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Maternity waiting facilities for improving maternal and neonatal outcome in low-resource countries (Review)

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[Intervention Review]

Maternity waiting facilities for improving maternal and neonatal outcome in low-resource countries

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A B S T R A C T

Background

A maternity waiting home (MWH) is a facility within easy reach of a hospital or health centre which provides emergency obstetric care (EmOC). Women may stay in the MWH at the end of their pregnancy and await labour. Once labour starts, women move to the health facility so that labour and giving birth can be assisted by a skilled birth attendant. The aim of the MWH is to improve accessibility to skilled care and thus reduce morbidity and mortality for mother and neonate should complications arise. Some studies report a favourable effect on the outcomes for women and their newborns. Others show that utilisation is low and barriers exist. However, these data are limited in their reliability.

Objectives

To assess the effects of a maternity waiting facility on maternal and perinatal health.

Search methods

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register (27 January 2012), CENTRAL (*The Cochrane Library* 2011, Issue 4 of 4), MEDLINE (1966 to January 2012), EMBASE (1980 to January 2012), CINAHL (1982 to January 2012), African Journals Online (AJOL) (January 2012), POPLINE (January 2012), Dissertation Abstracts (January 2012) and reference lists of retrieved papers.

Selection criteria

Randomised controlled trials including quasi-randomised and cluster-randomised trials that compared perinatal and maternal outcome in women using a MWH and women who did not.

Data collection and analysis

There were no randomised controlled trials or cluster-randomised trials identified from the search.

Main results

There were no randomised controlled trials or cluster-randomised trials identified from the search.

Authors' conclusions

There is insufficient evidence to determine the effectiveness of maternity waiting facilities for improving maternal and neonatal outcomes.

PLAIN LANGUAGE SUMMARY

Maternity waiting facilities for improving maternal and neonatal outcomes in low-resource countries

The chances of women dying because of complications of pregnancy and childbirth are still high in many parts of the world. The main direct causes of maternal and perinatal deaths are unsafe abortion, eclampsia, haemorrhage, obstructed labour, infections and sepsis. Most of these deaths can be prevented with early identification and treatment of complications. The poor utilisation of maternal health services and antenatal care in areas where deaths are high is mainly the result of barriers to access.

A maternity waiting home is a facility that is within easy reach of a hospital or health centre that provides antenatal care with skilled birth attendants and emergency obstetric care. The facility may also provide women with health education about pregnancy, giving birth and infant care. It is mostly women with high-risk pregnancies or those that are living far away that are encouraged to stay in these facilities at the end of their pregnancy. The extent to which women are cared for in the homes and the help that is available to them differs from country to country. A further difficulty is that home delivery is less expensive and women may not be willing to leave their families, who depend on their care, or their farms which are their means of existence.

The review authors could not find any individual or cluster-randomised controlled trials that evaluated the outcomes for women using a maternity waiting facility in low-resource countries. The fact that women who develop a serious obstetric complication need appropriate care in order to survive is clear. The effectiveness of maternity waiting homes in decreasing maternal deaths and stillbirths has been described in general terms in six retrospective population cohort studies. These are likely to describe women who were referred to stay in maternity waiting homes because of risk factors and compared them with women who came to the hospitals for other reasons. The control groups may have been self selected by disaster or women's ability to access the hospitals in time. The outcomes of births for the women who stayed at home were not known. There is insufficient evidence on which to base recommendations about the effectiveness of maternity waiting homes, and well controlled trials are needed.

BACKGROUND

The chances of women dying as a result of complications during pregnancy, delivery or the postpartum period remain high in many parts of the world. In 2005 the worldwide maternal mortality ratio was 402 deaths per 100,000 live births (confidence interval (CI) 216 to 654). Of the estimated 535,900 women who died that year, 50.5% (270,500) lived in sub-Saharan Africa and 45% (240,600) in Asia. These numbers have remained essentially unchanged since 1990 (Hill 2005).

Haemorrhage, eclampsia, sepsis, unsafe abortion and obstructed labour are the five main direct obstetric causes of maternal death (Khan 2006). It is well recognised that most of these maternal deaths can be prevented when appropriate treatment is started in time, and is given by a trained health professional in an adequate environment (WHO 2004).

In areas with high maternal mortality ratios, utilisation of maternal health services is low. This low utilisation of maternal health services is mainly a result of barriers to access and leads to high maternal and perinatal mortality and morbidity. Differences in utilisation between high- and low-income countries are enormous, but differences are also encountered within countries. Access to maternity health services is a key indicator of maternal mortality. Besides the per capita gross national product, access to maternal health services is the only other important predictor. Therefore, reaching a health facility that can provide emergency obstetric care is the best tool for reducing maternal mortality, and accessing that care will also lead to a significant reduction of perinatal morbidity and mortality (Bulatao 2003).

Since the 1960s, maternity waiting homes (MWH) have been advocated to bridge the geographical gap, which is the difference in care received by women living in remote areas compared to women living in urban areas. Women with high-risk pregnancies have been encouraged to go and stay close to the clinic at the end of their pregnancy (AbouZahr 1998; Fawcus 1996; Greenwood 1987; Kambarami 1999; Mahony 1995; Stewart 1968; WHO 1991).

What is a MWH?

A MWH is a facility within easy reach of a hospital or health centre which provides emergency obstetric care (EmOC). Women stay in the MWH at the end of their pregnancy and await labour. Once labour starts, women move to the health facility so they can be assisted by a skilled birth attendant (WHO 1991; WHO 2004).

There are many ways in which this concept is being implemented. In Zimbabwe and Ethiopia traditional style huts are used (Millard 1991; Poovan 1990); but also modern houses with toilet, bathroom and kitchen facilities (Cardoso 1986; Knowles 1988); old hospital wards (Wilson 1997); or, as in Papua New Guinea, a house on stilts may function as a MWH (Barss 1985).

The way women are cared for differs from country to country. Some facilities are completely self-catering and women provide their own food, water and firewood. Others are completely catered for, and sometimes the economic status of the women determines whether she is provided with food or not.

