Research Article

Haemorrhage in pregnancy: information given to women in Chiradzulu (Malawi)

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Keywords:
Haemorrhage in pregnancy, midwives, traditional birth attendants, information.

Abstract: Curationis 29(2): 48-55

Advising women on haemorrhage in pregnancy could be viewed as an integral aspect of maternal health care in Malawi. The WHO (1999) confirmed that haemorrhage in pregnancy was not only a direct reason for maternal mortality but also a major cause of maternal death. The question on the nature of information that midwives and traditional birth attendants (referred to as TBA's) in the Chiradzulu district in Malawi gave with regard to haemorrhage in pregnancy, therefore arose. Research available focused on the women's knowledge about the complications of pregnancy but not on the nature of information women received from midwives and TBA's. This study explored and described the nature of information that was given to rural women in the Chiradzulu district by the midwives and TBA's regarding haemorrhage in pregnancy. The findings revealed that although both the midwives and TBA's included important information about haemorrhage in pregnancy, there were deficiencies in some critical areas. Examples of these deficiencies were the definition of haemorrhage in pregnancy; the predisposing factors for antepartum and postpartum haemorrhage and deficiencies in the nature of information on the management and referral of haemorrhaging patients.

The findings provided insights into the nature of the information that was provided to the women regarding haemorrhage in pregnancy in the Chiradzulu district in Malawi. Thereafter guidelines were developed for the provision of this information. Finally a follow-up study was recommended after implementation of these guidelines in the district to evaluate the change in the nature of the information communicated to patients regarding haemorrhage by midwives and TBA's. In this study, haemorrhage during pregnancy referred to the perinatal phase, including antepartum, intrapartum and postpartum haemorrhage.

Introduction and background to the problem

Malawi is a small, landlocked developing country south of the equator in sub-Saharan Africa. It has a population of approximately 10 million people (The World Fact Book, 2006). Health care in nationalised and maternal health care services are provided at three levels: primary, secondary and tertiary. The main providers of health care at all three levels are midwives and traditional birth attendants (referred to as TBA's). Registered midwives were trained at university level whilst TBA's received basic non-professional training to provide services in rural areas where women doesn't have access to modern maternal health services. Only an estimated 55% of births in Malawi took place in healthy facilities (National Statistics Office, 1994; National statistics Office and ORC Macro, 2001). Midwives are registered to practice within communities and TBA's need licensing

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to enable legitimate practice that is governed by the Nurses and Midwives Act in Malawi. Maternal health information is an essential aspect of maternal health care, and particularly information on complications of pregnancy, including haemorrhage. Information on haemorrhage in pregnancy is essential as women should be made aware that haemorrhage is a major cause of maternal morbidity and mortality, in order for them to appreciate the need to seek early emergency care for haemorrhage and thereby reduce maternal morbidity and mortality.

Haemorrhage is a significant complication of pregnancy and is one of the major causes of maternal morbidity and mortality both in developed and developing countries (Malawi Safe Motherhood Programme (MSMP), 2000; Basin, 1996; Castro, Campero, Hernandez & Langer, 2000; Chichakli, Atrash, Mackay, Musan & Berg, 1999; Chiwuzi, Okolocha, Okojie, Ande & Onoguwe, 1997 & World Health Organization (WHO), 1998). In Malawi, the maternal mortality ratio is currently estimated at 1120 per 100, 000 live births (National Statistics Office and ORC Macro, 2001). Haemorrhage alone contributed to 24% of these deaths annually (MSMP, 2000). Local studies demonstrated that women in Malawi did not recognise haemorrhage. In addition, they have limited knowledge of the complications that may occur during pregnancy that could precipitate haemorrhage or results in reduced ability to tolerate haemorrhage. Furthermore, most research has focused on knowledge women have about complications of pregnancy and not on the nature of information women received from midwives and TBA's. Health information pertaining in particular to haemorrhage in pregnancy has a role in preventing maternal morbidity and mortality. The research question therefore is: What is the nature of the information given to rural women in Chiradzulu (Malawi) by the midwives and TBA's regarding haemorrhage in pregnancy?

