-based child-birth practices such as

(i) immediate drying of the infant,
(ii) foetal heart monitoring and
(iii) the use of partograph were being measured[10].

A similar protocol has been used and reported on by other researchers[11-13]

Besides observing and documenting the midwives performances according to the observation protocol, the research assistants also conducted three thermal controls of the newborns, immediately after birth, 30 minutes later and 120 minutes after delivery. The observational focus was on quality of care in relation to neonatal asphyxia and hypothermia.

During the training period, the principal investigator and the research assistants observed midwives performances and documented the protocol individually and thereafter checked for interreliability. When no differences were noticed, the research assistants were considered fully trained. Regular discussions and feedback encounters were held between the local research team and the research assistants.

The partograph, has been used since the 1970s to detect prolonged labour, to indicate when augmentation of labour is appropriate and to recognise cephalo-pelvic disproportion long before labour becomes obstructed[14]. If correctly used, the partograph increases the quality and regularity of all perinatal and maternal observations and serves as an early warning system of complicated deliveries[15 16]. The partograph used at the HCM labour ward is similar to the WHO model, which is a simplified compromise, including features of partographs originating from different parts of the world[15]. Data were also collected from the partographs belonging to the pre-and post intervention observation groups. Forty-two variables including

(i) the admission,
(ii) the graph,
(iii) the delivery, and
(iv) the newborn period of the partograph were examined and manually registered on a sheet containing all variables.

Data from the observations as well as from the partographs were entered into and analysed in the EPI-Info version 6.0.

Data analysis was conducted on group level (observations of midwives' performances in relation to childbirth). We purposively avoid to present data on observed midwives in order to

preserve confidentiality. All data were randomly checked for accuracy after being entered in the EPI-info program, i.e. every 20th record was controlled against the original data. When doubts occurred in relation to a result, data were also checked through general and specific browsing. Moreover, data from the observation study were compared to data from the partographs in order to verify findings.

The maternal risk variables in relation to neonatal outcome were defined as follows: £ than 17 years of age, ³ 35 years of age and ³ 5 deliveries, uterine height upon admission ³ 37 cm, blood pressure ³ 140/90 and stillbirth in the last pregnancy.

Intervention

The intervention consisted of three separate rounds of seminars at which all midwives attended. In the first series of seminars, results from the pre-intervention observations were presented. In areas where care was found to be less than optimal, the reasons as well as the measures to be taken in order to improve performances were discussed. The main focus was on hypothermia and on introduction of skin-to skin care[7 8]. A mother-infant dyad from the neonatal intensive care unit was invited to illustrate this methodology and for the mother to describe her experiences of caring for the newborn infant in this manner. This approach was considered crucial, as midwives had expressed their doubts concerning women's willingness to apply the skin-to-skin method[(17)]. Furthermore, the importance of monitoring foetal heart rate to prevent asphyxia was emphasised. In order to facilitate monitoring, it was decided by the HCM management that the main responsibility for the partograph should be transferred from the obstetricians and physicians to the midwives.

The second round of seminars included education in partograph documentation and interpretation. Preliminary results from the qualitative study on midwives' perceptions of factors influencing their ability to provide quality perinatal care[17] were presented and discussed with the midwives. The third round of seminars, which included repetition of previous lectures, took place only a few months prior to the post-intervention observations. The intention was to have six months between the pre- and post-intervention observations. However, due to severe flooding, which occurred in Mozambique during 1999 and 2000, the post-intervention observations was delayed by more than six months (until December 2001). Thus, the time period between the two observations was 15 months.

Results

Description of pre-and post-intervention groups

The two groups of observed midwifery attended deliveries (hereafter called the pre- and post-intervention groups) were similar regarding age distribution. Around 25 % of the women in labour were teenagers (28 *vs.* 24 % respectively) and in both groups, approximately 50% of the teenagers were 17 years or younger. The portion of women aged 35 years or more were also similar in both groups (16 *vs.* 14 %). More women in the post-intervention group had 1-5 previous deliveries (39.5 *vs.* 56 %, p = 0.001) (*Table 1*).

Twelve respectively 18 % of women were upon admission identified as maternal high-risk deliveries (haemorrhage, hypertension, malaria, infections) and 46 respectively 42 % (*Table 3*) had one or more of the defined maternal risk variables in relation to neonatal outcome (17 yrs or younger, 35 yrs or older, 5 or more deliveries, uterine height 37 cm or more, blood pressure 140/90 or more and stillbirth as outcome of previous pregnancy). The birth weights did not differ in the two groups; the means being 2,902 and 2,967 grams respectively.