When staying in the MWH, women often have access to antenatal care. They may visit the routine antenatal care program in the health facility but more often the MWH is visited regularly by a nurse, midwife or doctor. Often the time women spend in the MWH is also used to give health education about pregnancy, giving birth and neonatal care.

The costs of a MWH are covered in different ways. Communities have been involved in building huts while ministries of health or non-governmental organisations contribute to building costs. Running costs may be partly covered by user fees, and by fundraising projects co-ordinated by the waiting women (Eckermann 2008; Poovan 1990; Wessel 1990; Wilson 1997).

Risk selection

The concept of risk selection, and the aim to use resources effectively, played an important role in the early descriptions of MWHs (Thaddeus 1994). Consequently, selection of women for referral to a maternity waiting home is important. Selection takes place during antenatal clinics by the attending health professional, either within the hospital or in health centres or clinics without labour facilities. Several studies suggest that risk assessment should play a central role in reducing maternal mortality (Essex 1977; Larsen 1978; Lennox 1984). It was believed that by selecting women with risk factors such as a poor obstetric history, high parity or anaemia and advising them to stay near a hospital could prevent a poor outcome. Selection of women with high-risk pregnancies, however, has not always been successful. A study in Tanzania showed very poor risk selection by healthcare workers; only risk factors such as previous caesarean section and first pregnancy lead to more referrals to health facilities with emergency obstetric care (Jahn 1998). Even in a low-risk population it is estimated that 20% of pregnancies will result in complications requiring treatment at a facility with skilled attendants providing emergency obstetric care, which consists of intravenous or intramuscular antibiotics, oxytocics and anticonvulsants, assisted delivery and manual removal of the placenta (WHO 1994).

Consequently, although risk selection has played an important role the MWHs usually also allow women without formal risk factors to stay there, especially if they live far from health facilities. In Nicaragua, Honduras and Papua New Guinea, another reason why women came to stay was the availability of postpartum tubal ligation (Barss 1985; Danel 2004; Wessel 1990).

We systematically searched the literature for studies describing the use and effectiveness of the MWH. The literature describing MWHs comes from many different low-income countries: Zimbabwe, Zambia, Tanzania, former Zaire, Ghana, Ethiopia, Nigeria, Liberia, Malawi, Mozambique, Papua New Guinea, Nicaragua, Cuba, Peru, Honduras and Lao. Also, in the USA, certain groups of pregnant homeless adolescents were admitted to a waiting home (LaGuardia 1989).

Factors in success and utilisation of a MWH

Several authors have investigated the factors that play a role in the success of a MWH. In Zimbabwe, a cluster survey (including 235 respondents) examined the use of maternal care services and found that nearly all (97%) women attended antenatal care during their last pregnancy at least once, and 66% gave birth in hospital. The use of a MWH increased the likelihood of hospital delivery nearly six-fold. Only one-third of all respondents, however, did use the MWH. Complaints that were mentioned about the MWHs were that the houses were too small and crowded, the toilets needed

improvement and there was a shortage of water and firewood (Van den Heuvel 1999). Five years earlier, in a survey in the same district, two thirds of the women stated that they would use a MWH if one was provided. The other third mentioned the absence of food provision and that there was no help with cooking, the necessity to collect one's own water and firewood, poor hygiene and lack of transport for referrals as important factors for their refusal to use a MWH (Nhindiri 1996).

In a rural district in Ghana, 83% of women attended antenatal clinics at least once and 90% of respondents were willing to stay in a MWH when advised to do so (Martey 1995). In another district in Ghana the introduction of a MWH failed. This MWH was located in a refurbished ward in an old hospital. In the first year, 25 women were referred and only one spent one night there. After the first year, attitudes and barriers were assessed through focus group discussions with the people involved. There appeared to be strong financial barriers, and home delivery is less expensive. The costs of living are higher in a MWH. In addition, women could not take care of their families and their farms. The location of the MWH was also considered problematic because it was still some way from the hospital and arranging transport at night was difficult. It was not considered safe at night and no healthcare personnel were available (Wilson 1997). In Nicaragua, being away from the family was also considered the main drawback of staying in a MWH (Wessel 1990).

In southern Malawi not all hospitals have MWHs. In those hospitals without a MWH women may be lodged in the antenatal or postnatal ward, or in the guardian shelter. In interviews, 55% of women who had used a MWH were satisfied with their stay. They perceived the easy access to skilled attendance during delivery, receiving treatment during antenatal care and the development of new companionship as important advantages of using a MWH. However, concerns were raised about lack of supervision by midwives and poor staff attitudes during antenatal care and delivery (Touray-Daffeh 2003). In Zaire, MWHs near a hospital were rarely used. During focus group discussions it emerged that many women felt that the risk associated with staying in the MWH, with no food and no one to help, was greater than the risk of staying at home (Sambe 1990). Focus group discussions also took place in Lao before a MWH was established. Many potential barriers were identified such as lack of privacy, inability to use traditional birthing practices, lack of respect from health staff, and the cost of reaching the hospital (Eckermann 2008). In Peru, MWHs are reported to be successful. Women are allowed to bring their families with them and the introduction of the MWH was combined with a 'cultural adaptation' of the healthcare services including the option of vertical delivery, which was set down in a nationwide protocol (Fraser 2008).

In Kenya, a newly build MWH was used by less than 10% of women who delivered in hospital. Awareness about the existence of the MWH appeared to be a barrier as 72% of pregnant women did not know about the existence of the MWH, 95% indicated they would need their husband's permission to use the MWH (Mramba 2010).

From these studies it is clear that careful planning is required for successful introduction of a MWH. Even when women have a positive attitude towards staying in a MWH, barriers might prevent them from doing so. Direct and indirect costs might be too high. Also, the perceived level of care in both the MWH and the facility in which they are going to give birth is an important factor that will influence decision making.