Purpose and objectives of the study

The purpose of the study was to explore, describe and compare the nature of information that was given to rural women in Chiradzulu (Malawi) by the midwives and TBA's regarding haemorrhage in pregnancy. The results provided the framework to develop guidelines for giving this information to the women in the district both by the midwives and the TBA's. The purpose of the study was achieved through the following objectives:

- To explore and describe demographic data of the participants that had bearing on the study. This demographic data included age; professional qualifications; position; years of working experience and years of working in the current maternity facility; as well as the number of working hours per week.
- To explore, describe and compare the nature of information that is given to the rural women by the midwives and TBA's regarding haemorrhage in pregnancy.
- To describe and compare the recommended practices that are included in the information given to the rural women by the midwives and TBA's regarding haemorrhage in pregnancy.

Definitions

- **Midwife**

A midwife is a health practitioner who has successfully completed a prescribed course in midwifery and has acquired the necessary midwifery skills that enables her to give care according to the scope of practice. She is able to provide necessary supervision, life saving obstetric care and information to women in pregnancy and the delivery (Kapyepye, 2002:9).

- **Traditional birth attendant (TBA)**

The traditional birth attendant is a health worker who has undergone formal training in selected midwifery skills. She provides the backbone of maternity services at the periphery, including life saving obstetric care to low risk, maternity clients. She integrates health information into her care practice to enhance the women's awareness of major obstetric problems, including haemorrhage in pregnancy (Kapyepye, 2002:9).

- **Nature of information**

Provision of information is a planned activity and uses a combination of methods such as teaching, counselling and behaviour modification techniques that influence the patient's knowledge, health and illness behaviour (Elasy, Ellis, Brown and Pichert, 2000). The nature of information given (Kapyepye, 2002:9) includes:

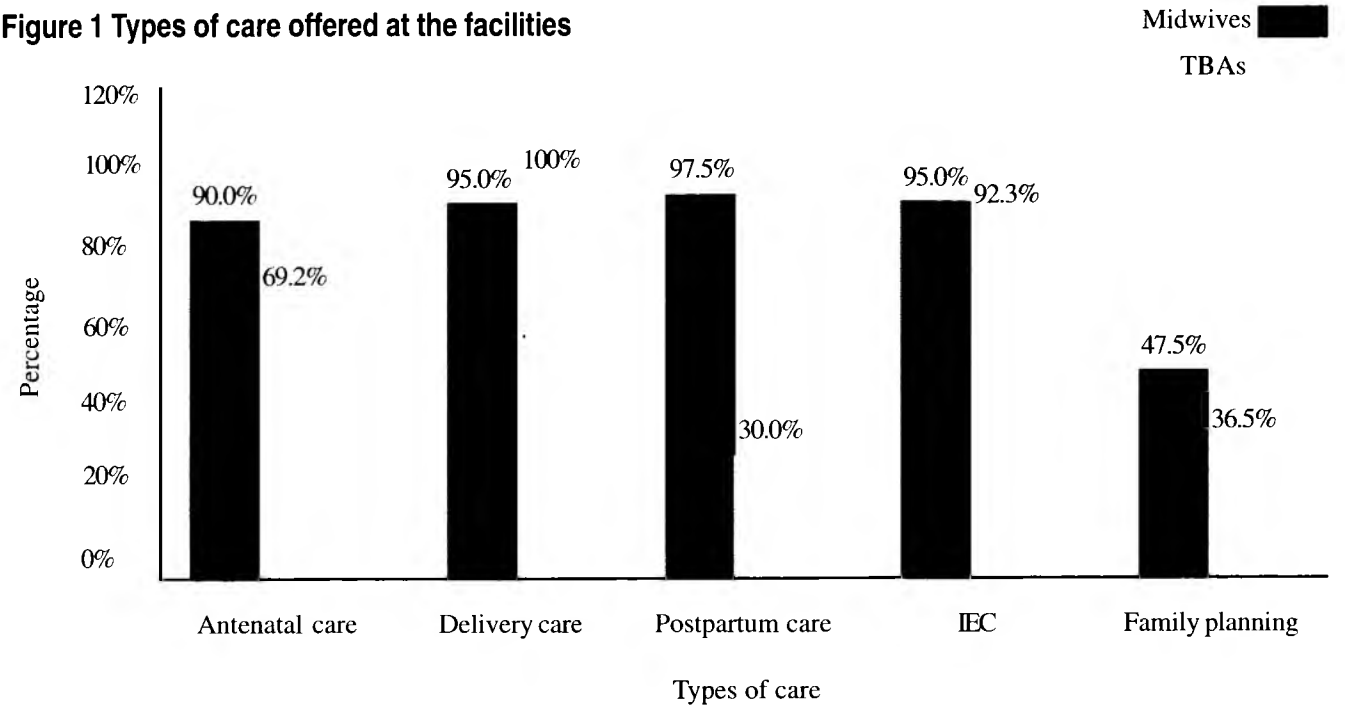
- o Complications of pregnancy (inclusive of haemorrhage in pregnancy)
- o Danger signs in pregnancy
- o Infection prevention
- o Nutrition
- o Family planning
- o Baby care
- o Antenatal care
- o Delivery care
- o Postpartum care

