

Menstrual regulation, other methods of voluntary pregnancy termination, and maternal mortality in Matlab, Bangladesh

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Background

Although maternal mortality rates in developing countries have declined in recent years, they remain unacceptably high [1], and achieving the Millennium Development Goal of reducing maternal mortality by three quarters between 1990 and 2015 remains a challenge. Bangladesh has achieved a relatively moderate level of maternal mortality considering its unfavorable socioeconomic conditions, poorly managed health infrastructure, and low rates of institutionalized deliveries [1, 2, 3]. It is believed that such a decline has been possible for two major reproductive health-related reasons: (1) rapid fertility decline and (2) the availability of menstrual regulation (MR), a relatively safe method for voluntary pregnancy termination (VPT). In this article, we examine the case-fatality rates associated with MR, other methods of VPT (OVPT), and live birth (LB). We use longitudinal data on 121,464 pregnancy outcomes and any subsequent maternal deaths during the period 1989-2008 (excluding 2001) from the Matlab Demographic Surveillance System (DSS).

Induced abortion is legal in Bangladesh when practiced to save women's lives in the early stages of pregnancy. Uterine evacuation, called menstrual regulation (MR), is permitted within ten weeks of a woman's last menstrual period using manual or electric vacuum aspiration before pregnancy is clinically confirmed. MR is available from trained female paramedics at the government and private health centers in both urban and rural areas. Husband's consent is not legally required prior to the procedure, but many providers ask for it. MR is not treated as abortion in Bangladesh, and for this reason in this paper we use the term "voluntary pregnancy termination (VPT)" to refer to a pregnancy that is voluntarily terminated.

Each pregnancy puts a woman's health at risk, including the risk of mortality. In Bangladesh maternal mortality varies by type of pregnancy outcome, being lowest for women

with LBs and highest for women with stillbirths, with miscarriages and induced abortion (not distinguished by type of method) in between [4]. The mortality risk associated with VPT is expected to differ considerably by method of VPT. It has been estimated that, worldwide, the case-fatality rate associated with unsafe abortion (220 per 100,000 procedures) is around 350 times higher than that for legal abortion in the United States [5]. Mortality risk associated with VPTs performed by trained practitioners in hygienic institutional settings should be lower than that associated a LB because a pregnancy going full term and childbirth per se may pose greater health risks than a pregnancy terminated within a short duration. In the U.S., less than one woman died among each 100,000 women who had legal induced abortions [6, 7], compared to 12 maternal deaths per 100,000 LBs [1]. However, in Bangladesh, MR is done in settings (health facilities or providers' homes) that, especially in rural areas, may not be as "safe" as sometimes presumed. In 1996, it was estimated that about 25% of hospitalized cases of complications from VPT in Bangladesh were for MR cases [8]

Study Area

Matlab, a rural sub-district of Bangladesh, is well known for its DSS as well as its MCH-FP project, which operates in half of the DSS area to provide intensive and quality family planning (FP) and MCH services [9, 10, 11]. The other half, known as Comparison Area, is typical of much of Bangladesh in contraceptive use [12], fertility and childhood mortality [13], and maternal mortality [2]. The MCH-FP Area has lower rates of fertility [14], VPT [15], and maternal mortality [4, 16] and greater coverage of antenatal care and better access to basic and emergency obstetric care [14, 16] than the Comparison Area.

Most deliveries in Matlab take place at home attended by traditional birth attendants, although, institutional deliveries have increased remarkably in the MCH-FP Area in recent years. In the early 1990s only a few births were delivered in health facilities; by 2008 the percentage had increased to 66% [14]. In contrast, only 18% of deliveries in the Comparison Area took place in health facilities in 2008 [14].

Both areas of Matlab have access to Chandpur government district hospital and some private clinics that provide emergency and intensive services, including caesarian section and blood transfusion. However, about half of the villages of both areas are more remote, and their residents have less access to transportation to Chandpur.

Since 1977, the Matlab MCH-FP Area has received a series of carefully designed reproductive health (RH) interventions that may directly and indirectly impact maternal health and mortality. Between 1978 and 2001, female community health workers (CHWs) provided injectable contraceptives, pills, and condoms and family-planning counseling at the doorstep fortnightly (1978-1995) or monthly (1996-2001). Since 2001, both health and FP services have been provided from these health centers. Tetanus immunization was introduced in 1979, and coverage has been universal since 1990. In 1982, a basic safe-motherhood intervention such as antenatal screening (conducted by CHWs by using a simple screening tool) began in the MCH-FP Area.