The figures in *Table 1* do not add up and there are generally more missing data in the pre-observation group. Outcome of previous

Table 1: **Demographic and childbirth characteristics of pre- and post-intervention groups**

Item	Pre-intervention group, N = 702	Post-intervention group, N = 616
Age (%, No)	**589**	**611**
≤ 19	29 (197)	24 (149)
20-34	55 (379)	61 (375)
≥ 35	16 (112)	14 (87)
Gestation (median, range)	2 (1-13)	2(1-11)
Parity (%, No)	**512**	**605**
0	44 (232)	35 (209)
1-5	40 (206)	56 (340)
≥ 5	16 (84)	9.3 (56)
Outcome of last **(%, No)**	**424**	**404**
Pregnancy	80 (347)	77 (311)
Live birth	16 (68)	15 (61)
Abortion	4.4 (19)	7.9 (32)
Still birth		
Reasons for **(%, No)**	**601**	**594**
Admission	78 (468)	75 (447)
Contractions	10 (61)	6.9 (41)
Ruptured membranes	2.2 (13)	0.2 (1)
Hemorrhage	9.8 (59)	18 (105)
Others *		

* Hypertension, malaria, infections

pregnancy, for example miss, 40 *vs.* 33% observations respectively (n.s.). The missing data are mainly a result of absence of information in the delivery-records.

Partograph documentation

The midwives were responsible for documentation of the admission and the delivery part of the partograph. Upon admission, blood pressure (85 *vs.* 89.%), uterine height (84 *vs.* 91%), foetal presenting part (81 *vs.* 82%) foetal heart rate (86 *vs.* 92%) and examination for clinical signs of anaemia (78 *vs.* 88 %) were more often controlled than variables such as the uterine tonus (25 *vs.* 30%). Variables reflecting the delivery focused on the newborn's weight (97 *vs.* 99%) and Apgar score (97 *vs.* 98%). However, in the majority of cases, midwives neglected to assess Apgar by its five parameters, the foetal heart rate, the respiration frequency, colour, tonus and reactivity (94 *vs.* 96%). Resuscitation procedures to newborns such as ventilation on mask, gastro-suction and medication were recorded in 53 (7) *vs.* 31 (5%) cases.

Table 2: **Documentation of the Partograph**

Item	All partographs			Partographs of women with identified risk*		
	Pre-intervention group, N-702	Post-intervention group, N=616	P-value	Pre-intervention Group, N=323	Post interventon group, N =261	P-value
Admission variables: (%, No)						
Blood pressure	85 (597)	89 (546)	NS	83 (268)	82 (214)	NS
Uterine height	84 (586)	91 (559)	NS	79 (256)	94 (244)	NS
Signs of anemia	78 (546)	88 (541)	NS	77 (248)	87 (227)	NS
Uterine tonus	25 (177)	30 (184)	NS	22 (70)	30 (77)	NS
Presenting part	81 (569)	82 (504)	NS	37 (119)	45 (118)	NS
FHR**	86 (603)	92 (565)	NS	81 (261)	94 (244)	0.001
Cervix dilatation	82 (574)	84 (516)	NS	80 (258)	80 (209)	NS
Delivery Variables **(%, No)**						
Type of delivery	36 (253)	25 (153)	0.001	35 (114)	28 (72)	NS
Newborn's weight	97 (682)	99 (608)	NS	97 (313)	96 (252)	NS
Apgar Score (5 min)	97 (680)***	98 (606)***	Ns	96 (310)	98 (255)	NS
Apgar score assessed by parameters (1-5)	5.7 (39)	4.3 (26)	NS	81 (262)	93 (243)	NS
Resuscitation procedures ****	7.5 (53)	5.0 (31)	0.001	0.9 (3)	- (0)	NS
The Partograph (%, No)						
Opening the graphic line	30 (210)	27 (163)	NS	27 (88)	27 (71)	NS
Plotting 1 time only	65 (136)	79 (129)	NS	64 (56)	79 (56)	NS

* ≤ Than 17 years of age, ≥ 35 years of age and ≥ 5 deliveries, uterine height upon admission ≥ 37 cm, blood pressure ≥ 140/90 and stillbirth in the last pregnancy. ** FHR = fetal heart rate, ***22 vs. 10 scores missing, **** Ventilation on mask, gastro-suction and medication

The graphic part of the partograph, which monitors progress of labour, was only initiated in 30 *vs.* 26 % respectively of the deliveries (pre- and post-intervention group) and disturbingly not more frequently in cases of identified maternal risk for neonatal outcome (*Table 2*).