Research design and - method

A quantitative, descriptive, exploratory, contextual and comparative study was used to explore and describe the nature of the information received by rural Malawian women in the Chiradzulu district. The description and comparison helped to determine differences in the information given by midwives and TBA's. The researcher-administered questionnaire allowed the collection of accurate data from the participants. Two hospitals, ten health centres and all the TBA facilities that provided maternal health care services in the Chiradzulu district in Malawi were included. The target population was all midwives (N=62) and TBA's (N=86) providing maternal health care services. A purposive sampling method was used and the sample realization was 40 midwives and 52 TBA's according to the inclusion criteria.

A researcher-administered questionnaire consisting of closed and open-ended questions was used to collect data. The researcher-administered questionnaire consisted of three sections of which each addressed an objective of the study. Section A was to acquire the demographic data that had a bearing on the study for example age, working experience and professional qualifications. Section B strived to explore, describe and compare the nature of the information that was given to rural Malawian women by midwives and TBA's regarding haemorrhage in pregnancy. Section C provided questions to explore, describe and compare recommended

Figure 1 Types of care offered at the facilities



practices that were included in the information given to the rural women. A pilot study was conducted to test the questionnaire for clarity. Suggestions were incorporated into the questionnaire and assisted to establish the reliability and validity of this tool. The researcher trained two research assistants that participated in the data collection. The questionnaires were in English and clarification was given to participants if they required it. Questions were repeated in the language of the participant, which was Chichewa. Data collection stretched over a period of three months, from December 2001 to February 2002. The validity of the questionnaire was ensured after Safe Motherhood officials and experts in the field of maternal health as well as experienced academic professional midwifes analysed and examined it. Inter-rated reliability was achieved by training given to the research assistants and after compared recordings indicated a correlation coefficient of 0.91 between the researcher and the assistants' rating.

Data was analysed by means of descriptive and inferential statistics. Frequencies, means and percentages were calculated and presented in bar graphs, pie charts and tables. Fischer's Exact Tests at the 0.05 level of significance were used to make comparisons about the type of information and recommendations given by midwives and TBA's. Validity was ensured by subjecting the researcher-administered questionnaire to content, construct and face validity.

