

Misoprostol for Prevention of Postpartum Hemorrhage at Home Birth in Afghanistan: Program Expansion Experience

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Introduction: Afghanistan has a maternal mortality ratio of 400 per 100,000 live births. Hemorrhage is the leading cause of maternal death. Two-thirds of births occur at home. A pilot program conducted from 2005 to 2007 demonstrated the effectiveness of using community health workers for advance distribution of misoprostol to pregnant women for self-administration immediately following birth to prevent postpartum hemorrhage. The Ministry of Public Health requested an expansion of the pilot to study implementation on a larger scale before adopting the intervention as national policy. The purpose of this before-and-after study was to determine the effectiveness of advance distribution of misoprostol for self-administration across 20 districts in Afghanistan and identify any adverse events that occurred during expansion.

Methods: Cross-sectional household surveys were conducted pre- (n = 408) and postintervention (n = 408) to assess the effect of the program on uterotonic use among women who had recently given birth. Maternal death audits and verbal autopsies were conducted to investigate peripartum maternal deaths that occurred during implementation in the 20 districts.

Results: Uterotonic use among women in the sample increased from 50.3% preintervention to 74.3% postintervention. Because of a large-scale investment in Afghanistan in training and deployment of community midwives, it was assumed that all women who gave birth in facilities received a uterotonic. A significant difference in uterotonic use at home births was observed among women who lived farthest from a health facility (> 90 minutes self-reported travel time) compared to women who lived closer (88.5% vs 38.9%; $P < .0001$). All women who accepted misoprostol and gave birth at home used the drug. No maternal deaths were identified among those women who used misoprostol.

Discussion: The results of this study build on the findings of the pilot program and provide evidence on the effectiveness, primarily measured by uterotonic use, of an expansion of advance distribution of misoprostol for self-administration.

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INTRODUCTION

Globally, one woman dies every 7 minutes from postpartum hemorrhage (PPH),¹ which is often attributable to uterine atony.² The World Health Organization recommends that women be provided with uterotonics, ideally oxytocin, during the third stage of labor.³ Unless a disposable prefilled single-use syringe (eg, Uniject) is available, oxytocin requires a skilled birth attendant (SBA) for administration and cold-chain storage, which is challenging in settings with staff shortages, inadequate infrastructure, or a high number of home births. When providing oxytocin is not possible, misoprostol (Cytotec) can be administered by less skilled health personnel, including community health workers (CHWs).³ Randomized controlled trials have demonstrated the efficacy of misoprostol for PPH prevention,⁴ and a review of 18 programs found high rates of use when CHWs distributed misoprostol to women late in pregnancy or at the time of birth.⁵

In Afghanistan, where two-thirds of births occur at home,⁶ the maternal mortality ratio is 400 per 100,000 live births⁷ and hemorrhage is the leading cause of maternal death.⁸ Misoprostol was not included on the National

Essential Medicines List for use in special programs until 2007. At this time, the Ministry of Public Health (MoPH) approved it for a 2005 to 2007 pilot study to validate the safety, acceptability, feasibility, and effectiveness of using CHWs for distribution of misoprostol to women at 8 months' gestation for self-administration immediately following a home birth. Results showed 92% uterotonic use in the 3 district intervention area, versus 25% in the control area; there were no cases of consumption before birth.⁹

In 2010, the MoPH requested that the United States Agency for International Development-funded Health Services Support Project expand the intervention to confirm program effectiveness, including identification of adverse events, before incorporating it into national policy. This article describes the implementation and evaluation of the expansion project.

METHODS

Ethical Considerations

We obtained approvals to conduct the study from the institutional review boards of the Afghanistan Public Health Institute within the MoPH and Johns Hopkins Bloomberg School of Public Health.