Four health centers were established in 1987 in the MCH-FP Area, and between 1987 and 2001 a number of safe-motherhood interventions were introduced in the area. In 1987, four trained midwives were posted in two of the four health centers to attend deliveries on call at home on a 24-hour basis. Midwives encouraged pregnant women with complications to seek care from the Matlab Health Center, where emergency care (but without caesarian section or blood transfusion) were available. Seriously complicated cases are transported to the district hospital in Chandpur. In 1990, additional midwives were posted in the other two health centers to provide the above-mentioned services. Pregnant women in the MCH-FP Area receive information about antenatal care, including danger signs of pregnancy, in a pictorial card; they are referred to midwives for counseling, antenatal, and delivery services. During the 1996-2002 period 58% women received at least one antenatal check-up, and 52% received an antenatal check-up during the third trimester from the health centers [17]. Between 1996 and 2001, maternity care was gradually redesigned to be facility-based, with basic obstetric care in the four health centers, while home-based delivery care by midwives was withdrawn. The project has made systematic efforts to increase institutional deliveries in the four health centers [10, 16, 18, 19, 20]. The MCH-FP project does not provide VPT services, although it did provide them between 1978 and 1983.

Data and Methods

The Matlab DSS contains longitudinal records of pregnancy outcomes and deaths of household members. During their regular visits to each household -- fortnightly during 1966-1999, monthly during 2000-2006, and bimonthly since 2007 -- the CHW records pregnancy status at the time of the visit and any pregnancy outcomes that occurred since the previous visit.

The data on VPTs are likely to be of good quality in both areas. However, some underreporting is possible because of stigma associated with VPT [9, 21].

Since 1989, the DSS has collected information on the method of VPT as reported by the respondents, though, for unknown reasons, this distinction was not made in 2001. There were a total of 5,211 VPTs in Matlab during the period 1989-2008 period, excluding 2001. Of these, 3,383 were by MR and 106 were by D&C; in this study we combine MR and D&C into a category we call “MR⁺” because D&C, which is provided by trained providers, nurses or physicians, is also a relatively safe method. Of the VPTs during the study period, 1,722 (33%) were by other methods of VPT (OVPT), which the DSS records in layman’s terms. The two main methods recorded were internal manipulation of the female genitalia (n=821) and drug application (n=594). Others were manipulation of the abdomen (n=80), injections (n=72), and drug ingestion (n=47); VPT method was not recorded for 108 cases.

The DSS records causes of death. The completeness of death enumeration is very high, but maternal death may be underreported due to misclassification of cause of death. The DSS defines a maternal death as “the death of a woman during pregnancy or within 42 days of pregnancy outcome from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes” [22] . Further information was collected by icddr,b investigators to improve the identification of maternal deaths that occurred between 1976 and 2005 [16, 19, 23]. These investigators followed an extended definition of maternal death -- a death within 90 days of a pregnancy outcome [24] -- and this is the definition we use here. We repeated the analysis for maternal deaths within 42 days; the main findings were the same as those shown here. Cases with accidental deaths (n=15) that occurred during pregnancy are excluded from our analysis.

In this study we consider all pregnancies that occurred in Matlab during the period 1989-2008, excluding 2001 (because the method of VPT was not distinguished in the DSS that year). We exclude from the analysis pregnancies that resulted in multiple births (twins or triplets [n=1,073]) because women with such outcomes may have different mortality risks. We also exclude cases where the women died during pregnancy before having an outcome (n=75). In order to report the incidence of VPT, we consider a sample of 121,464 pregnancy outcomes, of which 104,941 were singleton LBs, 3,426 stillbirths, 7,886 miscarriages, 3,489 ended by MR⁺, and 1,722 ended by OVPT. (The mortality associated with stillbirths and miscarriages is reported

in another study [4].) The sample for our mortality analysis is 110,152 pregnancies associated with LBs, MR⁺s, and OVPTs. We matched death records with the above pregnancy outcomes through the DSS identification numbers and found 153 maternal deaths among the 110,152 outcomes. We compare the mortality risks associated with MR⁺ and with OVPT with that associated with LB. We calculate maternal mortality risk, or case-fatality rate, for each outcome by dividing the number of deaths associated with that outcome by the number of such outcomes; we present these as risks per 100,000 outcomes. To compare the risks across groups, we calculate unadjusted odds ratios (ORs) and adjusted ORs from logistic regressions estimated for each Matlab area that control for factors found in other studies to be associated with maternal mortality (maternal age, pregnancy order, interpregnancy interval, previous child deaths, previous pregnancy losses, maternal education, household space [a proxy for household wealth], religion, and calendar year). We will conclude that a VPT method is “unsafe” if the case-fatality rate from that method is significantly higher than that associated with a LB.