Ethical considerations

Prior to the data gathering, the researcher obtained ethical approval to conduct the study from the Committee for Research on Human Subjects (Medical) and from the Faculty of Health Sciences' Post-graduate Research Committee at the University of the Witwatersrand (Clearance Certificate M01-10-08). The National Health Science Research Committee in the Ministry of Health and Population (Malawi) approved and granted permission to carry out the study in Malawi. Informed written consent was obtained from all participants. Autonomy was ensured by voluntary participation and that participants were assured that they could withdraw from the study at any time without penalty. In addition, participants were assured of anonymity, confidentiality and non-benevolence.

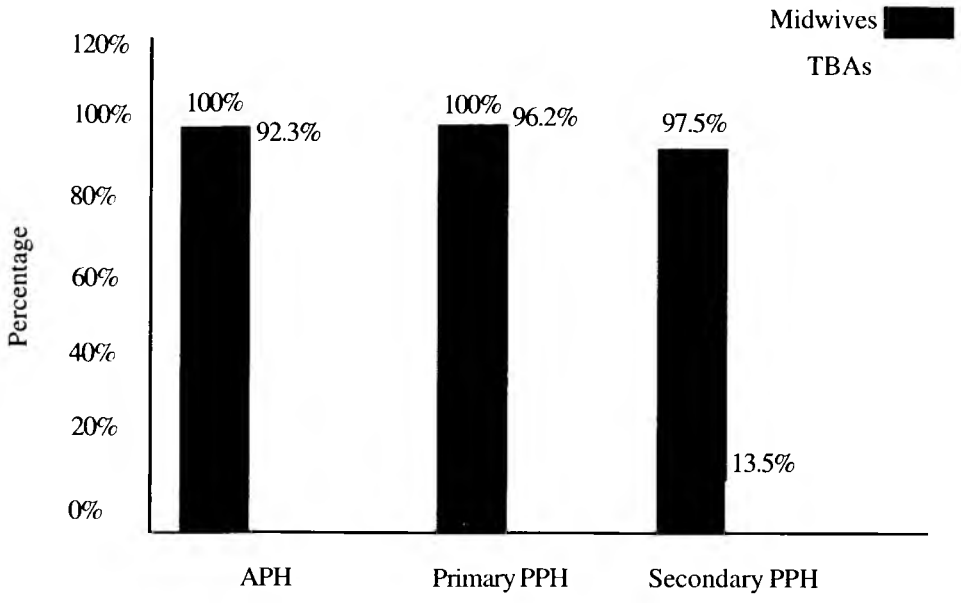
Results

The results were presented in accordance with the objectives. Section A consisted of six questions and addressed the first objective of the study pertaining to the demographic data of the participants. Questions pertained to age, professional qualifications, position, period of working experience, period of working in the current maternity facility and number of working hours per week. The majority of the midwives (75%, n=30) were between the ages of 30 - 49 years. The majority of the TBA's (57.7%, n=30) were aged between 50 and 69. At least 13.5% (n=7) of the TBA's were older than 70 years, whereas none of the midwives were older that 70 years. Ninety three percent (93%) of the midwives had enrolment certificates (n=37), 5% had a diploma (n=2) and 2.5% had a degree (n=1). All the TBA's had a TBA certificate. The majority of midwives (55%, n=22) had working experience of more than one year but less than 10 years. A quarter (25%, n=10) of midwives had 11 to 20 years' experience. Approximately the same number (than the midwives) of TBA's (58%, n=30) had experience of more than one year but less than 10 years and 15% (n=8) had 11 to 21 years' experience. Ninety percent (90%) of the midwives and 79% of the TBA's worked more than the officially stipulated 40 hours per week.

Section B addressed the second objective of the study, which was to compare the nature of the information that was given to rural women by midwives and the TBA's regarding haemorrhage in pregnancy. It was found that 90% (n=36) of midwives and 69.2% (n=36) of TBA's provided antenatal care. Ninety-five percent (95%, n=38) of midwives and 100% (n=52) of TBA's provided delivery care. It is however a concern that 97.5% (n=39) of midwives and only 30% (n=12) of TBA's provided postpartum care. Refer to Figure 1 for the types of care offered at the facilities.

