

# Does prior ultrasonography affect the safety of induced abortion at or after 13 weeks' gestation? A retrospective study

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## Abstract

**Introduction:** We aimed to assess whether ultrasonography prior to dilation and evacuation or medical abortion  $\geq 13$  weeks was correlated with safety.

**Material and methods:** We conducted a retrospective chart review of patients undergoing abortion  $\geq 13$  weeks at eight sites in Nepal from 2015 to 2019.

**Results:** We included 2294 women undergoing abortion  $\geq 13$  weeks (no upper gestational age limit); 593 underwent dilation and evacuation and 1701 had a medical abortion. Demographics differed by procedure for parity (19% vs 33% nulliparous, dilation and evacuation, and medical abortion) and gestational age (90% vs 52% were 13-15 weeks, dilation and evacuation, and medical abortion). Ultrasonography was performed in 81% of cases overall. Complications were rare ( $<1\%$  of dilations and evacuations, 1.4% of medical abortions). The most common adverse events with dilation and evacuation were hemorrhage and cervical laceration; three women required re-aspiration. Following medical abortion, 13.5% had retained products, 12.9% with prior ultrasound and 16.3% who had not had an ultrasound. Hemorrhage and severe side-effects occurred at similarly low rates regardless of whether ultrasonography was performed. In a logistic regression model where patient characteristics and case clustering within facilities were controlled for, we found a correlation between ultrasonography and complications when retained placenta was included in the model, but there was no correlation between ultrasonography and complications when retained placenta was excluded.

**Conclusions:** This study confirms low complication rates among women having an abortion  $\geq 13$  weeks' gestation in healthcare facilities. Settings without universal availability of ultrasound may still maintain low, comparable complication rates.

## KEYWORDS

adverse events, dilation and evacuation, medical abortion, placental retention, second trimester abortion, termination of pregnancy, ultrasonography

**Abbreviations:** D&E, dilation and evacuation; LMP, last menstrual period; MA, medical abortion.

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## 1 | INTRODUCTION

About 10% of all abortions globally take place at or after 13 weeks' gestation.<sup>1</sup> Women seeking abortion services at or after 13 weeks are often more vulnerable and socially disadvantaged than those seeking care at earlier gestations.<sup>2-4</sup> There is an ongoing need for accessible abortion services in this gestational age range, even in rural locations where healthcare systems are more limited.<sup>5,6</sup>

In Nepal, abortion services at or after 13 weeks are not well integrated into the healthcare system and the terrain of the country creates barriers to medical care. Access to second-trimester abortions is also limited due to fear of stigma, cultural/religious beliefs, mandated fees, concerns around sex-selection and funding restrictions which limit abortion accessibility at or after 13 weeks.<sup>1,6,7</sup> Additionally, resource-limited areas in Nepal do not always have access to ultrasound technology and only physicians can provide abortion care beyond 12 weeks' gestation.

Most research on second-trimester abortions has taken place in high-resource countries where ultrasonography is part of the standard of care. Previous work has documented a knowledge gap on whether the use or nonuse of ultrasound has an impact on abortion outcomes.<sup>8,9</sup> To date, one study on abortion  $\geq 13$  weeks' gestation has documented lower complication rates using intraoperative ultrasound during dilation and evacuation (D&E), but no research on ultrasound use for medical abortion (MA), the more commonly used method in low-resource settings, has been documented.<sup>8,9</sup> In 2011, a literature review on use of ultrasound reported that no evidence was available on the effects of preprocedure ultrasound for second-trimester abortion procedures for either safety or efficacy, despite the fact that ultrasound in some settings is widely used to estimate gestational age.<sup>8</sup> No additional studies have since been published, highlighting the need to conduct research on this issue.

We conducted a retrospective chart review of patients who underwent second trimester abortions in Ipas-supported programs in Nepal to assess whether the use or nonuse of ultrasound impacted outcomes such as complications or efficacy of the procedure. This study investigates the use of ultrasound before conducting D&E or MA procedures, and whether its use is correlated with different clinical outcomes compared with nonuse.