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Quick Points

- ◆ A program model using advance distribution of misoprostol to pregnant women for self-administration at home births in Afghanistan resulted in an increase in uterotonic coverage among women in the sample from 50.3% preintervention to 74.3% postintervention.
- ◆ The program included a 3-tiered approach: 1) household services: community health workers visited households in their catchment area to counsel pregnant women and their families and to provide advance distribution of misoprostol for self-administration to pregnant women; 2) community sensitization: community health councils (*shuras*) were engaged to raise awareness of misoprostol for prevention of postpartum hemorrhage; and 3) health facility intrapartum services: skilled birth attendants were supported to provide clean and safe childbirth services.
- ◆ Misoprostol for prevention of postpartum hemorrhage has the potential to reach rural populations; this study found a significant difference in distance to a health facility for women who gave birth at a facility and those who gave birth at home and used misoprostol.
- ◆ Maternal death audits and verbal autopsies confirmed that, among the maternal deaths in the 5 provinces where the program was implemented, none were among women who had accepted or used misoprostol.

Design

This study used a before-and-after design without a control group. Cross-sectional household surveys were conducted pre- and postexpansion to assess the effect of advance distribution for self-administration on uterotonic use. Verbal autopsies or maternal death audits were conducted to investigate deaths of pregnant women or women who had recently given birth that occurred during the study period.

Study Setting

The study was implemented in 20 districts (the 5 pilot districts and 15 additional districts) across 5 provinces (Faryab, Jawzjan, Kabul, Badakhshan, and Bamyan). Districts were selected based on 1) existence of a CHW network implementing the country's Basic Package of Health Services,¹⁰ 2) high number of home births, and 3) accessibility of health facilities.

Description of Intervention

The intervention, which was tested in the pilot, consisted of a 3-tiered approach: 1) household services: CHWs visited households to counsel pregnant women on birth preparedness and complication readiness, promote SBAs, explain the purpose and correct use of misoprostol, and distribute a package containing 3 tablets of 200 mcg misoprostol in advance for self-administration; 2) community sensitization: community health councils were engaged to raise awareness of misoprostol for PPH prevention; and 3) health facility intrapartum services: SBAs were supported to provide clean and safe childbirth services, including active management of the third stage of labor.

To support expansion, the implementation model was refined to: 1) strengthen capacity of CHWs, SBAs, and supervisors to counsel pregnant women, provide misoprostol for self-administration, monitor implementation, and collect and analyze data; 2) update counseling materials; 3) simplify monitoring mechanisms; 4) build capacity of SBAs to prevent and manage PPH through refresher training and a quality

assurance process; and 5) strengthen MoPH stewardship to oversee implementation and review data for decision-making purposes. Program monitoring data between January 2011 and April 2012 indicated that 7399 women received counseling and misoprostol in the 20 intervention districts.¹¹

Sampling

A 2-stage stratified random sampling strategy was used to select participants (women who had given birth within 6 months) for the pre- and postintervention cross-sectional household surveys. A sample size of 408 participants was selected to detect a 5.7% change in uterotonic use ($\alpha = .05$, power = 0.8, design effect = 1.5, response rate = 90%). Five of the 20 districts were randomly selected using a sampling proportionate to size approach, and 24 villages were selected within each district using systematic random selection. Surveyors went door-to-door to identify eligible women. Oral informed consent to participate was obtained from all respondents. To investigate potential adverse events associated with advance distribution of misoprostol, all peripartum maternal deaths identified by health workers in the 20 districts were investigated using verbal autopsy or maternal death audit methods.

Data Collection

Surveys

Sixteen data collectors were trained on survey tools, interview techniques, ethical considerations, and data quality assurance processes. The intervention was implemented between January 2011 and April 2012. Data were collected in November and December of 2010 (preintervention baseline data) and March and April of 2012 (postintervention endline data) using a structured questionnaire that was translated into Dari using a forward translation methodology.¹² Four supervisors, all physicians with extensive experience in conducting research, oversaw the process.