The effect of the MWH

The effectiveness of MWHs has been described in general terms. Cardoso 1986 reports how Cuba has improved its national health system since 1961. MWHs were part of an extensive project to improve the care for women giving birth. The first MWH opened in 1962, and by 1984 there were 85 facilities. In the same period, the proportion of deliveries in health institutions increased from 63% to 99%. A continuous audit of all cases of maternal death showed that between 1960 and 1984 maternal deaths from haemorrhage decreased dramatically from 32 per 100,000 birth to two per 100,000 births (Cardoso 1986).

In Honduras, the introduction of MWHs was part of a strategy to improve maternal health. It consisted of improving the referral of obstetric emergencies through the training of traditional birth attendants. Secondly, it aimed to identify women with high-risk pregnancies and encourage them to give birth in hospital. MWHs were built, and maintained with help from the communities, to allow those women living far away to go and stay near the hospital. With this risk approach, hospitals with a MWH (compared to hospitals without a MWH) had more women who were older than 34 years or had had more than four deliveries (Danel 2004).

In Malawi, the introduction of a MWH is thought to have contributed to the reduction of maternal mortality in the area to zero. Knowles 1988 suggests that all women should be referred to a MWH so that they can give birth in hospital.

In Nigeria, the establishment of MWHs has contributed to reducing the maternal mortality ratio in hospital from 10 per 1000 deliveries to less than one per 1000 deliveries, and the stillbirth rate from 116 per 1000 deliveries to 20 per 1000 deliveries (Stewart 1968).

In Papua New Guinea, it was observed that many complications occurred in grand multiparas. A policy of early referral of these grand multiparas to a MWH, combined with the advocacy of tubal ligation for these women after giving birth, has led to a reduction in emergency referrals by air from 25 to nine per year. Nevertheless, the authors also observed that a few stillbirths have occurred with women staying in the MWH when mothers failed to inform the nurses that their labour had started (Barss 1985).

We found nine studies that evaluated the effect of a MWH. In Zimbabwe, Chandramohan 1994 evaluated a MWH over a two-year period. This study compared the outcome of delivery in 1573 women who had stayed in the MWH to 2915 women who had not. They found that non-users were more likely to have obstructed labour (1% versus 0.06%). Non-users were also less likely to have a caesarean section (15% versus 18%). Among the non-users there were six craniotomies and four hysterectomies compared to zero amongst the MWH users (Chandramohan 1994). The authors found that only 31% of the women with high-risk pregnancies had stayed in the MWH. They concluded that the success of a MWH depends on the risk selection, but that this may implicate a high patient load for the hospital which may overstretch its resources.

In the same study population the effect on perinatal outcomes was recorded. The perinatal death rate per 1000 births was 19.1 in the users group compared to 32.2 amongst the non-users (risk ratio (RR) 1.7, 95% CI 1.1 to 2.6). In the subgroup with antenatal high-risk pregnancies, the difference was 21 compared to 43 (RR 2.1, 95% CI 1.2 to 3.6). When adjusted for other risk factors the RR was 1.9 (95% CI

CI 1.1 to 3.9). In the group with low-risk pregnancies without any antenatal risk factors, no difference in perinatal deaths was found (Chandramohan 1995). In a second study in Zimbabwe, including 854 births, the authors found no significant difference in risk status, perinatal and maternal outcomes between women who had stayed in a MWH and women who had not but came to hospital to deliver (Millard 1991). The third study in Zimbabwe, including 1053 births over a two-year period, did not find any significant difference in risk status or in pregnancy outcomes between users and non-users. In total, four maternal deaths occurred (maternal mortality ratio 380 per 100,000 live births), three among non-users and one in the users group (Tumwine 1996). In 1997, Zimbabwe had 1335 health facilities with a MWH available in 255 of these. However not all of these MWHs had a midwife to supervise the shelter, nor the means of communication with a referral unit (Feresu 2003).

In Zambia, risk selection worked well. The women in the MWH group had maternal, antenatal and intrapartum risk factors. As a consequence, more caesarean sections and vacuum extractions were performed in the MWH group compared to the non-MWH group. There was no difference in the maternal mortality ratio and perinatal death rate (van Lonkhuijzen 2003).

A study in Timor-Leste used a different study design to evaluate the effect of the introduction of a MWH. The authors compared the distances that women lived from the hospitals before and after the introduction of a MWH. They found that 80% and 62% of women giving birth in two different health facilities lived within a 5 km radius. After introduction of the MWH the proportion of women that came from further away did not change. This study also indicated that the further away the women live the lower the proportion that will deliver in hospital, illustrating the geographical barrier (Wild 2012). On the contrary, a report from Eritrea reported an 49% increase in health centre births after the introduction of a MWH. The authors, however, only very briefly described the method by which they ascertained this increase.

The largest observational study to date describes the experience in Attat hospital in Ethiopia (Kelly 2010). Outcomes for 6805 women who delivered in hospital after staying in a MWH were compared to outcomes for 17,343 women who only arrived in the hospital after labour had started. The authors found a maternal mortality ratio of 89.9 per 100,000 (95% CI 41.1 to 195.2) live births and a stillbirth rate of 17.6 per 1000 births (95% CI 14.8 to 21.0) for the waiters as compared to 1333.1 (95% CI 1156.2 to 1536.7) and 191.2 (95% CI 185.4 to 197.1) for the non-waiters. The caesarean section rate was 38.5% for waiters as compared to 20.3% for non-waiters, and none of the waiters experienced uterine rupture versus 5.8% in the non-waiters group. The authors of this study concluded that at least part of the better outcome for the waiters could be explained by the timely and appropriate obstetric management of these women. However, they also recognised that only 5% of the expected births in the area took place in the health facility.

While these studies only looked at institutional births, Spaans 1998 also included home births in his analysis of 1041 deliveries in Zimbabwe. Of these, 22% occurred at home and 78% in hospital. MWHs were used by 59% of all women. The two most frequent reasons for women delivering at home were lack of money (35%) and unsure gestational age (26%). Two women died at home due to postpartum haemorrhage and one died in hospital due to cerebral malaria. Primiparae and women with a previous caesarean section

more frequently delivered in hospital. The authors concluded that the MWH improved access to hospital care (Spaans 1998).

