Original research article

Incidence of abortion-related near-miss complications in Zambia: cross-sectional study in Central, Copperbelt and Lusaka Provinces ☆,☆☆

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Abstract

Objectives: To describe the magnitude and severity of abortion-related complications in health facilities and calculate the incidence of abortion-related near-miss complications at the population level in three provinces in Zambia, a country where abortion is legal but stigmatized.

Study design: We conducted a cross-sectional study in 35 district, provincial and tertiary hospitals over 5 months. All women hospitalized for abortion-related complications were eligible for inclusion. Cases of abortion-related near-miss, moderate and low morbidity were identified using adapted World Health Organization (WHO) near-miss and the prospective morbidity methodology criteria. Incidence was calculated by annualizing the number of near-misses and dividing by the population of women of reproductive age. We calculated the abortion-related near-miss rate, abortion-related near-miss ratio and the hospital mortality index.

Results: Participating hospitals recorded 26,723 births during the study. Of admissions for post-abortion care, 2406 (42%) were eligible for inclusion. Near-misses constituted 16% of admitted complications and there were 14 abortion-related maternal deaths. The hospital mortality index was 3%; the abortion-related near-miss rate for the three provinces was 72 per 100,000 women, and the near-miss ratio was 450 per 100,000 live births.

Conclusions: Abortion-related near-miss and mortality are challenges for the Zambian health system. Adapted to reflect health systems capabilities, the WHO near-miss criteria can be applied to routine hospital records to obtain useful data in low-income settings. Reducing avoidable maternal mortality and morbidity due to abortion requires efforts to de-stigmatize access to abortion provision, and expanded access to modern contraception.

Implications: The abortion-related near-miss rate is high in Zambia compared with other restrictive contexts. Our results suggest that near-miss is a promising indicator of unsafe abortion; can be measured using routine hospital data, conveniently defined using the WHO criteria; and can be incorporated into the frequently utilized prospective morbidity methodology.

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Keywords: Abortion-related near-miss; Abortion-related mortality; WHO near-miss criteria; Prospective morbidity methodology; Termination of pregnancy; Induced abortion

1. Introduction

Unsafe abortion is a leading and easily preventable cause of maternal mortality and morbidity [1,2]. Globally, the highest regional estimate of abortion-related mortality (90 per 100,000 live births) comes from sub-Saharan Africa, where most abortion laws are restrictive, abortion may bear greater societal stigma, poverty is common, and comprehensive abortion care services are limited [1]. Unsafe abortion remains a contentious, poorly measured and largely neglected health problem in this region.

Obtaining accurate population-representative data on unsafe abortions is more challenging in such high-burden contexts [3,4]. Women having terminations of pregnancy (TOPs) are unlikely to report them in surveys and providers are unlikely to maintain accurate reports.

Hospital records on post-abortion care (PAC) admissions are the most frequently used source of data [5], but have limitations. Although national mortality may be high, numbers of deaths are often small at individual hospitals. All admissions for abortion-related morbidity in hospitals may not be representative of morbidity in the community [6,7], and it is difficult to distinguish miscarriages (spontaneous abortions) from induced abortions (TOPs) when morbidity is of low severity, as a means of identifying unsafe TOPs [8].

The idea of near-miss morbidity aims to address some of these measurement challenges. The World Health Organization (WHO) operational definitions of maternal near-miss [9] define a level of morbidity so severe that, in women with abortion-related complications, it is most likely the result of a TOP rather than a miscarriage [10], such that survival requires hospital treatment. By extension, documented near-misses at health facilities can be assumed to represent all cases within the population [11], providing an indicator of the most severe unsafe TOPs that can be tracked over time. Since it has similar characteristics, near-miss can be used as a proxy for mortality. It occurs more frequently [12–14], and allows for larger samples and increased statistical power in quantitative analyses [15]. To the best of our knowledge, no studies have yet estimated the incidence of abortion-related near-miss at the population level [5].