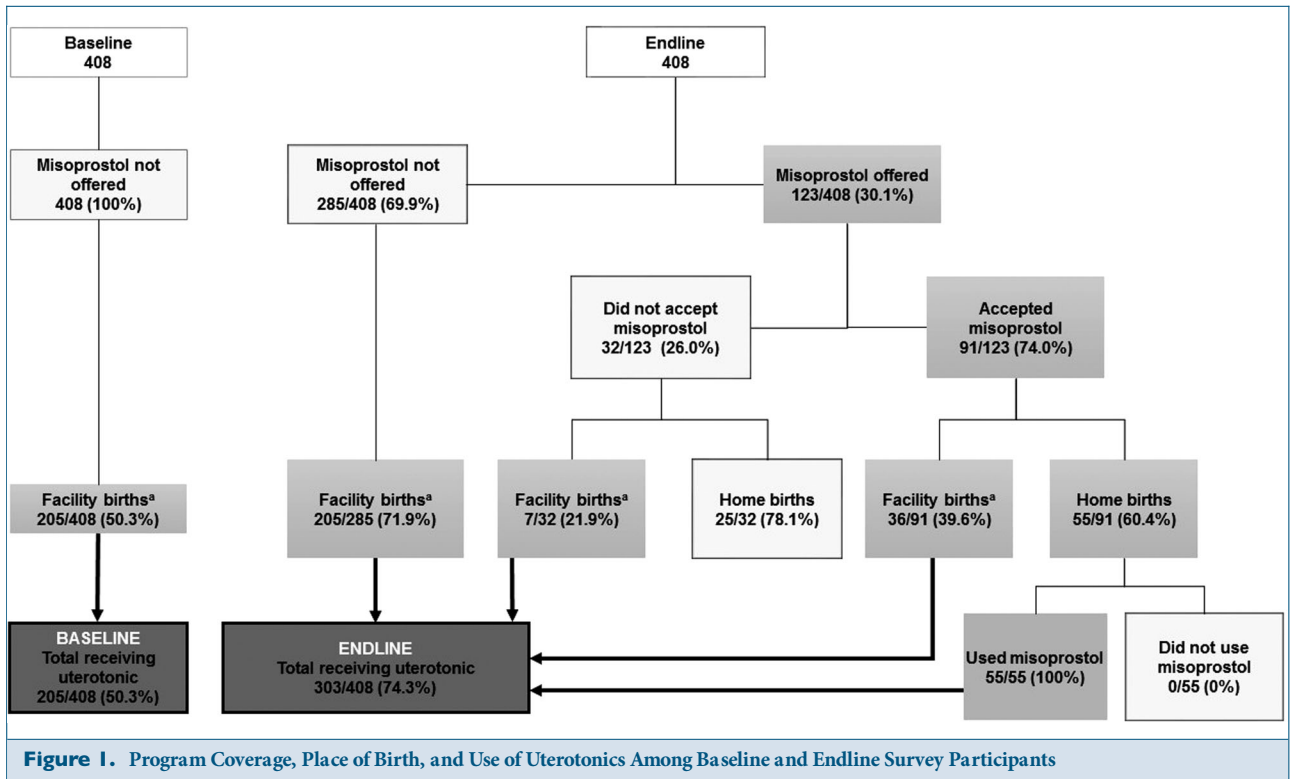


Figure 1. Program Coverage, Place of Birth, and Use of Uterotonics Among Baseline and Endline Survey Participants

^aUterotonic use is assumed for all health facility births.

Verbal Autopsy and Maternal Death Audits

Training on verbal autopsy and maternal death audit methods was conducted for 19 study personnel, obstetrician-gynecologists from Kabul hospitals, and members of the Afghanistan Society of Obstetricians and Gynecologists. Verbal autopsies and maternal death audits were conducted as soon as possible after a death was reported during the implementation period.

When CHWs identified a peripartum maternal death in the community, study personnel, in coordination with community health supervisors, interviewed persons knowledgeable about events leading to the death using the 2007 World Health Organization verbal autopsy questionnaire^{13,14} adapted for Afghanistan.

When maternal deaths were reported at health facilities, study personnel reviewed patient records and conducted interviews with providers who attended the deceased using standardized maternal death audit forms.

Verbal autopsies and audits were audio-recorded. Once completed, verbal autopsy, audit forms, and recordings were independently reviewed by 2 of the obstetricians trained in review and coding. A death was deemed pregnancy-related if the 2 obstetricians agreed on the primary cause. Information on the cause of each maternal death identified was entered in a database maintained by the study team.