The information provided to women on

Figure 2 Types of vaginal bleeding included in the information



the complications of pregnancy (17.5% vs. 7.7%; p=0.2) and danger signs of pregnancy (57.5% vs.46.2; p=0.3) were not significantly different for the midwives and the TBA's. However, midwives provided significantly less information on the care of the neonate after childbirth (27.5% vs. 48.1%; p=0.05) and significantly more information on delivery (50.0% vs. 23.1%; p=0.008) than the TBA's. With reference to the nature of the information given by midwives and TBA's the following: All midwives and TBA's mentioned that they did provide information on haemorrhage during pregnancy. There were no significant difference in the type of patients to who midwives and TBA's gave information on haemorrhage in pregnancy. All midwives and TBA's described haemorrhage as an obstetric emergency. Significantly fewer midwives described haemorrhage as a cause of foetal death (67% vs. 86.5%; p=0.04) but significantly more midwives described haemorrhage as a cause of anaemia (20% vs. 3.8%; p=0.018) than did the TBA's. Significantly more midwives described a haemorrhage as any amount of blood loss during pregnancy or labour (90% vs. 25%; p=0.00) than TBA's. Significantly more midwives than TBA's reported to blood loss in excess of 300ml to be abnormal (17.5% vs. 0%; p=<0.001). Although antepartum haemorrhage and primary postpartum haemorrhage were well addressed by both midwives and TBA's, only 13.5% of TBA's would consider discussing secondary postpartum haemorrhage with their patients (refer to Figure 2).

Significantly more midwives viewed a previous history of bleeding during pregnancy (80% vs. 30.8%; p=<0.001), anaemia (67.5% vs. 28.9%; p=0.0003), high blood pressure (80% vs. 7.7%; p=<0.001) and uterine fibroids (72.5% vs. 28.9%; p=<0.001) as predisposing factors for antepartum haemorrhage. Midwives were significantly more concerned about a full bladder (95% vs. 21.1%; p=<0.001), previous history of bleeding (57.5% vs. 23.1%; p=<0.001), multiple pregnancies (60% vs. 32.7%; p=0.01), polyhydramnios (27.5% vs. 7.7%; p=0.02), prolonged labour (72.5% vs. 38.5%; p=<0.001), decreased clotting factors (50% vs. 3.9%; p=<0.001) and lack of antenatal clinic attendance (67.5% vs. 11.5%) as predisposing factors for postpartum haemorrhage. Significantly fewer TBA's would consider advising mothers that haemorrhage in pregnancy could result in anaemia, infection, reduced ability to breastfeed, or possibly even death (p=<0.001).

Section C addressed the third objective of the study, which was to describe and compare the recommended practices regarding haemorrhage in pregnancy that were included in the information given to the rural women by the midwifes and TBA's. Table 1 provided an overview of the recommended practices for prevention of bleeding in pregnancy. It was of concern that significantly fewer TBA's than midwives would consider advising women to attend routine antenatal clinic visits as a means of preventing haemorrhage (59.6% vs. 92.5%; p=<0.001).

There were no significant differences between advice given by midwives and TBA's to women regarding the prevention of a postpartum haemorrhage. The routinely advised practice, by both midwives and TBA's, for the prevention of a postpartum haemorrhage was to encourage breastfeeding (92.5% vs. 90.4%; p=1.00). Very few midwives (12.5%) and TBA's (1.9%) considered advice on the importance of emptying the bladder to prevent haemorrhage. None of the midwives or TBA's would recommend the use of traditional herbs for the prevention of a haemorrhage. Information on recommended prevention of a postpartum haemorrhage provided by both midwives and TBA's included reporting bleeding (87.5% vs. 84.6%; p=0.77) and infections (80% vs. 78.9%; p=1.00) to a health facility. Significantly fewer TBA's than midwives would recommend exercises for the contraction of the uterus (9.6% vs. 72.5%; p=<0.001). Midwives (100%) and TBA's (96.2%) would advise women to report to the hospital immediately if they presented with a postpartum haemorrhage. Midwives were significantly more likely to assess the patient first for blood loss and then to call an ambulance (59.4% vs. 0%; p=0.005) than the TBA's. In addition, midwives were more likely to consider resuscitating a patient whilst awaiting the arrival of an ambulance (40.6% vs. 0%; p=0.005) than the TBA's.