Zambia has one of the most liberal abortion laws in sub-Saharan Africa. Implementation is, however, impeded by a requirement for three signatories to support an elective TOP, except in an emergency. No recent studies have described the burden of TOPs or miscarriages in Zambia [16], but unsafe TOPs have been previously estimated to account for 30% of maternal deaths and 50% of gynecological admissions [17,18]. Our study describes the magnitude and severity of moderate and severe complications from both miscarriage and TOP, and the incidence of abortion-related near-miss in three provinces.

2. Methods

2.1. Design, setting and population

We conducted a cross-sectional study in Central, Copperbelt and Lusaka Provinces. Lusaka and Copperbelt account for 69% of Zambia's total urban population [19], while Central Province is more rural. Forty-three level one (district), level two (provincial) and level three (tertiary and national) hospitals — which serve as public (*n*=30) or private (*n*=13) referral facilities and provide comprehensive care for severe complications — were eligible for inclusion and were invited to participate.

We used the Zambian Ministry of Health definition of abortion (Appendix A) [18]. All women admitted with an *International Classification of Diseases* (*ICD-10*) diagnosis of incomplete, complete, missed, septic, inevitable or spontaneous abortion, who were hospitalized for greater than 24 h or had a complication classified as moderate (Table A1) or near-miss morbidity, or died between 1st December 2013 and 31st April 2014, were eligible for inclusion.

We defined morbidity categories by adapting the prospective morbidity methodology (PMM) initially proposed by WHO to determine whether abortion complications were related to miscarriages or unsafe TOPs, adapted by South African researchers, and subsequently used in other studies to collect data on abortion-related morbidity and management [8,10,20–23]. We changed the morbidity categories from low, moderate and severe [20] to low, moderate, near-miss and suspected near-miss. We introduced anemia cutoff levels for each category using the WHO cutoffs for pregnant women [24], except in the near-miss category in which we used a level of 4 g/dL. This decision was based on discussions with clinicians and experts on maternal near-miss during the design of our adapted criteria. Four grams per deciliter is also the cutoff for severe anemia requiring urgent transfusion according to the Zambia Transfusion Service. We also revised the infection definition for the moderate category and replaced the high-severity category with a near-miss category. We introduced anemia into our classification because hemorrhage is a major complication of unsafe abortion [25], but the PMM does not include in its categories criteria other than shock to assess severity of blood loss. Many women and hospitals are unable to objectively quantify blood loss after an abortion, but it is possible to assess the effect of blood loss by measuring hemoglobin levels in such settings. We also adapted the WHO near-miss criteria to reflect a middle-income country context (Table A1). We included as criteria anemia alone (<4 g/dL) and anemia in combination with blood transfusion (4–7 g/dL with any blood transfused). These criteria are important adaptations because clinical information in medical records is often incomplete in low- and middle-income countries, and parameters to identify severe bleeding objectively and classify cases as hypovolemic shock are often not readily available. We lowered the WHO near-miss threshold for a massive blood transfusion from 5 units of blood to 2 units in our adapted criteria. This is because of the scarcity of blood products in Zambia and was endorsed by our local investigator, B.V. It has also been reported by maternal near-miss studies in similar settings such as Malawi [26] and Tanzania [27]. Both studies suggest 2 units of blood as the optimal threshold for massive transfusion in such contexts. The suspected near-miss category was based on our experience in a pilot study in which cases were considered to be near-miss by clinicians, but the case file contained insufficient information to classify it objectively as such (information on the pilot study is included in Appendix B). We included the suspected near-miss cases in the near-miss category in the final analysis.

2.2. Data collection

We collected data continuously for 5½ months from 1st December 2013 to 15th May 2014. Only women admitted from the 1st December 2013 to 30th April 2014 were included in the analyses. We used a pretested standardized form structured to approximate patient care, in order to minimize the data collectors work and improve data quality. A 1-day training was conducted with 67 data collectors (clinicians working in the wards in which eligible women were likely to be admitted) recommended by each hospital. Clinically trained study supervisors (namely O.O., who is a medical doctor, and a Zambian nurse hired for the study) extracted data in three hospitals (9%) in which no in-facility data collectors were recommended. Data collectors extracted information from hospital files and did not interview women directly. They were instructed not to differentiate between complications resulting from miscarriages and TOPs. Health providers were, however, told to ask about and record reported attempts to induce abortion and to note physical evidence of attempted termination during clinical examination. Monthly supervision visits were conducted to collect completed forms and verify information from hospital files. Data collectors received a small financial incentive for participation. We collected the total numbers of women admitted for any abortion-related complication from hospital registers, regardless of complication severity and outcome, women provided with TOP, number of deliveries and total live births.