Analytical Methods

Survey data were analyzed as descriptive statistics, including frequencies and cross tabulations, using STATA, version 11 (StataCorp LP, College Station, TX). Verbal autopsy and

maternal death audit results were tabulated using Microsoft Excel 2010 (Microsoft Corporation, Redmond, WA).

RESULTS

Surveys

A total of 816 women who had recently given birth were interviewed in the sample area, including 408 women preintervention to establish a baseline and another 408 women postintervention for the endline survey (Figure 1). Among endline participants, 84.3% had a CHW in their community (Table 1).

Endline data showed that 30.1% of respondents were offered misoprostol by a CHW, and 74.0% of these accepted (22% of all respondents). Of those who accepted and gave birth at home, 100% used misoprostol. A total of 21.9% of women, who were offered but did not accept misoprostol, gave birth in a facility, where uterotonics are available. Uterotonic use increased from 50.3% at baseline to 74.3% at endline. Endline use included 60.8% of the study population who gave birth in a facility and 13.5% who used misoprostol at a home birth. Among women who were offered and accepted misoprostol, 39.6% gave birth in a facility and 60.4% at home.

There was a significant difference in distance to a health facility for women who gave birth at a facility and those who gave birth at home and used misoprostol. Only 38.9% of women who lived within 30 minutes of a facility gave birth at home and used misoprostol, compared with 88.5% of women who lived more than 90 minutes from a facility, gave birth at home, and used misoprostol ($P = .001$) (Table 2).

Table 1. Health Service Access and Involvement for Baseline and Endline Study Population

| Characteristics | Baseline | Endline | P |
|--|----------------------|------------|--------|
| | (N = 408) | (N = 408) | |
| | n (%) | n (%) | |
| Community health worker in community^a | (Data not collected) | 344 (84.3) | N/A |
| Received information on PPH^b | 239 (58.7) | 293 (72.0) | <.0001 |
| Support persons who received information about PPH^c (multiple-responses allowed) | | | |
| Husband | 54 (13.4) | 124 (30.7) | <.0001 |
| Mother-in-law | 54 (13.4) | 143 (35.4) | <.0001 |
| Mother | 34 (8.4) | 144 (35.6) | <.0001 |
| Source of information on PPH^d (multiple responses allowed) | | | |
| Midwife | 185 (77.4) | 201 (68.1) | .017 |
| Community health worker/community health supervisors | 50 (20.9) | 144 (48.8) | <.0001 |
| Friends/relatives | 39 (16.3) | 14 (4.8) | <.0001 |
| Traditional birth attendant (<i>dai</i>) | 14 (5.9) | 12 (4.1) | .339 |
| Basic health center | 9 (3.8) | 2 (0.7) | .012 |
| Comprehensive health center or hospital | 10 (4.2) | 3 (1.0) | .018 |
| Poster | 2 (0.8) | 34 (11.5) | <.0001 |
| Place of Birth^e | | | |
| Home | 203 (49.8) | 160 (39.2) | .002 |
| Facility | 205 (50.2) | 248 (60.8) | |
| Support person present at birth^f (multiple responses allowed) | | | |
| None | 4 (1.8) | 1 (0.2) | .032 |
| Husband | 86 (42.2) | 99 (62.8) | <.0001 |
| Mother | 87 (42.7) | 74 (47.1) | .217 |
| Mother-in-law | 113 (55.2) | 95 (60.2) | .155 |
| Sister | 30 (14.6) | 25 (15.7) | .662 |
| Sister-in-law | 38 (18.4) | 41 (26.1) | .010 |

^aEndline denominator = 408.

^bBaseline denominator = 407, endline denominator = 407.

^cBaseline denominator = 403, endline denominator = 404.

^dBaseline denominator = 239, endline denominator = 295.

^eBaseline denominator = 408, endline denominator = 408.

^fBaseline denominator = 204, endline denominator = 158.