Results

For Matlab as a whole there were 4.29 VPTs (2.87 by MR⁺ and 1.42 by other VPT methods) per 100 pregnancy outcomes; hence, the majority of the VPTs, 66.9%, were by MR⁺ (Table 1). The rate of VPT in the Comparison Area (5.46% of all pregnancies) is nearly twice that in the MCH-FP (2.99%). The incidences of MR⁺ and OVPT were 42% and 51% lower in the MCH-FP Area than the Comparison Area; these differences are all statistically significant ($p < 0.001$). The share of VPTs that are MR⁺ was significantly higher in the MCH-FP Area (69.3%) than in the Comparison Area (65.8%) (OR=1.14; 95% CI 1.01-1.29).

For Matlab as a whole, the case-fatality rate for MR⁺ (258 deaths per 100,000 MR⁺s) is higher than that for LBs (118 deaths per 100,000 LBs), but is considerably lower than that associated with OVPT (1,161 deaths per 100,000) (Figure 1). In the Comparison Area, case-fatality rates (per 100,000 pregnancies) were 119, 348, and 1,003, for LB, MR⁺, and OVPT, respectively. (The statistical significance of differences is tested in Table 3.) In the MCH-FP Area, the corresponding case-fatality rate is similar to that in the Comparison Area for LBs (117), considerably lower for MR⁺ (84), and but higher for OVPT (1,521). Although the differences between areas are fairly large for pregnancies that were voluntarily terminated, the case-fatality rates do not differ significantly between areas for any of the three outcomes, probably because of relatively small number of VPTs.

These case-fatality differences across VPT methods and between Matlab areas may be due to differences in durations of pregnancies, a possibility we explore in Table 2. Mean duration of pregnancy was longer for OVPT than MR⁺ (9.17 weeks vs. 7.86 weeks [p<0.001]) (Table 2). The pregnancy duration for MR⁺ users was shorter in the MCH-FP Area than in the Comparison Area (7.38 vs. 8.26 [p<0.001]). For OVPT users, the reverse was true; mean duration was longer in the MCH-FP Area than the Comparison Area (9.28 vs. 9.02 [p<0.001]).

Table 3 shows unadjusted and adjusted ORs comparing the mortality risks associated with MR⁺ and with OVPT to those associated with LBs, between OVPT and MR⁺, and between Matlab areas. The adjusted ORs are smaller than the corresponding unadjusted ORs for all cells except for MR⁺ in the MCH-FP Area, for which the ORs are not statistically significant. Conclusions about whether ORs are statistically significant at P<0.05 are the same for unadjusted and adjusted ORs for all cells except MR⁺ for the total sample.

In the Comparison Area, the unadjusted and adjusted mortality risks for both methods of VPT are each significantly higher than for LBs (adjusted OR=2.49 [95% CI:1.13-5.46] for MR⁺ and 7.19 [3.72-13.89] for OVPT). In the MCH-FP Area, the OR for MR⁺ is below 1.00 but not significantly so (adjusted OR=0.76 [0.10-5.68]). The adjusted OR for OVPT is 10.61 [4.66-24.14] in the MCH-FP Area, which is slightly higher than (but not significantly different from) that in the Comparison Area (7.19 [3.72-13.89]). In each area of Matlab, women using OVPT had much higher mortality risks than women using MR⁺; the ratios are particularly large for the MCH-Area (adjusted OR=13.93 [1.17-113.26]).

Discussion

We have analyzed high-quality longitudinal data on 121,464 pregnancy outcomes over a period of 20 years in Matlab, Bangladesh. Two thirds of voluntary pregnancy terminations (VPT) were by menstrual regulation or D&C (MR⁺), and one third were by other, presumably less safe, methods.