## 2 | MATERIAL AND METHODS

We have conducted a retrospective chart review of women who underwent an abortion procedure at or after 13 weeks in one of eight hospitals in seven different districts in Nepal. Hospitals where second trimester abortions have been performed from 2015 to 2019 with moderate-to-high volume were selected. Facilities included a mix of both public and private facilities, including district-level to provincial-level tertiary hospitals. The exposure of interest in this study was use of ultrasonography. Potential cases were identified by querying the logbook of abortion cases maintained by each hospital. Included in the study were all women undergoing an abortion at or

### Key message

Abortion procedures beyond 13 weeks' gestation are associated with low rates of adverse events even in facilities where ultrasonography is not always available.

after 13 weeks' gestation with no upper gestational age limit, either by medical or surgical means, where at least some primary or secondary outcomes were recorded. MA was provided using mifepristone and misoprostol, and surgical abortion was performed by D&E (removal of pregnancy using forceps and aspiration techniques after preparing/dilating the cervix). Extracted data included demographics, medical comorbidities and other possible confounders, procedure type and abortion outcomes such as incidence and management of retained placenta and complications (infection, uterine perforation or rupture, cervical laceration, estimated blood loss  $>500$  mL) during the in-hospital period. Data also included whether ultrasonography was performed at any time during the woman's pregnancy either before or during the abortion procedure, the indication and subsequent findings. Ultrasonography performed  $\geq 13$  weeks' gestation is standardly performed transabdominally in these settings. Physicians at all included sites made the decision to conduct an ultrasound or not on a case-by-case basis without cost implications for the woman.

Confirmation of gestational age in the analysis utilized postprocedure fetal foot length, where available, as was standardly recorded in the participating facilities. The correlation between gestational age by fetal foot length and the other gestational dating methods (last menstrual period [LMP], physical examination and ultrasound) was tested in STATA version 14 (Stata Corp., College Station, TX, USA), and the most reliable method of dating recorded for each case was used.

Continuous variables were summarized with means, standard deviations, medians and ranges. Categorical variables were summarized with counts and percentages. Logistic regression was planned separately for MA and D&E cases, with the occurrence of any complication as the outcome variable and ultrasound use as the primary independent variable. Separate models were run where retained products were included or excluded as a safety outcome. All models controlled for gestational age of the pregnancy, maternal age, ethnicity of the woman and any comorbidities. Models also accounted for clustering of cases at the health facility level. All inference hypothesis testing is completed with a two-tailed alpha-level of 5%. All data were analyzed using STATA.

### 2.1 | Ethical approval

Ethical approval was given by the Ethical Review Board of the Nepal Health Research Council (reference number 155 2019) on 21 April 2019.

### 3 | RESULTS

We reviewed charts from 2618 women from eight facilities, many of whom traveled to obtain care, as evidenced by the fact that the women in the study were from 69 districts in Nepal. All abortion procedures were provided by either generalist or specialist (OB/GYN) physicians. Of the charts reviewed, 2294 met the inclusion criteria of receiving abortion care with a gestational age  $\geq 13$  weeks, as confirmed by most reliable dating method. Of these, 593 underwent D&E and 1701 MA. Demographics differed by procedure type for

parity, with 19% of those who were nulliparous undergoing D&E, compared with 33% of those who had MA (Table 1). Gestational age, on average, was lower among those having D&E (13.9 weeks) vs MA (16.1 weeks). Overall, 90% of those who had a D&E were at 13-15 weeks' gestation compared with only 52% of MA cases.

Gestational age was confirmed in the analysis by postprocedure fetal foot length for 2223 of the 2618 cases. Other methods of gestational age assessment used were ultrasound, physical examination and reported LMP. Of these, ultrasound had the highest correlation with fetal foot length, at 81%, followed by physical examination (77%) and