Around 45 percent of women were admitted late in labour (< 3 hours before delivery and/or cervical dilatation > 8 cm). The initiation of the partograph was therefore also examined in relation to length of stay at the labour ward. Significantly more partographs were initiated in the group of women who stayed longer than 3.0 hours before delivery in both groups (7 *vs.* 24%, $p < 0.01$ and 10 *vs.* 17%, $p < 0.05$). However, the same reduction, which was noticed in the overall analysis, was also found in the "long stay group" in the post-intervention group.

The overall documentation of the partographs, when initiated, was found to be inadequate. Although all variables were recorded once the partograph was initiated, 65 *vs.* 79% ($p < 0.05$) of the partographs were plotted only once during labour (*Table 2*). Hypertension i.e. blood pressure >130/90, was recorded in 88 (15 %) *vs.* 68 (13%) of women upon admission. Of these, 69 and 34 women, respectively, stayed longer than 3.0 hours before delivery. However, only four *vs.* nil had a partograph, which was documented during labour.

Quality of intrapartum and neonatal care

Measures taken in order to detect signs of asphyxia and to prevent heat loss in the newborn infant are illustrated in *Table 2*. Statistically, there were no improvements in the foetal heart rate monitoring in the beginning of the expulsion period (2nd stage of labour), (51 *vs.* 54 %) and a significant reduction in foetal heart rate monitoring was noticed during the expulsion period in the post-intervention group 25 *vs.* 13 %, $p = 0.001$). Furthermore, only 57 *vs.* 50 % respectively, of the infants were dried as an initial procedure to prevent heat loss.

Foetal heart rate monitoring during the expulsion period, for example, was not conducted more frequently in cases where maternal risk indicators for neonatal outcome had been identified (26 *vs.* 13 %, $p = 0.001$) (*Table 3*).

Neonatal outcome

Hypothermia proved to be a common problem, which despite extensive discussions related to heat loss prevention increased 30 minutes postpartum in the post-intervention group (38 *vs.* 57 %, $p = 0.001$), as measured by the assistant research midwives (*Table 4*). The observed midwives rarely measured or assessed the newborns' temperatures, and even if this performance improved significantly in the post-intervention group (2 *vs.* 8. %, $p < 0.001$), the actual numbers were still low (17 *vs.* 49 recordings of temperature).

Few cases of severe asphyxia, i.e. Apgar score ≤ 3, was found (7 *vs.* 5 respectively) whereas moderate asphyxia, (Apgar score 4-7), was 11 *vs.* 10 % respectively. Eleven observations of Apgar score are unexplainably missing from the pre-intervention group.

Naso-pharyngeal aspirations were applied in 55 *vs.* 40 % ($P < 0.001$) of all newborns. The proportion of newborns transferred to the neonatal unit was smaller in the post-intervention group (17 *vs.* 13%, $p = 0.04$). Twelve (of 15) and 8 (of 9) neonatal deaths in the two groups were found among the transfers. The foetal heart rate was controlled in eight of the nine cases in the post-intervention group as compared to three of the 15 cases in the pre-intervention group ($p=0.004$, Yates corrected X^2). No stillbirths were recorded in any of the groups, however, 1 observation of Apgar 0 after five minutes was made in the post-intervention group.

Table 3: Quality of intrapartum and immediate neonatal care

	All observations				Observations in cases of identified maternal risk*			
	pre-intervention group N=702		Post-intervention group, N=616	P-value	Pre-Intervention		Post-Intervention	P-value
Partograph used	**697**		**612**		**323**		**259**	
(%, No)	31	(215)	24 (144)	0.01	31	(99)	24 (62)	NS
FHR controlled when expulsion period (2nd stage of labour began)** (%, No)	**690** 51	(349)	**599** 55 (328)	NS	**321** 51	(162)	**252** 53 (138)	NS
FHR controlled during the expulsion period (2nd stage of labour) (%, No)	**674** 25	(168)	**538** 13 (68)	0.001	**314** 26	(82)	**231** 13 (29)	0.001
Initial intervention to prevent heat loss (%, No)	**626**		**603**		**318**		**256**	
Dried								
Covered	57	(329)	50 (303)	NS	56	(178)	50 (128)	NS
Placed under heater	40	(278)	41 (249)	NS	41	(130)	43 (111)	NS
Skin-to-skin care	2.8	(19)	6.3 (38)	0.01	3.1	(10)	3.9 (10)	NS
	0	(0)	2.2 (13)	0.001	0	(0)	2.7 (7)	0.009**