Both midwives (85%) and TBA's (84.6%) reported that patients' lack of awareness was a contributing factor towards women delaying to seek medical attention in the event of a haemorrhage. Midwives felt that their patients were powerless in decision making (25% vs. 1.9%; p=<0.001) and had a long way to walk to a clinic (45% vs. 11.5%; p=<0.001). These factors of decision making and the distance to walk were significantly more important in the case of midwives' patients than in the case of patients of TBA's. Both

Table 1. Recommended practices for prevention of bleeding in pregnancy (APH)

PRACTICE	MIDWIVES (n = 40)		TBA's (n = 52)		FISHER'S EXACT TEST
	FREQUENCY		FREQUENCY		P-VALUE
	N	%	n	%	
Avoid pregnancy over 36	28	70	19	36.5	0.0017
Avoid high number of pregnancies	32	80	43	82.7	0.7908
Visit antenatal clinic regularly	37	92.5	31	59.6	0.0006
Avoid heavy work	31	77.5	40	76.9	1.0000
Take iron and folic acid tablets	33	82.5	26	50	0.0019
Seek help for physical illness	22	55	25	48.1	0.5351
Report abuse	20	50	10	19.2	0.0032
Report history of bleeding in previous pregnancies	26	65	25	48.1	0.0001
Adequate diet	5	12.5	3	5.8	0.2877
Avoid taking drugs	2	5	0	0	0.1863
Avoid donating blood	1	2.5	0	0	0.4348

midwives and TBA's provided information on how to manage a haemorrhage at home (97.5% vs. 100%; p=0.43).

Significantly more midwives than TBA's felt that they needed more staff at the health care facilities (15% vs. 0%; p=0.005) and felt that they needed more reading material (72.5% vs. 32.7%; p=<0.001), in order to better manage haemorrhage in pregnancy. However, significantly more TBA's than midwives felt that they needed to formulate support groups within the community (76.9% vs. 50%; p=0.009) to manage haemorrhage in pregnancy more effectively.

Discussion of results

Demographic data

The first objective of the study was to explore and describe the demographic data of the participants (Section A of questionnaire). From the demographic data it is evident that both the midwives and TBA's who provided maternal health care were older women. Based on an African cultural perspective it could have been that the patients trusted these practitioners to give advice because of their maturity (Chalmers, 1990 & Gennaro, Kamwendo, Mbweza & Kershbaumer, 1998). Their maturity was further supported by the fact that the midwives and the TBA's had many years of experience. Experience provides practitioners with knowledge for the understanding of issues; to become experts and to master a number of routines that they can perform easily (Woolfolk, 1993).

A concern identified from the results is definitely the fact that the midwives and TBA's worked very long hours. The standard working week in Malawi is 40 hours and most midwives and TBA's worked more than a standard 40-hour week. In Malawi, as in the rest of the world, practitioners are working longer hours due to staff shortages (Mahoko, 1991). The working hours of midwives and TBA's needs revision in order to provide safe and effective ante- and postnatal services.