Current sources are limited in evaluating the effect of the use of a MWH on maternal mortality and morbidity and neonatal outcome. These available data consist of retrospective cohort studies with significant potential for bias. Women that have stayed in the MWH and that may have been referred because of risk factors are compared to women that came to the hospital for other reasons. This last population might be selected by disaster or might be women who were able to reach the hospital in time. Birth outcomes for the women who stayed at home are not known.

The conclusions of these studies should, therefore, be interpreted with caution. Evidence from randomised controlled trials at the level of the individual or at the level of a geographical area (cluster-randomised trials) would be better to assess the effect of the MWH.

OBJECTIVES

To assess the effects of a maternity waiting facility on maternal and perinatal health.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials including quasi-randomised and cluster-randomised trials.

Types of participants

All pregnant women.

Types of interventions

All types of facilities within easy reach (as defined by trial authors) of a medical facility that are designated for the lodging of pregnant women who await labour, with the purpose of the women being assisted by skilled attendants during delivery. We only included facilities in which women received at least the antenatal care that was available to all other women in the community.

Types of outcome measures

Primary outcomes

Maternal

- Maternal death
- Sepsis
- Uterine rupture
- Postpartum haemorrhage
- Prolonged or obstructed labour
- Use of antiretrovirals during labour (in HIV-positive women)

Neonatal

- Perinatal mortality
- Respiratory distress syndrome
- Neonatal infection and sepsis

Secondary outcomes

Maternal

- No skilled birth attendant at delivery
- Delivery at a healthcare facility
- Pre-eclampsia or eclampsia
- Chorioamnionitis and endometritis (as defined by trialists)
- Serious placental abruption
- Mode of birth
- Prolonged postpartum hospital stay (as defined by trialists)
- Satisfaction with care

Neonatal

- Apgar score less than seven at five minutes
- Intrauterine death
- Neonatal death
- Birthweight less than 2500 g
- Prolonged hospital stay (as defined by trialists)
- Breastfeeding not established

Search methods for identification of studies

Electronic searches

We searched the Cochrane Pregnancy and Childbirth Group's Trials Register by contacting the Trials Search Co-ordinator (27 January 2012).

The Cochrane Pregnancy and Childbirth Group's Trials Register is maintained by the Trials Search Co-ordinator and contains trials identified from:

1. quarterly searches of the Cochrane Central Register of Controlled Trials (CENTRAL);
2. weekly searches of MEDLINE;
3. weekly searches of EMBASE;
4. handsearches of 30 journals and the proceedings of major conferences;
5. weekly current awareness alerts for a further 44 journals plus monthly BioMed Central email alerts.

Details of the search strategies for CENTRAL, MEDLINE and EMBASE, the list of handsearched journals and conference proceedings, and the list of journals reviewed via the current awareness service can be found in the 'Specialized Register' section within the editorial information about the Cochrane Pregnancy and Childbirth Group.

Trials identified through the searching activities described above are each assigned to a review topic (or topics). The Trials Search Co-ordinator searches the register for each review using the topic list rather than keywords.

In addition, we searched CENTRAL (*The Cochrane Library* 2011, Issue 4 of 4), MEDLINE (1966 to January 2012), EMBASE (1980 to January 2012), CINAHL (1982 to January 2012), African Journals Online (AJOL) (January 2012), POPLINE (January 2012) and Dissertation Abstracts (January 2012).

In the previous version of this review, we also searched the National Research Register archive (March 2008).

See Appendix 1 for search strategies.

Searching other resources

We retrieved any additional relevant references referred to in papers identified through the above search strategy and assessed their suitability for inclusion in the review.

In the previous version of the review, we also contacted the librarians of the following institutions, in March 2008:

- Royal Tropical Institute, Amsterdam;
- Prince Leopold Institute of Tropical Medicine, Antwerp;
- Liverpool School of Tropical Medicine (Donald Mason Library);
- London School of Hygiene and Tropical Medicine.

We did not apply any language restrictions.

Data collection and analysis

If randomised controlled trials are identified in subsequent updates of this review, we will collect and analyse the data using the methods outlined in Appendix 2.

R E S U L T S

Description of studies

There were no randomised controlled trials or cluster-randomised trials identified from the search strategy.

Risk of bias in included studies

There were no randomised controlled trials or cluster-randomised trials identified from the search strategy.

Effects of interventions

There were no randomised controlled trials or cluster-randomised trials identified from the search strategy.

D I S C U S S I O N

There were no randomised controlled trials or cluster randomised controlled trials that evaluated outcomes for women using a maternity waiting facility in low-resource countries.

Strengths and weaknesses of the current evidence

In the Background section of the review we described findings from a range of studies examining maternity waiting facilities in terms of their acceptability to women and their effects on maternal and infant outcomes. Overall, findings were generally encouraging suggesting that waiting facilities may increase the number of women accessing hospitals or health centres for the birth (Andemichael 2009; Spaans 1998). Some studies reported improved outcomes for women, infants, or both (Chandramohan 1994; Kelly 2010; Millard 1991; Spaans 1998; Tumwine 1996), or at least no worse outcomes even for high-risk women (van Lonkhuijzen 2003). Despite these positive findings the high risk of bias in studies means that results may be difficult to interpret.