After the main study, a validation study was conducted in one tertiary hospital to verify if all cases had been included in our study. One study supervisor retrieved case files for March 2014 from the medical records department and traced women from hospital registers. Data from eligible cases were extracted retrospectively into data forms and the degree of underreporting assessed.

2.3. Data analysis

Data analysis was conducted in Stata 13.1, and an algorithm was used to assign morbidity level to cases using clinical signs and symptoms. We quantified the number of near-misses that would have been identified using our adapted study criteria and WHO near-miss criteria. Data from each hospital were calculated, divided by 5, and multiplied by 12 to generate yearly estimates of abortion-related complications and near-misses for the three provinces. Data were weighted for nonresponse by each stratum (level of facility) in each province and for all three provinces based on the sampling fraction achieved. We derived population estimates of women of reproductive age from the Zambia 2010 census of population and housing, by assuming that women of reproductive age constituted 45.3% of all women. We used this estimate and estimates of live births from the 2013–14 Zambia Demographic and Health Survey (ZDHS) as denominators. We calculated the overall intrahospital abortion-related mortality ratio, intrahospital abortion-related near-miss morbidity ratio, hospital mortality index, abortion-related near-miss morbidity rate and abortion-related near-miss morbidity ratio for each province and for the three provinces together (terms defined in Appendix A) [9,28].

3. Results

Of the eligible private and public facilities, 35 (81%) agreed to participate, ranging from 63% in Lusaka to 94% in Copperbelt province. Twenty-eight (93%) of public hospitals approached participated in the study, compared with seven (54%) of private hospitals. Most of the institutions that declined participation were private district-level hospitals, and most were in Lusaka province and were reluctant to provide information they considered to have legal implications. Information was recorded on 2404 cases within the study period. Data from 12 cases were excluded because gestational age was greater than 28 weeks. An additional 14 cases (11% of the total that month) were missed, but were identified in the validation study and included in the final analysis. The cases missed included seven low-severity admissions, five moderate-severity admissions and two deaths. Table A2 presents the complication severity of cases included and missed in the original and validation study. Other than the severity of cases, there were no significant differences in demographic characteristics, reproductive history and hospital management of the women missed in the original study.

There were 26,723 births in the study period; 791 TOPs were recorded in the hospital registers and 5771 admissions for PAC, of which we included 2406 morbidity cases (42%) after miscarriages and TOPs. Near-miss morbidity constituted 7% of PAC admissions. Among all the cases in our study, majority were classified as low-severity (58%), followed by moderate (25%) and near-miss (16%). We identified 14 abortion-related maternal deaths. We did not identify any near-miss cases in the validation study. A death identified in the main study was missed in the validation study, and deaths identified in the validation study had been missed in the main study. There were no differences in demographic characteristics, reproductive history or hospital management between missed cases identified in the validation study and cases collected prospectively.

Women in our sample ranged from 12 to 49 years of age (mean 26.7), with a mean parity of 2. Altogether, 13% [95% confidence interval (CI) 12–14] of women reported that they were using contraception at conception and most women presented in the first trimester of pregnancy (41%, 95% CI 39–43) (Table A3). The proportion of women reporting a termination attempt, or in whom an attempt was identified by a clinician, was 5% (95% CI 4–6). Abortion-related maternal deaths were more likely to show clinical evidence of unsafe abortion (14%) than near-miss (6%), moderate-severity (7%) or low-severity cases (4%) (p=.004). Table A4 shows the conditions associated with near-miss morbidity and mortality. Many near-miss cases presented with severe anemia

(44%), 24% had massive blood transfusion, 27% had hypovolemic shock and 10% had septic shock.