**TABLE 1** Demographics

	D&E (n = 593)				Medical abortion (n = 1701)				Total (n = 2,294)			
	Ultrasound		No ultrasound		Ultrasound		No ultrasound		Ultrasound		No ultrasound	
	n	%	n	%	n	%	n	%	n	%	n	%
<b>Maternal age</b>												
11-19	40	9%	8	6%	172	12%	40	13%	212	11%	48	11%
20-29	238	51%	62	49%	739	53%	150	50%	977	52%	212	50%
30-39	149	32%	50	40%	431	31%	98	33%	580	31%	148	35%
40-56	40	9%	6	5%	58	4%	13	4%	98	5%	19	4%
<b>Comorbidities</b>												
Hypertension	1	<1%	0	0%	3	<1%	0	0%	4	<1%	0	0%
Asthma	4	1%	0	0%	2	<1%	3	1%	6	<1%	3	1%
Gastritis	1	<1%	0	0%	4	<1%	0	0%	5	<1%	0	0%
Diabetes mellitus	1	<1%	0	0%	2	<1%	0	0%	3	<1%	0	0%
Chronic renal disease	0	0%	0	0%	1	<1%	0	0%	1	<1%	0	0%
Uterine abnormalities	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Porphyria	1	<1%	0	0%	0	0%	0	0%	1	<1%	0	0%
Tuberculosis	2	<1%	1	1%	7	1%	0	0%	9	<1%	1	<1%
Other condition	11	2%	4	3%	42	3%	8	3%	53	3%	12	3%
None	450	96%	122	97%	1340	96%	291	97%	1790	96%	413	97%
<b>Previous pregnancy</b>												
None	94	20%	20	16%	463	33%	94	31%	557	30%	114	27%
$\geq 1$	373	80%	106	84%	937	67%	207	69%	1310	70%	313	73%
<b>Previous births</b>												
None	100	21%	22	17%	508	36%	102	34%	608	33%	124	29%
$\geq 1$	367	79%	104	83%	892	64%	199	66%	1259	67%	303	71%
<b>Previous abortions</b>												
None	365	78%	101	80%	1145	82%	254	84%	1510	81%	355	83%
$\geq 1$	102	22%	25	20%	255	18%	47	16%	357	19%	72	17%
<b>Gestational age</b>												
13-15 weeks	418	90%	115	91%	699	50%	187	62%	1117	60%	302	71%
16-18 weeks	42	9%	11	9%	401	29%	88	29%	443	24%	99	23%
19-21 weeks	7	2%	0	0%	203	15%	17	6%	210	11%	17	4%
22-24 weeks	0	0%	0	0%	79	6%	6	2%	79	4%	6	1%
>25 weeks	0	0%	0	0%	18	1%	3	1%	18	1%	3	1%

LMP (72%). Gestational age by fetal foot length was not recorded for 395 women; in these cases, the next most reliable method was used: gestational age by ultrasound for 276 cases, physical examination for 90 cases and LMP alone for 27 cases. Two cases did not have any gestational age dating method recorded and were excluded. In total, 319 women were excluded from the analysis because their gestational age as based on the most reliable method available was <13 weeks. A further 16 women were excluded because they were missing data for other key variables, including age and procedure type. See Figure 1 for details of the study sample identification.

Ultrasound was performed for >80% of all patients (79% vs 82%, among D&E and MA groups, respectively). At four of the eight facilities, ultrasonography was performed for more than 90% of all cases; there was no facility in which ultrasound was performed for every case. No significant demographic differences existed between those having and those not having undergone ultrasonography (Table 1). Most ultrasound investigations were performed at sites where ultrasound was used routinely for most patients (91% for both D&E and MA). An average of 16% (14% for D&E and 17% for MA) among all sites were performed selectively if the provider could not establish gestational age by LMP and examination or there was a medical

indication (Table 2). Only 3% of ultrasound investigations among both D&E and MA patients were performed for a medical indication. The most common medical issue leading to the use of ultrasound was lack of fetal movement, followed by failure of MA drugs, vaginal bleeding, concerns about the fetal status or placental location, and serious maternal conditions (preeclampsia, hyperemesis). Most ultrasound findings were normal ( $n = 1330$ ). Of those with abnormal findings, 46% documented an intrauterine demise, 36% a fetal anomaly, 7% severe oligohydramnios and 3% inevitable spontaneous abortion; 7% were missing or classified as "other".