All of the retrospective cohort studies describing the effects of having waiting facilities were at high risk of selection bias. That is, women using facilities were different from those not using facilities, and such differences mean that the results may not

be valid or generalisable. Differences between women using or not using facilities may have been by design, for example where women with risk factors were specifically referred to waiting facilities, nevertheless findings may well have been confounded by other selection factors. For example, Kelly 2010 reported large differences in maternal and perinatal mortality rates favouring women using waiting facilities compared with women admitted directly in labour; however, women admitted during labour were less likely to have attended for any antenatal care (and therefore were less likely to have had antenatal risk factors detected), were younger, and more likely to be nulliparous and, most importantly, in a context where most women gave birth at home were often seeking admission because a problem had already developed. Although the effect size in this study was large, it is difficult to know how much of the decreased mortality rate is accounted for by differences between women in the two study groups rather than by attendance at the waiting facility. Wild 2012 also highlighted the possibility of selection bias; this study examined whether the introduction of waiting facilities in a rural area increased the number of women who lived in remote areas accessing health facilities for the birth (as intended) and concluded that they did not. The further women lived from healthcare facilities the less likely they were to access them. This applied just the same before and after the introduction of waiting facilities, raising the possibility that those women that seek health care for the birth are the same ones that take up waiting facilities. These women are likely to be different from those that do not.

There is a strong likelihood that as well as the opportunity to 'wait' for the birth at a location with immediate or improved access to a hospital or health centre, other aspects of care were different for women attending or not attending waiting facilities. There was considerable variability in the amenities and care available at waiting facilities. Some waiting facilities provided basic shelter, while in other cases the waiting facility was part of a broader package of care including the provision of food, education and antenatal care. Access to healthcare staff may have increased the likelihood of women reporting problems, and antenatal monitoring in the waiting facility may in turn have increased the likelihood of complications being detected and provided for in the subsequent course of antenatal and intrapartum care. In the study by Spaans 1998 comparisons were made between women giving birth at home and in hospital; in the latter group the majority of women had used waiting facilities. Women giving birth at home and in hospital are likely to have had quite different care experiences (for both antenatal and intrapartum care) irrespective of whether or not they attended waiting facilities.

The variation in waiting facilities and the populations and areas served means that results from individual studies may not be easily generalisable to other settings. Studies examining the limited uptake of facilities in some settings underlines the need to take account of local customs and practice, and the broader factors facilitating or inhibiting access. Access to waiting facilities and to health care are not only affected by geography and distance or access to affordable and efficient transport links. Women may have many factors to take into account when deciding where they spend the last weeks of their pregnancy and, indeed, where they give birth.

The fact that women who develop a serious obstetric complication need appropriate care in order to survive is clear. From the literature we reviewed it is also clear that in many places a large number of women are unable to deliver in a healthcare facility. Antenatal care attendance might be good but when labour starts many barriers may prevent women from reaching a hospital. So, building a MWH may be a solution for some but not for all women. If women manage to stay in a MWH, immediate access to emergency obstetric care, if required, should be guaranteed.

There is an urgent need for studies to provide evidence to assess the effect of a MWH on pregnancy outcomes for women and neonates in low-resource countries. This information will be best obtained from randomised controlled trials.

AUTHORS' CONCLUSIONS

Implications for practice

There is insufficient evidence upon which to base recommendations for practice.

Implications for research

The available literature describing the effect of MWHs provides limited insight into the potential benefit of these facilities. Randomised controlled trials are required to provide the most reliable evidence on the effect for improving outcomes in low-resource countries.

ACKNOWLEDGEMENTS

REFERENCES

References to studies excluded from this review

Andemichael 2009 *{published data only}*

Andemichael G, Haile B, Kosia A, Mufunda J. Maternity waiting homes: A panacea for maternal/neonatal conundrums in Eritrea. *Journal of the Eritrean Medical Association JEMA* 2009;**4**(1):18-21.

Chandramohan 1994 *{published data only}*

Chandramohan D, Cutts F, Chandra R. Effects of a maternity waiting home on adverse maternal outcomes and the validity of antenatal risk screening. *International Journal of Gynecology & Obstetrics* 1994;**46**(3):279-84.

Chandramohan 1995 *{published data only}*

Chandramohan D, Cutts F, Millard P. The effect of stay in a maternity waiting home on perinatal mortality in rural Zimbabwe. *Journal of Tropical Medicine and Hygiene* 1995;**98**(4):261-7.

Kelly 2010 *{published data only}*

Kelly K, Kohls E, Poovan P, Schiffer R, Redito A, Winter H, MacArthur C. The role of a maternity waiting area (MWA) in reducing maternal mortality and stillbirths in high-risk women in rural Ethiopia. *BJOG: an international journal of obstetrics and gynaecology* 2010;**117**(11):1377-83.

Millard 1991 *{published data only}*

Millard P, Bailey J, Hanson J. Antenatal village stay and pregnancy outcome in rural Zimbabwe. *Central African Journal of Medicine* 1991;**37**:1-4.

Spaans 1998 *{published data only}*

Spaans WA, van Roosmalen J, Van Wiechen CMAG. A maternity waiting home experience in Zimbabwe. *International Journal of Gynecology & Obstetrics* 1998;**61**(2):179-80.

Tumwine 1996 *{published data only}*

Tumwine JK, Dungare PS. Maternity waiting shelters and pregnancy outcome: experience from a rural area in Zimbabwe. *Annals of Tropical Paediatrics* 1996;**16**:55-9.

van Lonkhuijzen 2003 *{published data only}*

van Lonkhuijzen L, Stegeman M, Nyirongo R, van Roosmalen J. Use of maternity waiting home in rural Zambia. *African Journal of Reproductive Health* 2003;**7**(1):32-6.

Wild 2012 *{published data only}*

Wild K, Barclay L, Kelly P. Martins N. The tyranny of distance: maternity waiting homes and access to birthing facilities in rural Timor-Leste. *Bulletin of the World Health Organization* 2012;**90**:97-103.

Additional references

AbouZahr 1998

AbouZahr C. Improving access to quality maternal health services. *Planned Parenthood Challenges* 1998, (1):6-9.

Barss 1985

Barss P, Blackford C. Grand multiparity: benefits of a referral program for hospital delivery and postpartum tubal ligation. *Papua New Guinea Medical Journal* 1985;**28**:35-9.

Bulatao 2003

Bulatao RA, Ross JA. Which health services reduce maternal mortality? Evidence from ratings of maternal health services. *Tropical Medicine and International Health* 2003;**8**:720-1.