Nature of information

This section addresses the second objective of the study, i.e. to explore, describe and compare the nature of the information given to rural women by midwives and TBA's regarding haemorrhage in pregnancy (Section B of the questionnaire). The findings suggested that although the midwives and TBA's included the necessary information, there were deficiencies in critical areas. Midwives and TBA's should be encouraged to discuss between them the factors that could make information provision more effective and to aim for the same goal of providing a good quality health care service to all patients. It was of concern that few TBA's provided postpartum care, as it was during this period that postpartum haemorrhage occurred. According to Gennaro et al. (1998:192), postpartum haemorrhage is the leading cause of maternal mortality in Malawi. The WHO (1998) recommended that all pregnant women should have access to basic maternity care during pregnancy and delivery, including antenatal care, a clean and safe delivery and postnatal care. In addition, fewer than half of the midwives and TBA's discussed complications of pregnancy and danger signs of pregnancy with their patients. Non-inclusion of these two vital topics would mean that women were denied the opportunity to have information in the areas that may have lead to recognising the severity of the problems and to seek care timeously (Pender, 1982), resulting in maternal mortality (Walraven, Telfer & Ronsmans, 2002). Policies and guidelines for information, education and counselling should have emphasised the inclusion of the danger signs and complications of pregnancy. Teaching material should also have been made available for health care providers to refer to.

The midwives and TBA's respectively,

explained haemorrhage in pregnancy inconsistently from each other. For example, midwives provided less information on care of the neonate but more information on specific issues pertaining to delivery than did the TBA's. Furthermore, significantly more TBA's didn't view a blood loss of more than 300ml as abnormal. Chichakli et al. (1999:721) indicated that most pregnancy-related deaths due to haemorrhage could have been prevented through early diagnosis and effective and immediate management. In addition, Castro et al. (2002) revealed that maternal deaths resulted from the lack of realising the needs for immediate treatment.

Both groups did not see new mothers as a specific group that required information on haemorrhage. Beger and Cook (1998:163) argued that the special learning needs of new mothers should be taken into consideration. With regard to new mothers, it was recommended that multigravidae women assist in the provision of information on haemorrhage in pregnancy to primigravidae, as they could benefit from the experience of the multigravidae.

Both midwives and TBA's explained antepartum and intrapartum haemorrhage as a type of haemorrhage to their patients. However, it was evident that TBA's did not view postpartum haemorrhage as important or dangerous, as only 13.5% included the information in their advice. This was dangerous because secondary postpartum haemorrhage is just as important as primary postpartum haemorrhage, especially in rural areas where patients are far away from the health facilities (Essex, 1981; Bennett & Brown, 1999). TBA's required refresher courses on the prevention and diagnosis of a secondary postpartum haemorrhage, and it should also be emphasised in their curriculum.

Significantly fewer TBA's than midwives included important information on the predisposing factors for antepartum haemorrhage such as previous history of bleeding during pregnancy, anaemia, high blood pressure and uterine fibroids (Cronje & Grobler, 2003). Anaemia was an important factor because it resulted in the patient being less able to tolerate a postpartum haemorrhage, which is thus more likely to result in maternal death (Walraven et al., 2000). In addition, significantly fewer TBA's than midwives included the following important information on the predisposing factors for postpartum haemorrhage: full bladder, previous history of bleeding, multiple pregnancy, polyhydramnios, prolonged labour, decreased clotting factors and poor antenatal clinic attendance. All these factors were documented predisposing factors contributing towards postpartum haemorrhage (Cronje & Grobler, 2003). The information on the predisposing causes of postpartum haemorrhage should have included the following critical information: emptying of the bladder, treatment of anaemia, excluding any history of previous bleeding, preventing prolonged labour, and preventing mismanagement of the third stage of labour. There might be significantly reduced maternal morbidity and mortality for patients who received antenatal care (Bernis, Dumont, Bouillon, Gueye, Dompnier & Bouvier-Colle, 2000:70; Browne & Dixon, 1978).

Recommended practices

The last objective of the study was to describe and compare recommended practices that should be included in the information given to the rural women by the midwives and TBA's regarding haemorrhage in pregnancy (Section C of the questionnaire). In general, most common practices for the prevention of antepartum haemorrhage were included in the information given to women. It was however of concern that TBA's did not view attending the antenatal clinic as important for the prevention of bleeding during pregnancy. In addition, both midwives and TBA's did not consider an empty bladder to be necessary for the contraction of the uterus, and thus for prevention of a postpartum haemorrhage. A full bladder prevented efficient uterine contraction and also alluded to poor management of the labouring patient (Sellers, 1993).