The incidence of both methods of VPT was significantly lower in the MCH-FP Area than in the Comparison Area. This is undoubtedly due to the greater availability of quality RH information, counseling, and services in the MCH-FP Area, which led to a reduction in unintended pregnancy and thus fewer VPTs [15]. Although the MCH-FP project workers do not promote VPT, it is likely that community- and facility-based health workers in the area discuss

the potential danger of VPTs performed by untrained practitioners, resulting in lower use of less safe methods of VPT.

We found a high case fatality of 258 per 100,000 MR⁺s for Matlab as a whole, which is higher than the 220 per 100,000 *unsafe* terminations observed worldwide [5]. MR⁺ case fatality is even higher, 348 per 100,000, in the government-served Comparison Area. This raises a serious question about the safety of MR in Bangladesh. The case fatality for OVPTs is even higher – an alarming 1,161 per 100,000 OVPTs for Matlab, over five times higher than that from unsafe VPTs worldwide.

Mortality risk of MR⁺ relative to LBs was 2.49 [95% CI: 1.13-5.46] times higher in the Comparison Area, but somewhat lower (OR=0.76 [0.10-5.68]) in the MCH-FP Area, though not significantly so. The high mortality risk for MR in the Comparison Area, which is a typical rural government-served sub-district, is consistent with findings from a recent MR-program assessment in 74 selected facilities in Bangladesh [25]: Only one facility fulfilled the criteria of “basic” care, and none fulfilled the criteria of “comprehensive” care. Patient data further show the seriousness of the problem: About half (48%) of all obstetric complications in those facilities were from VPT (75% of which are MR) -- a clear indication of problems associated with MR procedures. About 13% of the complications from VPT were serious or life-threatening. Moreover, it was concluded that less than one percent of VPT complications were treated with appropriate technology.

The OR of dying from OVPT compared to LB was 7.19 in the Comparison Area and 10.61 in the MCH-FP Area. The ORs of dying from OVPT relative to MR⁺ were 2.89 (Comparison Area) and 13.93 (MCH-FP Area).

There are several possible reasons why women select OVPT over MR in Bangladesh in general and Matlab in particular. Because of abortion-related stigma and concerns about confidentiality, some women may not seek VPT services from trained providers or official facilities where VPT cases are registered [26], even though it is mandatory in government, private, or NGO facilities that confidentiality be maintained. For the same reason, women who use OVPT may not seek post-abortion care (PAC) even if they have subsequent life-threatening complications [26, 27]. In addition, the costs associated with MR or with PAC may reduce the use of these services [27]. It should be noted, however, that the MCH-FP project has a

mechanism of ensuring services to women who cannot afford to pay for them, which suggests that stigma is the main barrier to seeking PAC in the MCH-FP Area.

The maternity centers equipped with PAC services in the MCH-FP Area are likely to reduce the risk of women dying from both MR and OVPT. MCH-FP maternity center staff and community-based midwives may channel cases with complications arising from VPT and serious cases for blood transfusion and related life-saving services to the nearby district hospital in Chandpur [28]. These services are not available in the Comparison Area. The women who had MR⁺s in the MCH-FP Area and encountered complications probably sought services from the project's PAC services; this may explain the lower case fatality associated with MR⁺ in that area (though the differences between areas are not significant, perhaps because of small sample sizes).

Despite the project PAC services in the MCH-FP Area, we observe that women there who used OVPT had high level of mortality (in fact, higher than in the Comparison Area); this warrants investigation. The somewhat higher OVPT case fatality in the MCH-FP Area may be because women in that area who use OVPT are a selected and disadvantaged group that perceives a greater degree of stigma and/or is unable to make a quick decision to terminate a pregnancy; in making a late decision, they do not qualify for MR and seek unsafe services from lay providers. This is consistent with the fact that the duration of pregnancy among OVPT users was longer in MCH-FP Area than the Comparison Area, whereas for MR⁺ the opposite was true.

LB deliveries may also result in complications. It is noteworthy that we find no differences between Matlab areas in case-fatality rates for LBs (also found elsewhere [4]), despite the better maternal health services there. This, too, merits further attention.