Cardoso 1986

Cardoso UF. Giving birth is safer now. *World Health Forum* 1986;**7**:348-52.

Danel 2004

Danel I, Rivera A. Honduras, 1990-1997. In: Koblinsky MA editor(s). Reducing Maternal Mortality. Learning from Bolivia, China, Egypt, Honduras, Indonesia, Jamaica and Zimbabwe. World Bank Publications, 2004:51-62.

Eckermann 2008

Eckermann E, Deodato G. Maternity waiting homes in Southern Lao PDR: the unique 'silk home'. *Journal of Obstetrics & Gynaecology Research* 2008;**34**(5):767-75.

Essex 1977

Essex BJ, Everett VJ. Use of an action-orientated record for antenatal screening. *Tropical Doctor* 1977;**7**:134-8.

Fawcus 1996

Fawcus S, Mbizvo M, Lindmark G, Nystrom L. A community-based investigation of avoidable factors for maternal mortality in Zimbabwe. *Studies in Family Planning* 1996;**27**(6):319-27.

Feresu 2003

Feresu S, Nyandoro M, Mumbwanda L. Zimbabwe, 1980-2000. In: Koblinsky MA editor(s). Reducing Maternal Mortality. Learning from Bolivia, China, Egypt, Honduras, Indonesia, Jamaica and Zimbabwe. World Bank Publisher, 2003:63-80.

Fraser 2008

Fraser B. Peru makes progress on maternal health. *Lancet* 2008;**371**:1233-4.

Greenwood 1987

Greenwood AM, Greenwood BM, Bradley AK, Williams K, Shenton FC, Tulloch S, et al. A prospective survey of the outcome of pregnancy in a rural area of the Gambia. *Bulletin of the World Health Organization* 1987;**65**:635-43.

Higgins 2011

Higgins JPT, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011. Available from www.cochrane-handbook.org.

Hill 2005

Hill K, AbouZhar C, Wardlaw T. Estimates of maternal mortality worldwide between 1990 and 2005: an assessment of available data. *Lancet* 2007;**370**(9595):1311-9.

Jahn 1998

Jahn A, Kowalewski M, Kimatta SS. Obstetric care in southern Tanzania: does it reach those in need?. *Tropical Medicine and International Health* 1998;**3**:926-32.

Kambarami 1999

Kambarami RA, Chirenje MZ, Rusakaniko S. Antenatal care patterns and factors associated with perinatal outcome in two rural districts in Zimbabwe. *Central African Journal of Medicine* 1999;**45**(11):294-9.

Khan 2006

Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. *Lancet* 2006;**367**:1066-74.

Knowles 1988

Knowles JK. A shelter that saves mothers' lives. *World Health Forum* 1988;**9**:387-8.

LaGuardia 1989

LaGuardia KD, Druzin ML, Eades C. Maternity shelter care for adolescents: Its effect on incidence of low birth weight. *American Journal of Obstetrics and Gynecology* 1989;**161**(2):303-6.

Larsen 1978

Larsen JV, Muller EJ. Obstetric care in a rural population. *South African Medical Journal* 1978;**54**:1137-40.

Lennox 1984

Lennox CE. Assessment of obstetric high risk factors in a developing country. *Tropical Doctor* 1984;**14**:125-9.

Mahony 1995

Mahony O, Steinberg M. Population-based survey of obstetric practices among rural women in the Bizana district, Transkei. *South African Medical Journal* 1995;**85**(11):1168-71.

Martey 1995

Martey JO, Djan JO, Twum S, Browne ENL, Opoku SA. Utilization of Maternal Health Services in Ejisu District, Ghana. *West African Journal of Medicine* 1995;**14**(1):24-8.

Mramba 2010

Mramba L, Nassir FA, Ondieki C, Kimanga D. Reasons for low utilization of a maternity waiting home in rural Kenya. *International Journal of Gynecology & Obstetrics* 2010;**108**(2):152-3.

Nhindiri 1996

Nhindiri P, Munjanja S, Zhanda I, Lindmark G, Nystrom L. A community-based study on utilisation of maternity services in rural Zimbabwe. *African Journal of Health Science* 1996;**3**(4):120-5.

Poovan 1990

Poovan P, Kifle F, Kwast BE. A maternity waiting home reduces obstetric catastrophes. *World Health Forum* 1990;**11**(4):440-6.

RevMan 2011 [Computer program]

The Nordic Cochrane Centre, The Cochrane Collaboration. Review Manager (RevMan). Version 5.1. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2011.

Sambe 1990

Sambe D. Karawa Health Zone, Zaire. In: Rooks J, Winikoff B editor(s). A Reassessment of the Concept of Reproductive Risk in Maternity Care and Family Planning Services. New York: The Population Council, 1990:72-8.

Stewart 1968

Stewart DB, Lawson JB. The organisation of obstetric services. In: Lawson JB, Stewart DB editor(s). Obstetrics and Gynaecology in the Tropics and Developing Countries. London: Edward Arnold, 1968:305-12.

Thaddeus 1994

Thaddeus S, Maine D. Too far to walk: maternal mortality in context. *Social Science and Medicine* 1994;**38**:1091-110.

Touray-Daffeh 2003

Touray-Daffeh F, Lungu K, Ashwood-Smith H, Bokosi M, Ratsma E. Perceptions, utilisation and quality of care in Maternity Waiting Huts in Southern Malawi. Safe Motherhood. Operations Research and Participatory Needs Assessments (1998-2002). Project Management Unit, 2003:20.

Van den Heuvel 1999

Van den Heuvel OA, De Mey WG, Buddingh H, Bots ML. Use of maternal care in a rural area of Zimbabwe: a population-based study. *Acta Obstetricia et Gynecologica Scandinavica* 1999;**78**(10):838-46.

Wessel 1990

Wessel L. Maternity waiting homes. Casa Materna brings care to rural women in northern Nicaragua. Maternal Mortality and Morbidity: a Call to Women for Action. Amsterdam: Women's Global Network for Reproductive Rights, 1990:40-1.