The proportion of women who had recently given birth and received information on PPH increased significantly from 58.7% to 72.0% ($P < .0001$) (Table 1). The primary source of information on PPH was the midwife, followed by the CHW. While this was consistent in baseline and endline surveys, the proportion who reported CHW as the primary source increased from 20.9% to 48.8% ($P < .0001$). The proportion who reported friends or relatives as the primary information source decreased from 16.3% to 4.8% ($P < .0001$) (Table 1).

Recall of information about misoprostol was near universal. Among those who recalled information on misoprostol, 99.3% recalled at least one of 3 messages, and 88.6% recalled all 3 (Table 3). Among those who gave birth at home, only one person reported taking fewer than 3 tablets, and one person reported taking misoprostol before the birth of the newborn.

Verbal Autopsies and Maternal Death Audits

Twenty-two maternal deaths were identified, and of these cases, only one was in a catchment area covered by a CHW

Table 2. Birth Location and Uterotonic Use and Antenatal Care Visits by Women Who Were Offered and Accepted Misoprostol From a Community Health Worker

| | Total (N = 91) | Home | | P |
|--|-------------------|---------------------------------|----------------------------|------|
| | | Facility Births ^a | Births/Used Misoprostol | |
| By Time to Facility | | | | |
| <30 min | 37 | 61.1% | 38.9% | .001 |
| 30-89 min | 27 | 47.8% | 52.2% | |
| >90 min | 26 | 11.5% | 88.5% | |
| Number of Antenatal Care Visits | | | | |
| 0 | 0 | 0.0% | 0.0% | |
| 1-2 | 18 | 38.9% | 61.1% | .932 |
| 3 or more | 70 | 40.0% | 60.0% | |
| Don't know or missing | 3 | — | — | |

^aUterotonic use is assumed for all births at health facilities.

Table 3. Recall of Misoprostol Messages and Number of and Timing of Misoprostol Tablets Taken

| Of Those Who Recalled Information on Misoprostol (n = 137) | |
|--|------------|
| | n (%) |
| Recalled 1 of 3 messages | 136 (99.3) |
| Recalled 2 of 3 messages | 134 (97.8) |
| Recalled all 3 messages | 121 (88.6) |
| Number of tablets ^a taken among acceptors with home births (n = 55) | |
| 1 | 1 (1.8) |
| 2 | 0 (0.0) |
| 3 | 49 (89.1) |
| >3 | 3 (5.5) |
| Don't know or missing | 2 (3.6) |
| When taken among acceptors with home births (n = 55) | |
| During labor, but before birth of the newborn | 1 (1.8) |
| After birth of newborn, but before placenta was expelled | 51 (92.7) |
| After placenta was expelled | 2 (3.6) |
| Don't know or missing | 1 (1.8) |

^aDispensed packages contained 3 tablets.

with a maternal death audit; and 5 were not investigated because of geographic barriers. Of the 16 deaths that were investigated, 75% (n = 12) were attributed to PPH, with the others attributable to preeclampsia/eclampsia (n = 2), complications resulting from placental retention (n = 1), and an unknown cause (n = 1). None of the women who had died from maternal causes had accepted or had taken misoprostol.

DISCUSSION

This study builds on findings of a pilot and demonstrates the effectiveness and safety of the expansion of a program for advance distribution of misoprostol for self-administration in Afghanistan to prevent PPH. Uterotonic use increased from 50.3% preintervention to 74.3% postintervention because of the comprehensive approach that consisted of use of misoprostol for home births and oxytocin for births at health facilities. Uterotonic use was considerably higher than the national estimate for institutional births (32%),⁶ suggesting that misoprostol can help to address coverage gaps for noninstitutional births. While the pilot achieved 92% uterotonic use, use in the expansion program was 74.3%, which was surprising, as higher uterotonic use was expected. However, the results are consistent with other experiences, suggesting that efforts to expand programs are likely to encounter implementation challenges.^{15,16}

A higher proportion of women who gave birth at home and used misoprostol lived farther from the health facility (> 90 minutes). Women who live closer tend to use the facility: 61% of women who live within 30 minutes of a facility gave birth there versus only 11.5% of women who lived more than 90 minutes away. The results show that the intervention was effective in providing uterotonic coverage to those living

in remote households. A program in Nepal also found that a misoprostol intervention was effective in reaching the disadvantaged, including those living in more remote areas.¹⁷ Afghanistan has disparities in service utilization between rural and urban populations; the results of this study suggest that advanced distribution of misoprostol is an equitable intervention that can reduce disparities in access to uterotonics.