The occurrence of adverse events during the in-hospital period was rare overall: 0.8% among D&E and 1.4% among MA patients (Table 3). The most common adverse events occurring with D&E were hemorrhage ( $n = 4$ ) and cervical laceration ( $n = 1$ ), all of which occurred among patients who had had ultrasound. Three women required re-aspiration after D&E for retained products: two had received an ultrasound and one had not.

Among MA patients, the most common adverse events during the in-hospital period were hemorrhage and severe side-effects: 1.4% of those having undergone ultrasound vs 1.7% with no ultrasound. Retained products were more common: 13.5% overall had retained products, with 12.9% among the ultrasound group and 16.3% of those without a prior ultrasound. Of MA patients with retained products, 7% underwent aspiration and 55.7% received additional medication (oxytocin or misoprostol). A minority of patients had a manual removal of the placenta (8%). Six patients initiated an MA, but during the process chose to switch to receive a D&E instead, based on their request ( $n = 5$ ) or for a reason not documented ( $n = 1$ ). For the MA procedure, most women needed three or fewer doses of misoprostol to completely expel the pregnancy, and just over 2% needed seven or more doses. The number of required misoprostol doses did not differ by whether ultrasound was performed.

Abnormal or failed pregnancies were only documented among women who had an ultrasound. The absence of data for women who did not have an ultrasound prevented us from including abnormal pregnancies in our logistic regression models. However, for cases where an ultrasound was used, rates of complications and retained products did not significantly differ among those with documented abnormal or failed pregnancies compared with those with normal pregnancies seeking induced abortion.

Logistic regressions, with controls and adjustment for clustering by facility, were run separately for each procedure type (D&E and MA). The model demonstrated that having had an ultrasound was correlated with lower odds of complications among MA patients when retained placenta was included as a complication (odds ratio = 0.70,  $P = .000$ ). However, since retained placenta is expected to occur at a baseline rate with MAs at or after 13 weeks, we conducted additional logistic regressions of complications excluding retained placenta in the model and found no significant correlation between use of ultrasound and complications of D&E or MA (Table 4). An additional regression of retained placenta alone among MA patients found no statistically significant correlation with use of ultrasound (odds ratio = 0.90,  $P = .60$ ).