WHO 1991

World Health Organization. Essential Elements of Obstetric Care at First Referral Level. Geneva: WHO, 1991.

WHO 1994

World Health Organization. Indicators to Monitor Maternal Health Goals - Report of a Technical Working Group. Geneva: WHO, 1994.

WHO 2004

World Health Organization. Making Pregnancy Safer: the Critical Role of the Skilled Attendant: a Joint Statement by WHO, ICM and FIGO. Geneva: WHO, 2004.

Wilson 1997

Wilson JB, Collison AHK, Richardson D, Kwofie G, Senah KA, Tinkorang EK. The maternity waiting home concept: the

Nsawam, Ghana experience. The Accra PMM Team. *International Journal of Gynecology & Obstetrics* 1997;**59 Suppl 2**:S165-S172.

CHARACTERISTICS OF STUDIES

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Andemichael 2009	Hospital-based before and after study comparing number of deliveries in a health facility before and after introduction of a MWH.
Chandramohan 1994	Hospital-based cohort study comparing maternal outcomes for women admitted to the MWH and women delivering in hospital after self referral or referral by a traditional birth attendant.
Chandramohan 1995	Hospital-based cohort study comparing perinatal outcomes for women staying in the MWH and women who presented after onset of labour.
Kelly 2010	Hospital-based cohort study comparing maternal and perinatal outcomes for women staying in the MWH and women who presented after onset of labour.
Millard 1991	Hospital-based cohort study comparing pregnancy outcome for women staying in a MWH and women admitted directly from the community.
Spaans 1998	Community-based cohort study describing outcomes for women who gave birth at home, in hospital, or in hospital after having stayed in a MWH.
Tumwine 1996	Hospital-based cohort study comparing risk factors and pregnancy outcomes for women staying in a MWH and women who gave birth in hospital without staying in the MWH.
van Lonkhuijzen 2003	Hospital-based cohort study comparing risk factors and pregnancy outcomes for women staying in a MWH and women who gave birth in hospital without staying in the MWH.
Wild 2012	Hospital-based before and after study comparing the distance women travelled when giving birth in hospital before and after introduction of a MWH.

MWH: maternity waiting home

APPENDICES

Appendix 1. Search strategies

CENTRAL (*The Cochrane Library* 2011, Issue 4 of 4):
(waiting next facilit* or waiting next home* or hut* or shelter*) near (antenatal* or prenatal* or pregnan* or mother* or matern* or birth* or childbirth).

MEDLINE (1966 to January 2012)**, EMBASE** (1980 to January 2012) and **CINAHL** (1982 to January 2012):
We adapted the CENTRAL search strategy by changing the truncation symbol and proximity operator.

African Journals Online (AJOL) (January 2012):
(maternity OR maternal OR pregnant OR pregnancy OR birth OR childbirth OR antenatal OR antenatally OR prenatal OR prenatally) AND (waiting OR shelter OR shelters OR hut OR huts).

POPLINE (January 2012):
(maternity OR maternal OR pregnant OR pregnancy OR birth OR childbirth OR antenatal OR antenatally OR prenatal OR prenatally) AND (waiting OR shelter OR shelters OR hut OR huts).

Dissertation Abstracts (January 2012) **and The National Research Register Archive** (March 2008):

We used similar terms as for searches listed above, adapted for each of the databases.

Appendix 2. Data collection and analysis methods for subsequent updates of this review

Selection of studies

Two review authors will independently assess for inclusion all the potential studies we identify as a result of the search strategy. We will resolve any disagreement through discussion or, if required, we will consult a third person.

Data extraction and management

We will design a form to extract data. For eligible studies, at least two review authors will extract the data using the agreed form. We will resolve discrepancies through discussion or, if required, we will consult a third person. Data will be entered into Review Manager software (RevMan 2011) and checked for accuracy.

When information regarding any of the above is unclear, we will attempt to contact authors of the original reports to provide further details.

Assessment of risk of bias in included studies

Two review authors will independently assess risk of bias for each study using the criteria outlined in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2011). Any disagreement will be resolved by discussion or by involving a third assessor.

(1) Sequence generation (checking for possible selection bias)

We will describe for each included study the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups.

We will assess the method as:

- low risk of bias (any truly random process e.g. random number table; computer random number generator);
- high risk of bias (any non random process e.g. odd or even date of birth; hospital or clinic record number);
- unclear risk of bias.

(2) Allocation concealment (checking for possible selection bias)

We will describe for each included study the method used to conceal the allocation sequence in sufficient detail and determine whether intervention allocation could have been foreseen in advance of, or during recruitment, or changed after assignment.

We will assess the methods as:

- low risk of bias (e.g. telephone or central randomisation; consecutively numbered sealed opaque envelopes);
- high risk of bias (open random allocation; unsealed or non-opaque envelopes, alternation; date of birth);
- unclear risk of bias.

(3) Blinding (checking for possible performance bias)

We will describe for each included study the methods used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Studies will be judged at low risk of bias if they were blinded, or if we judge that the lack of blinding could not have affected the results. Blinding will be assessed separately for different outcomes or classes of outcomes.

We will assess the methods as:

- low, high or unclear risk of bias for participants;
- low, high or unclear risk of bias for personnel;
- for outcome assessors.low, high or unclear risk of bias.

(4) Incomplete outcome data (checking for possible attrition bias through withdrawals, dropouts, protocol deviations)

We will describe for each included study, and for each outcome or class of outcomes, the completeness of data including attrition and exclusions from the analysis. We will state whether attrition and exclusions were reported, the numbers included in the analysis at each stage (compared with the total randomised participants), reasons for attrition or exclusion where reported, and whether missing data were balanced across groups or were related to outcomes. Where sufficient information is reported, or can be supplied by the trial authors, we will re-include missing data in the analyses which we undertake. We will assess methods as:

- low risk of bias (less than 20% of data are missing);
- high risk of bias (more than 20% of data are missing);
- unclear risk of bias.