Although traditional herbs were routinely used in Malawi, TBA's and midwives did not recommend it's use for the prevention of a haemorrhage in pregnancy. Both midwives and TBA's recommended to patients that they should report a postpartum haemorrhage at their nearest health facility and that the stage at which a woman seek medical attention for a haemorrhage, determined the outcome of the situation. This is supported by Bennett & Brown (1999:71) and Sellers, (1993) which stated that delays in instituting treatment could make the problem more complicated or worse and may result in a maternal mortality. The research findings indicated that not all TBA's realised the need to explain to women that they should seek medical attention, when noticing bleeding during pregnancy or when noticing heavy blood loss after delivery. Thus, delays in referral for medical treatment were more apparent in the case of TBA's. Midwives were significantly more likely to assess the patient first for blood loss, and then call an ambulance, and would resuscitate the patient whilst awaiting the ambulance. Advisably all maternal health care providers should be conversant with the practice of referral that is followed in their facility so that they could explain it to their patients.

Further delays in obtaining medical treatment were caused by midwives and TBA's who did not explain the referral system to the patient, which resulted in the patient not understanding the importance of complying with the referral. Undue delays or refusal might have been caused and eventually the condition may worsen and even result in the loss of life (Bennett & Brown, 1999:72). Other factors that contributed to the delay in seeking care were lack of patient awareness of the danger of haemorrhage in pregnancy, powerlessness in decision-making and the long distance to the clinic.

Midwives and TBA's recommended strategies for the improvement of information provision to patients regarding haemorrhage in pregnancy. The majority of the midwives viewed provision of a variety of educational materials to the community and health workers as important, whereas the majority of the TBA's viewed to the creation of support groups in the community as important. The midwives also felt that increased staff levels would assist in the provision of information on haemorrhage in pregnancy. Further recommendations for the provision of information on haemorrhage in pregnancy by midwives and TBA's were provided.

Recommendations for midwifery practice, education and research

Further recommendations for the provision of information on haemorrhage in pregnancy by midwives and TBA's were formulated as follows:.

- To initiate joint meetings between midwives and TBA's, in order to discuss and share experiences that can improve the provision of health information to the women.
- To initiate an in-service education programme for maternal health care providers in the district to upgrade knowledge of complications and the danger signs of pregnancy.
- To review and upgrade midwifery curricula on aspects of health education given on the complications and danger signs of pregnancy.
- Similar studies in other districts were recommended to evaluate the information, education and counselling strategies in the greater Malawi.
- To increase the training period for the TBA's and to empower them to acquire adequate knowledge and necessary information on haemorrhage in pregnancy.
- A follow-up study could be recommended after the implementation of these guidelines for the purpose of evaluation.

Conclusion

The overall view gained from the findings of the study was that both the midwives and TBA's did include basic information about haemorrhage in pregnancy but there were deficiencies in some critical areas. In addition, TBA's gave significant less information than midwives on some aspects for example antepartum and postpartum care and practices that could help prevent haemorrhage in pregnancy ($p - value < 0.05$).

Limitations

The sampling method that was used to select the participants who complied with the inclusion criteria prevented a wider representation of maternal health care providers in the district. This caused a decreased generalisability of the study results. In addition, the questionnaire was formulated in such a way that the participants had to respond to some questions from recall; hence the data were based on the participants' ability to recall what they knew. Lastly, data collection was done during the rainy season and this made it impossible to reach the most remote areas of the district, where the dirt roads were inaccessible.

Acknowledgements

This study was conducted as part of an MSc (Nursing) study at the University of the Witwatersrand, while the second and third authors were employees of WITS. University. Ms Petra Bester, doctoral candidate and research assistant, North-West University, assisted in the final preparation of this article.

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