A high proportion of women reported use of the correct number of misoprostol tablets, correct timing, and recall of misoprostol messages. While it is concerning that one woman in the study reported taking misoprostol before the birth of her newborn, this was the only case documented among the 7399 women reached by the intervention (program monitoring data, not shown). Death investigations found no maternal deaths attributable to misoprostol. In communities without CHWs, no women reported use of misoprostol, which suggests there was no drug leakage out of implementation areas. These results collectively indicate that misoprostol can be safely used for prevention of PPH, and CHWs are an appropriate distribution mechanism.

The global discussion around advanced distribution of misoprostol includes adverse events from misuse.^{18,19} Of 22 maternal deaths identified, one was identified in an area reached by the intervention. In this case, the woman was not administered misoprostol. Of the 16 maternal deaths investigated, findings revealed no association between cause of death and use of misoprostol.

There are also concerns about the potential for misoprostol to deter women from seeking facility-based labor and birth care. However, our findings showed an increase in the proportion of women who gave birth in a facility after the intervention. The MoPH has undertaken a large-scale effort to expand the number of community midwives²⁰; therefore, we do not attribute the increase in facility-based births to the misoprostol intervention alone. Nevertheless, the intervention did not dissuade women from receiving skilled birth attendance, which is in line with what other programs have also demonstrated.^{8,16,21}

Our experience with program expansion can inform maternal health strategies in Afghanistan. Despite considerable progress in increasing skilled birth attendance, there are still disparities between urban and rural areas.⁶ Advance distribution of misoprostol can provide a lifesaving intervention to the two-thirds of pregnant women in Afghanistan who are not giving birth in a facility. Based on the results of the expansion program, the MoPH continued to list misoprostol for PPH prevention as a special drug on the 2014 National Essential Medicines List and highlighted expansion of the program as a priority in the 2012-2016 Reproductive Health Strategy as part of a comprehensive PPH prevention program.²²

Other policy-level considerations will be needed to provide an enabling environment for even further expansion. Building on the policy changes, we suggest that advance distribution of misoprostol to prevent PPH in home births be integrated within the Basic Package of Health Services, with close monitoring to identify any concerns with CHW workload. In addition, while the MoPH is training additional numbers of CHWs, an alternative or complementary strategy will be needed to reach women living in remote areas without access to existing health services. A recent study in

Ethiopia found that the utilization of multiple mechanisms for distribution of misoprostol helped increase its use.²³

There were several limitations in our study. First, because implementation districts were purposively selected, the results may not be generalizable to areas of the country with limited CHW presence and access to health services. Second, although this was the only program authorized to distribute misoprostol for prevention of PPH, the increase of uterotonic use that we observed may not be entirely attributable to the intervention described in this article, given the MoPH and international development partner investment in improving health services. Additionally, by assuming that all facility births received oxytocin, there may be an overestimation of actual uterotonic use; however, this does not undermine the importance of our primary findings related to the program effectiveness of advance distribution of misoprostol. Since misoprostol use was tracked separately from facility-based births, we can draw conclusions about program effectiveness. Third, this study used the same standard items as other studies for measuring the reported use of misoprostol (eg, self-report by women who had recently given birth) and oxytocin (eg, self-report of facility-based birth).^{17,21} Finally, this study's findings are based on women's recollection of their births, which may be subject to recall bias.

CONCLUSION

In Afghanistan, the expansion of advance distribution of misoprostol for self-administration as part of a comprehensive approach to prevent PPH resulted in higher uterotonic use. Based on the results of this study, the MoPH committed to future expansion of the program to prevent PPH. It is our hope that development and implementation of a national strategy for counseling on prevention of PPH and expansion of advance distribution of misoprostol for self-administration in home births will lead to the increased use of uterotonics, both in facilities and in home-based births, and a decrease in the maternal mortality ratio in Afghanistan.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

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