(5) Selective reporting bias

We will describe for each included study how we investigated the possibility of selective outcome reporting bias and what we found.

We will assess the methods as:

- low risk of bias (where it is clear that all of the study's prespecified outcomes and all expected outcomes of interest to the review have been reported);
- high risk of bias (where not all the study's prespecified outcomes have been reported; one or more reported primary outcomes were not prespecified; outcomes of interest are reported incompletely and so cannot be used; study fails to include results of a key outcome that would have been expected to have been reported);
- unclear risk of bias.

(6) Other sources of bias

We will describe for each included study any important concerns we have about other possible sources of bias.

We will assess whether each study was free of other problems that could put it at risk of bias:

- low risk of other bias;
- high risk of other bias;
- unclear risk of other bias.

(7) Overall risk of bias

We will make explicit judgements about whether studies are at high risk of bias, according to the criteria given in the Handbook (Higgins 2011). With reference to (1) to (6) above, we will assess the likely magnitude and direction of the bias and whether we consider it is likely to impact on the findings. We will explore the impact of the level of bias through undertaking sensitivity analyses - *see* 'Sensitivity analysis'.

Measures of treatment effect

Dichotomous data

For dichotomous data, we will present results as summary risk ratio with 95% confidence intervals.

Continuous data

For continuous data, we will use the mean difference if outcomes are measured in the same way between trials. We will use the standardised mean difference to combine trials that measure the same outcome, but use different methods.

Unit of analysis issues

Cluster-randomised trials

We will include cluster-randomised trials in the analyses along with individually randomised trials. We will adjust their sample sizes using the methods described in Higgins 2011, using an estimate of the intracluster correlation co-efficient (ICC) derived from the trial (if possible), or from another source. If ICCs from other sources are used, we will report this, and conduct sensitivity analyses to investigate the effect of variation in the ICC. If we identify both cluster-randomised trials and individually randomised trials, we plan to synthesise the relevant information. We will consider it reasonable to combine the results from both if there is little heterogeneity between the study designs and the interaction between the effect of intervention and the choice of randomisation unit is considered to be unlikely.

We will include cluster-randomised trials for which the unit of allocation is a health facility or geographical area.

We will also acknowledge heterogeneity in the randomisation unit and perform a separate meta-analysis. Therefore the meta-analysis will be performed in two parts as well.

Dealing with missing data

For included studies, levels of attrition will be noted. The impact of including studies with high levels of missing data in the overall assessment of treatment effect will be explored by using sensitivity analysis.

For all outcomes analyses will be carried out, as far as possible, on an intention-to-treat basis, that is we will attempt to include all participants randomised to each group in the analyses. The denominator for each outcome in each trial will be the number randomised minus any participants whose outcomes are known to be missing.

Assessment of heterogeneity

We will use the I^2 statistic to measure heterogeneity among the trials in each analysis. If we identify substantial heterogeneity ($I^2 > 50\%$) we will explore it by prespecified subgroup analysis and perform sensitivity analysis. A random-effects meta-analysis will be used as an overall summary if this is considered appropriate.

Assessment of reporting biases

Where we suspect reporting bias (*see* selective reporting bias above), we will attempt to contact study authors asking them to provide missing outcome data. Where this is not possible, and the missing data are thought to introduce serious bias, the impact of including such studies in the overall assessment of results will be explored by a sensitivity analysis**.**

Data synthesis

We will carry out statistical analysis using the Review Manager software (RevMan 2011). We will use fixed-effect inverse variance meta-analysis for combining data where trials are examining the same intervention, and the trials' populations and methods are judged sufficiently similar. Where we suspect clinical or methodological heterogeneity between studies sufficient to suggest that treatment effects may differ between trials we will use random-effects meta-analysis.

If substantial heterogeneity is identified in a fixed effect meta-analysis this will be noted and the analysis repeated using a random-effects method provided that an average treatment effect is clinically meaningful.

Subgroup analysis and investigation of heterogeneity

For fixed-effect and random-effects model meta-analyses we will conduct planned subgroup analyses classifying whole trials by interaction tests available in RevMan 2011. We will carry out subgroup analysis for primary outcomes only.

Sensitivity analysis

We will carry out sensitivity analysis to explore the effect of trial quality. This will involve analysis based ratings of selection bias and attrition bias. We will exclude studies of poor quality in the analysis in order to assess for any substantive difference to the overall result. Or, we will carry out sensitivity analysis to explore the effect of trial quality assessed by concealment of allocation, by excluding studies with clearly inadequate allocation of concealment.

W H A T ' S   N E W

Date	Event	Description
10 February 2012	New search has been performed	Search updated. We did not identify any trials for inclusion.
		We identified three papers describing the outcome of the introduction of a maternity waiting home (Andemichael 2009; Kelly 2010; Wild 2012) (*see* Characteristics of excluded studies) and updated the Background with details of a paper that describes reasons for low utilisation (Mramba 2010).
10 February 2012	New citation required but conclusions have not changed	This review has been updated. The conclusions have not changed.

C O N T R I B U T I O N S   O F   A U T H O R S

All authors participated in the writing of the protocol. LvL conducted the searches, LvL and JS reviewed the literature identified by the search, LvL wrote the first draft of the review, all authors contributed to writing the final document.

For this update: LvL updated the searches and identified new papers. LvL amended the introduction and added papers to the excluded papers table. LvL, JS and JvR all read the final document and agree with all amendments.

D E C L A R A T I O N S   O F   I N T E R E S T

None known.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- National Institute for Health Research, UKNIHR, UK.

  Programme of centrally-managed pregnancy and childbirth systematic reviews of priority to the NHS and users of the NHS: 10/4001/02

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The latest Cochrane Pregnancy and Childbirth Group methods have been incorporated into this review (Appendix 2).

INDEX TERMS

Medical Subject Headings (MeSH)

*Developing Countries; Maternal-Child Health Centers [*standards] [*statistics & numerical data]; Pregnancy Outcome

MeSH check words

Female; Humans; Infant, Newborn; Pregnancy