The fundamental reason for VPT is unintended pregnancy; such pregnancies result from a lack of adequate FP information, counseling, and services. Although the total fertility rate (TFR) in Bangladesh declined to 2.5 births per woman in 2010 from over 6.0 in the early 1980s, there is still a high level of unmet contraceptive need, and it has increased recently, from 11% in 2004 to 17% in 2007 [13]. The high (and increasing) unmet contraceptive need in Bangladesh is due in part to the rapid reduction in desired family size and greater interest in controlling the timing and spacing of births. In 2006, total wanted fertility rate was 1.9 but TFR was 2.7, a 42% excess fertility [13]. High unmet need may also arise because the contraceptive method mix in Bangladesh is skewed toward short-acting methods. The majority of women who do not want to

have any more children and use oral pills, which have quite a high use-failure rate [29]. Permanent and long-acting methods, which are highly effective and thus appropriate for limiting purposes, have not been popular in Bangladesh, and recently the prevalence of these methods has declined [13]. Women aged 40 and over experience an extremely high level of VPTs in Matlab (30). There were six VPTs for every 10 LBs among women 40-44, and 14 VPTs for 10 LBs among women 45 and older [31]. The Bangladesh FP program should rejuvenate its information and counseling about appropriate contraceptive methods and provide a more appropriate mix of contraceptive methods in order to reduce the number of unintended pregnancies and thus VPT, with particular attention to the needs of older women.

A large number of women with complications of VPT, both MR and other methods, are admitted to health facilities; this is a burden to the health system, and a large number of women die from VPT complications [8]. The Bangladesh programs that provide MR services need a serious evaluation and restructure in terms of physical infrastructure, provider skills, counseling, and information. PAC programs also need serious evaluation and restructure regarding the quality of services and awareness-raising on the use of life-saving services available in these programs.

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Table 1. Incidence of voluntary pregnancy termination (VPT) by method of VPT and Matlab area, 1989-2008, excluding 2001

	Both areas	Comparison	MCH-FP	OR (MCH-FP/ Comparison) [95% CI]
Number of pregnancy outcomes [†]	121,464	64,111	57,353	--
VPTs per 100 pregnancy outcomes	4.29	5.46	2.99	0.55*** [0.51-0.58]
MR ⁺ per 100 pregnancy outcomes	2.87	3.59	2.07	0.58*** [0.54-0.62]
OVPT per 100 pregnancy outcomes	1.42	1.87	0.92	0.49*** [0.44-0.54]
Percentage of VPTs that are by MR ⁺	66.9%	65.8%	69.3%	1.14* [1.01-1.29]

[†] Includes live births (n=104,941), stillbirths (n=3,426), miscarriages (n=7,886), MR⁺ (n=3,489 [3,283 cases of MR and 106 cases of D&C]), and OVPT (n=1,722).

*p<0.05; ***p<0.001

Table 2. Mean duration of pregnancy termination (in weeks) by method of VPT and Matlab area, 1989-2008, excluding 2001

Type of pregnancy termination	Both areas	Comparison Area	MCH-FP Area
All VPTs	8.19	8.42	7.94
MR ⁺	7.86	8.26	7.38
OVPT	9.17	9.02	9.28

Table 3. Odds ratios and 95% confidence intervals of maternal mortality: MR⁺ and OVPT, by Matlab area, 1989-2008, excluding 2001

Type of pregnancy outcomes	Unadjusted OR [95% CI]			Adjusted OR [†] [95% CI]		
	Both areas	Comparison	MCH-FP	Both areas	Comparison	MCH-FP
MR ⁺ relative to live birth	2.19* [1.11-4.30]	2.93** [1.40-6.11]	0.72 [0.10-5.19]	2.03 [0.10-4.14]	2.49* [1.13-5.46]	0.76 [0.10-5.68]
OVPT relative to live birth	9.93*** [6.18-16.97]	8.50*** [4.58-15.79]	13.16*** [6.25-27.70]	8.51*** [5.10-14.20]	7.19*** [3.72-13.89]	10.61*** [4.66-24.14]
OVPT relative to MR ⁺	4.54*** [2.06-10.00]	2.91* [1.18-7.13]	18.32** [2.29-146.82]	4.20** [1.89-9.32]	2.89* [1.16-7.18]	13.93* [1.17-113.26]

[†] From a logistic regression model that controlled maternal age, gravidity, pregnancy interval, previous child deaths, previous pregnancy losses, maternal education, household space, religion, and calendar year.

*p<0.05; **p<0.01; and ***p<0.001.

Figure 1. Maternal mortality risk (case fatality per 100,000) by type of pregnancy outcome, by Matlab area, 1989-2008, excluding 2001