* ≤ Than 17 years of age, ≥ 35 years of age and ≥ 5 deliveries, uterine height upon admission ≥ 37 cm, blood pressure ≥ 140/90 and stillbirth in the last pregnancy. ** FHR = Fetal heart rate, ***Yates corrected X_2 P-value.

Table 4: **Neonatal outcome**

Item	Pre-intervention group, N= 702	Post-intervention group, N = 616	P-value
Newborns temp. Measured by midwives (%, No)	2.4 (17)	(7.9) (49)	0.001
Newborns temperature by MRA*			
	684	**608**	
Immediate after birth (%) ≤ 36	50 (341)	54 (328)	NS
30 minutes after birth (%) ≤36	**567** 38 (217)	**525** 57 (301)	0.001
120 minutes after birth (%) ≤36	**330** 29 (95)	**113** 36 (41)	NS
Apgar Score (1 min) by midwives	**691****	**616**	
≤3	1.0 (7)	0.6 (4)	NS
4 –7	11 (73)	9.8 (60)	NS
8 – 10	88 (611)	90 (550)	NS
Naso-pharyngeal aspiration	**691** 55 (379)	**615** 40 (247)	NS
Resuscitation ***	3.2 (22)	3.3 (20)	NS
Type of delivery	**692**	**611**	
Cephalic	97 (672)	97 (594)	NS
Breach	2.9 (20)	2.8 (17)	NS
Vacuum Extraction	0.3 (2)	0.5 (3)	NS
Fresh still births recorded	(0)	(0)	
Transferred to neonatal unit (%, No	**686** 17 (117)	**608** 13 (79)	0.001
Neonatal deaths (%, No)	**685** 2.2 (15) NS	**597** 1.5 (9)	

*MRA = midwives research assistants, ** 11 cases missing
*** ventilation on mask, gastro suction and medication

perception of care (95 *vs.* 98.5%) and 96 *vs.* 91 % respectively (ns) reported that they were satisfied with the care given.

Discussion

The comparatively large group, 1318 women in labour, and the fact that data from both the observation study and the partographs were registered using similar coding practices in the same statistical program, may be considered as the strength of this study. Furthermore, we believe that the procedures of repetitive control of data and comparing observation and partograph data to each other increase the reliability of our data.

Quality of the partograph

The graphic part of the partograph in the present study was found to be inadequately and inappropriately used both in low- and high-risk deliveries. Very few partographs were initiated and could therefore neither serve as a tool for early detection of prolonged labour nor as a guide for timely intervention to prevent asphyxia[15 16]. Despite the HCM management's decision to engage midwives in documentation of the graph, this had not happened. As the midwives were quite positive to be engaged in this activity[17], the causes for failure need to be sought elsewhere, for example, in delay implementation or resistance from the physicians.

The fact that almost half of all women were admitted late in labour (< 3 hours before delivery and/or cervical dilatation > 8 cm) might be a reason to consider reviewing the general use of the partograph and concentrate on identified risk cases. Monitoring of the foetal heart rate, however, need to be promoted as a natural part of midwifery performances in all cases.

Prevention and early detection of asphyxia

The quality of midwifery care related to prevention and early detection of asphyxia was found to be mediocre. The foetal heart rate, for example, was monitored only in approximately half of all deliveries at the beginning of the second stage, and the monitoring reduced drastically during the 2nd stage, including retrospectively identified asphyxia cases. According to Saugstad[9], 5-10 percent of all newborns require some form of respiratory or cardiovascular support in the labour room or adjacent nursery, a figure that may be assumed to be higher in settings with limited resources. Despite the fact that data from this study only reflect vaginal and midwifery attended deliveries, approximately 50 percent of all newborns in the pre- and post-intervention groups underwent naso-pharyngeal suction. However, less than five and ten percent, in the two groups respectively were subjected to other resuscitation methods such as ventilation and medical stimulation. The frequent naso-pharyngeal aspiration observed does not agree with the HCM midwives perception that routine aspiration of newborns had ceased[17] as a result of introduction to evidence based practice. Research studies have revealed that routine gastric as well as naso-pharyngeal suction has not been proven beneficial for the newborn infants[10]. The significant reduction observed in the post-intervention group, however, might be interpreted as a positive outcome of the intervention.