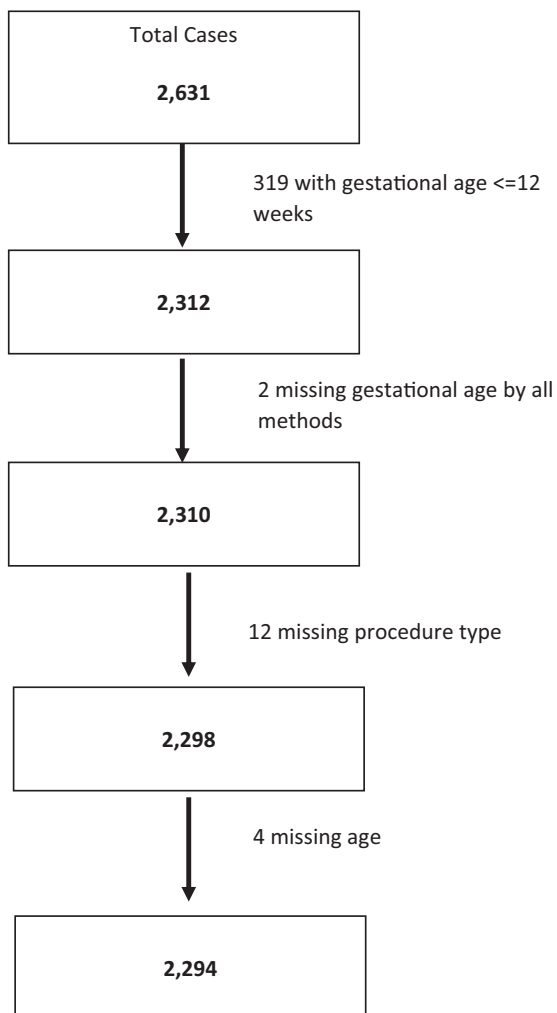


FIGURE 1 Study sample identification

**TABLE 2** Ultrasound use and findings

	D&E (n = 593)		MA (n = 1701)		Total (n = 2294)	
	n	%	n	%	n	%
No ultrasound used	126	21%	301	18%	427	19%
Ultrasound used	467	79%	1400	82%	1867	81%
Reason for ultrasound*						
Routine (performed for all patients)	426	91%	1277	91%	1703	91%
Dating	65	14%	234	17%	299	16%
Problem	11	2%	36	3%	47	3%
Ultrasound findings						
Normal	379	81%	951	68%	1330	71%
Abnormal	77	16%	435	31%	512	27%
Missing	11	2%	14	1%	25	1%
Abnormal ultrasound						
Intrauterine demise	38	49%	200	46%	238	46%
Fetal anomaly	23	30%	163	37%	186	36%
Severe oligohydramnios	0	0%	37	9%	37	7%
Inevitable spontaneous abortion	10	13%	5	1%	15	3%
Other	6	8%	30	7%	36	7%

\*Reasons not mutually exclusive.

**TABLE 3** Adverse events and retained placenta by procedure type and ultrasound use

	Dilation and evacuation (D&E)						Medical abortion (MA)					
	Ultrasound used (n = 467)		No US used (n = 126)		TOTAL (n = 593)		Ultrasound used (n = 1,400)		No US used (n = 301)		TOTAL (n = 1,701)	
	n	%	n	%	n	%	n	%	n	%	n	%
Any adverse event reported, including retained products	8	1.7%	1	0.8%	9	1.5%	190	13.6%	57	18.9%	247	14.5%
Any adverse event reported, excluding retained products	5	1.1%	0	0.0%	5	0.8%	19	1.4%	5	1.7%	24	1.4%
No complication reported	459	98.3%	125	99.2%	584	98.5%	1210	86.4%	244	81.1%	1454	85.5%
Type of complication												
Hemorrhage, blood transfusion	1	0.2%	0	0.0%	1	0.2%	6	0.4%	0	0.0%	6	0.4%
Hemorrhage, no transfusion	3	0.6%	0	0.0%	3	0.5%	13	0.9%	4	1.3%	17	1.0%
Infection/fever	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Readmission	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Retained products	2	0.4%	1	0.8%	3	0.5%	181	12.9%	49	16.3%	230	13.5%
Uterine perforation	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Cervical laceration requiring repair	1	0.2%	0	0.0%	1	0.2%	0	0.0%	0	0.0%	0	0.0%
Other complications	0	0.0%	0	0.0%	0	0.0%	1	0.1%	1	0.3%	2	0.1%
Switched procedure (from MA to D&E)	0	0.0%	0	0.0%	0	0.0%	3	0.2%	3	1.0%	6	0.4%

TABLE 4 Logistic regression of complications by ultrasound use

	Complications include retained placenta				Complications excludes retained placenta			
	Complication		Clustered by facility		Complication		Clustered by facility	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
<b>Medical abortion</b>								
US used	0.672	0.485-0.932	0.672	0.573-0.788	0.814	0.302-2.199	0.814	0.463-1.432
Constant	0.234	0.175-0.312	0.234	0.166-0.329	0.017	0.007-0.041	0.017	0.011-0.027
<b>Dilation and evacuation</b>								
US used	2.179	0.270-17.583	2.179	0.575-8.257	1.000	0.004-0.026	1.000	0.003-0.036
Constant	0.008	0.001-0.057	0.008	0.003-0.022	0.011	0.000-0.015	0.011	0.000-0.110

Abbreviations: CI, confidence interval; OR, odds ratio; US, ultrasound.

<sup>a</sup> Controls: gestational age, maternal age, ethnicity of woman, comorbidities (hypertension, asthma, gastritis, diabetes, renal disease, uterine abnormality, porphyria, tuberculosis, other comorbidities).

## 4 | DISCUSSION

This retrospective study demonstrated that in low-resource settings where ultrasound prior to provision of abortion at or after 13 weeks is used commonly but not uniformly, rates of adverse events remained low. These findings suggest that providers assess judiciously when to use ultrasound and have physical examination skills which are trustworthy. The regular use of ultrasound may be associated with lower overall rates of adverse events, including retained placenta, among MA patients; however, no significant difference in complications was found between the two groups when retained placenta was excluded. These results suggest that facilities can safely offer abortion care at or after 13 weeks' gestation and maintain low complication rates even without universal availability of ultrasonography.

Although ultrasound use is not required as part of national protocols for abortion care in Nepal, its use prior to abortion procedures in this study was higher overall than we anticipated. This may be due to the sites included in the study, which were tertiary level, as they provide the highest volume of abortion cases. Regardless, we think these data provide a useful insight into the overall safety of abortion procedures ≥13 weeks occurring in health facilities outside of high-resource settings, where ultrasonography is used for all patients. We found overall low adverse event rates, for both MA and D&E, which did not appear to be associated with ultrasound assessment in our regression model. Although we could not include the impact of an abnormally developing or failing pregnancy in the model, we did not see differing rates of adverse outcomes based on these characteristics between the groups. Whether placental retention is considered an adverse event varies by abortion method. For D&E, leaving parts of the pregnancy (such as the placenta) intrauterine is uncommon and is generally considered an adverse event, whereas for MA it is relatively more common, occurring in an average of 10% of cases.<sup>10</sup> In this population, data demonstrated a rate of placental retention replicable in the literature which appeared not to be influenced by ultrasound status.<sup>10</sup> Placental retention after second trimester MA was successfully managed in this population in the hospital setting with use of MVA or additional uterotonics or, less commonly, manual removal.

Interestingly, we found that physical examination assessment for gestational age was almost as reliable as ultrasonography in determining gestational age when compared with postprocedure fetal foot length. This finding would refute the notion that ultrasound is required prior to abortion services in the face of physical examination by experienced providers. In women seeking prenatal care, the accuracy of physical examination using fundal height measurements from anatomic landmarks is noted to improve when one provider makes multiple estimates over time, which reduces interobserver differences.<sup>11,12</sup> Although physical examination with fundal height measurement is an accepted technique during antenatal care when ultrasound measurement is not available, it has not yet been studied prior to abortion care in the second trimester.<sup>13</sup>

There are several limitations to our study. The study design, which is not a randomized trial, does not allow us to conclude that



any individual woman could undergo a second-trimester abortion with or without an ultrasound with the same outcome. We were not able to collect data on how providers chose between induced abortion methods, treatments for abnormal pregnancies or details beyond the indication for obtaining an ultrasound. Therefore, we are unable to comment on providers' decision-making around whether and for whom ultrasonography was performed, but our data suggest that complications from the procedure and retained placenta occurred at comparable rates among those with different demographic characteristics, maternal morbidities and pregnancy risk levels. It is likely that those who did not receive an ultrasound were those more likely to have a physical examination concordant with LMP, to report a normal pregnancy, and possibly to have a baseline lower risk of complications. However, the very high rates of ultrasound use suggest that the imaging was not used exclusively for those with abnormal pregnancies or discordant dates. Our data are further limited by the nature of medical record reporting, which contains little detail into decision-making. Additionally, delayed complications such as infection were not systematically captured in this chart review, as women may have sought care in different settings after discharge.

Although intraoperative use of ultrasound has been reported to decrease complication rates during D&E, we only assessed preprocedure use, as intraoperative ultrasound is not used in Nepal.<sup>9</sup> We found that complication rates were very low in both method groups, even without using intraoperative ultrasound for D&E. These findings may reflect the safety of the procedure in the hands of experienced providers as well as the overall earlier gestational age range of the included D&E population. Serious adverse events are known to increase markedly as gestational age increases.<sup>14-16</sup>

## 5 | CONCLUSION

Our findings demonstrate a low rate of adverse events following abortions  $\geq 13$  weeks' gestation in a low-resource hospital setting without the universal use of ultrasonography. These data are important because of the significant number of resource-poor areas globally, the critical need for access to safe and affordable abortion care, and implications for decreasing barriers to second trimester abortion. Future research into abortion after 13 weeks' gestation should include sites in low-resource settings to increase the applicability of findings beyond the developed world.

## CONFLICT OF INTEREST

None.

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