Prevention of hypothermia

The fact that the midwives hardly ever measured the newborns' temperatures is a problem, in particular when contemplating the low temperatures observed in both the pre- and post-intervention group. Moreover, drying, which is considered to be the most important intervention to prevent heat loss in newborns[118] was undertaken only as an initial procedure in about half of the deliveries. Findings from the qualitative part of this study, conducted after the pre-intervention observation in 1999, indicate that the midwives at HCM did not consider hypothermia to be a significant problem[17], a perception which appears to be quite common in low-income

countries[2 18]. The midwives firmly believed that the regular use of a mechanical heater combined with wrapping the infant in a cotton cloth was adequate to maintain the newborn's body temperature. Furthermore, the HCM midwives emphasised that the nursery was separated from the labour room, and in case several women delivered simultaneously, they were unable to control the newborns sufficiently[17].

The skin-to-skin method has been implemented successfully for low-weight infants at the neonatal intensive care unit at HCM in Maputo[19]. This method is also advocated in the Mozambican national strategy for safer motherhood[20]. It was therefore discouraging to find that discussions held during the intervention phase in of the current study (June-October 1999) regarding implementation of skin-to-skin care to reduce hypothermia did not result in improvements. According to the midwives, the failure to improve was due to inadequate logistics and women's resistance to embrace the skin-to-skin practice[17].

Neonatal temperature strongly correlates with that of the labour room temperature, whether it is in a domestic or a hospital setting[1]. A significant portion of newborns in low-income countries are likely to suffer from hypothermia during cooler periods[21 22]. In the current study we even found that the rate of hypothermic infants was higher in the post-intervention phase, which took place in the warm season (October-November 2000). It therefore seems appropriate to emphasise in midwifery education that hypothermia is a threat to newborns in all seasons in Mozambique, not only during the cooler period when temperature drops significantly.

How do we interpret the statistically significant deterioration observed in certain variables in the post-intervention group? The research assistants remained the same during the two observation periods. However, the lag-time between the pre- and post intervention observa-tions (1999 and 2001) may have influenced the momentum of the study and the attentiveness of the research assistants. This might explain, for example, some of the observed reduction in foetal heart rate monitoring during the expulsion period of labour (*Table 2*). Other aspects such as the significant increase in number of hypothermic newborns (*Table 4*) and the failure to implement skin-to-skin care indicate that the results most likely reflect deterioration in midwifery performance. The reduction of partographs used in the post intervention group may mirror the fact that management regulation regarding the partograph i.e. including the midwives in documentation of the graphic line of the partograph, was not implemented as intended.

The relatively low number of asphyxia cases observed is probably a result of not including all consecutive cases, including caesarean sections. Only a few cases of vacuum extractions were observed. A previous study of vacuum extraction deliveries in Maputo showed, for example, that 83 percent of all newborns born with assistance of vacuum extraction suffered from asphyxia[23]. Birth asphyxia is considered to remain a major cause of perinatal morbidity and mortality in low-income countries[24-26]. However, Buchmann, *et. al.* who studied intrapartum related birth asphyxia in South Africa, argue that the high rates of asphyxia related perinatal deaths might be reduced through improved perinatal care. The challenge is considered to be great, though, and requires change in midwifery staffing norms as well as better foetal monitoring and partograph-based labour management[5].

Our findings indicated that a majority of women were satisfied with the care given, which may represent the women's true feelings. The positive responses, however, may also be a reflection of the sense of relief, which is often experienced in the aftermath of a delivery, in particular if the question was posed in the immediate postpartum period. On the other hand, women may not have felt free to display their true sentiments. The latter is supported by our qualitative study, which indicates that midwives' interaction with women in childbirth was limited and non-empowering[17]. The

reduction of satisfied women found in the post-intervention group, although non-significant, is nevertheless a sign to be taken seriously. In-depth interviews or focus group discussions with women are likely to provide a more comprehensive interpretation of the present study's findings.

The intervention

The observed deterioration of midwifery performances turned our attention to the intervention, looking for potential weaknesses in design and implementation. As far as we can judge, the interventions bear similarities with other educational programs used in comparable settings[27 28]. One may speculate, though, whether a more frequent presence of the entire research team would have made a difference or not. This approach was applied in a previous study and resulted in partial success[27]. Documentation of partographs in that study generally improved but the midwives did not reflect adequately upon information received. The complexity of implementing change, which may improve quality of care, has been discussed in several studies. In Brazil, two educational programs for improving essential newborn care were compared and neither was found to bring the expected improvements. The researchers therefore concluded that interventions other than education were required[28]. This was demonstrated by a research team in Nicaragua where a series of interventions, including education and organisational changes positively influenced quality of perinatal care and reduced neonatal mortality[29]. It is difficult to deduce what factors contribute to a successful intervention. It is probably a combination of multidimensional intervention and the presence of a dedicated person, as demonstrated in the Kigoma project in Tanzania [30].

The failure to improve midwifery performances in the present study may also be related to other factors such as high rotation of personnel. New midwives, who had not participated in the first seminars, allegedly substituted midwives who did not comply with local guidelines and whose performances were judged inadequate. However, the institutional memory at HCM can be considered intact, as management and responsible labour ward staff remained the same, and therefore could have influenced the situation positively.

Informal observations indicated that clinical teachers and nursing students had little contact with the labour ward staff and appeared to be unaware of the intention to implement skin-to skin care. In order to establish uniform perinatal care routines and close the theory-practice gap in midwifery, the distance between educators and practicing midwives must be reduced[31]. This might be achieved at HCM if students are assigned to clinical midwives when conducting deliveries, and not as observed, only to clinical teachers.

The proportion of perinatal and early neonatal deaths (of child mortality) is around 38 percent and increasing. Unless we can offer higher coverage of quality services to resource-low and poor settings during childbirth and the immediate newborn period, little progress will be made[32]. The present study attempted to address this problem by identifying failures in caring routines as well as develop a training programme in order to improve midwifery performances. The results, however, clearly demonstrates the difficulties of making changes in childbirth caring procedures.

A theoretical model depicting the HCM midwives' own perceptions regarding barriers to providing quality perinatal care, also describes how the midwives handled identified barriers, i.e. a non-conducive environment, a sense of professional inadequacy, inadequate interaction with women and non-appliance of best and evidence-based practices. "The strategies applied i) improvising, and ii) identifying areas in need of change which might reduce the barriers whereas iii) holding others accountable, and iv) yielding to dysfunction and structural control would must likely increase the barriers." The midwives moreover frequently referred to communication and collaboration as main tools to improve

perinatal care, but consistently gave examples to the contrary[17]. Failure in communication has also been identified by other researchers as an essential factor of sub-optimal care, which contributes to the negative neonatal outcome of childbirth[33]. Lack of inter-professional collaboration has also been recognised as an existing problem which may block attempts to achieving an overall improvement in quality of care[34]. Furthermore, the full potential of midwives is unfortunately not recognised within the commonly rigid hierarchical structure of health systems in low-income countries[31]. The need for change identified by the HCM midwives[17] should therefore include advocacy for recognition of the midwife as a valid and respected member of the obstetric team. The lack of a supportive regulatory framework for midwives, however, is a source of concern[35], which needs to be addressed in order to promote sound midwifery practices.

Conclusion and implications for practice

The HCM midwives' monitoring of the foetal condition was inadequate and will, unless remedied, not prevent development of perinatal asphyxia. Furthermore, the elevated number of hypothermic newborn infants needs to be discussed in depth with the HCM midwives to convince them that i) hypothermia is, in fact, a serious problem and ii) that the immediate care of the newborn infant needs to include drying and covering the new-born as well as the skin-to-skin contact with the mother. Exchange of experiences with the neonatal intensive care unit, where the method has successfully been installed, may prove valid to the midwives. The need for improved communication and collaboration at HCM is demonstrated by the fact that midwives had not initiated documenting all parts of the partograph as decided. Future research should focus, not so much on the difficulties related to perinatal care but on the possibilities to circumvent problems and create cost-effective practices. The appreciative inquiry method[36] might prove a valuable instrument in achieving this.

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