Our adapted study criteria identified considerably more near-misses (392) than the WHO criteria (115). The main difference was in the massive blood transfusion category, where our definition yielded 94 cases while the WHO definition yielded five (Table A5). Our anemia category identified 86 near-miss cases with a diagnosis of severe or very severe anemia and no other inclusion criteria; these cases would not have been captured by the WHO criteria. Table A5 compares the relationship between massive blood transfusion, as defined by our study and the WHO, and anemia severity.

The intrahospital abortion-related mortality ratio was 52 per 100,000 live births, the intrahospital abortion-related near-miss morbidity ratio was 1467 per 100,000 live births, and the mortality index was 3%. We projected the annual number of near-miss complications, taking account of facility weights within each province. We estimated the annual number of near-miss cases in the three provinces in 2014 at 1022. The rate of abortion-related near-miss morbidity was 72 per 100,000 women of reproductive age, while the abortion-related near-miss ratio was 450 per 100,000 live births (Table A6). Lusaka province had the highest abortion-related near-miss rate at 88 per 100,000 women of reproductive age, followed by Copperbelt province at 65 and Central province at 55 (Table A6).

4. Discussion

Our study showed that despite relatively liberal laws, high numbers of abortion-related near-miss morbidities and deaths occur in Zambian hospitals. There was also a high incidence of near-miss morbidity at the population level, with the most urbanized provinces having the highest tolls. Sequelae of hemorrhage were the most frequently occurring complications in near-miss cases and deaths.

Methodologically, prospective data collection was more effective in identifying near-miss cases, which were all missed in the retrospective validation study. It was feasible to collect information on abortion-related near-miss from routine clinical records on a large scale using the adapted WHO criteria in a resource-poor context. We judged the clinical and management criteria to be most relevant in Zambia, comparable to studies conducted in neighboring countries [26,27]. Similar to a recent study in Tanzania [27,29], the WHO massive transfusion threshold (≥5 units of blood) excluded many eligible women in our study because many facilities did not have adequate blood banks. Using anemia as an indicator improved our ability to identify near-miss cases in the context of limited blood transfusion. Hemorrhage is a major complication of unsafe abortion [25], and its degree can be proxied by anemia, more readily assessed in low-income countries. Clinical information in medical records is often incomplete and parameters to identify severe bleeding objectively and classify cases as hypovolemic shock are

often not readily available. Adding anemia severity to the near-miss criteria and other morbidity categories of the PMM provides additional value in such contexts.

Setting a suitable cutoff for anemia within the near-miss category and other morbidity levels is challenging. In this study, since we analyzed both near-miss and suspected near-miss cases as near-misses, we ultimately included three categories of women as near-miss anemia cases. From Table A1, the three groups were as follows: women who survived with less than 4 g/dL of hemoglobin, women with hemoglobin less than 7 g/dL who had any blood transfusion, and women with hemoglobin between 4 and 7 g/dL regardless of whether they received blood. In summary, we included women with hemoglobin less than 7 g/dL regardless of whether they received blood or not. A study in Malawi used a hemoglobin level below 6 g/dL after vaginal bleeding in its near-miss criteria [30]. The cutoff for severe anemia based on the WHO categorization of anemia severity in pregnant women is 7 g/dL [24]. However, this level of hemoglobin may be too high for a stringent near-miss classification in which near-misses can only survive due to hospital intervention and aimed at providing population representative estimates and for monitoring and evaluation.

The abortion-related near-miss rate (72) and ratio (450) in our study were higher than those estimated in most studies included in a 2012 systematic review by Adler et al. [5], while the proportion of near-miss cases among all abortion-related admissions (7%) was similar to their median value (6%). Near-miss occurred most frequently in urban provinces with the highest concentration of skilled providers and health facilities. This may be because, despite the availability of health facilities, urban areas have higher population densities and may have higher abortion rates among women who want to meet their reproductive intentions [31,32]. In this scenario, poor knowledge of the abortion law [33], societal stigma around unintended pregnancy [34,35] and reluctance to provide TOPs by health facilities may predispose more Zambian women to access clandestine abortions with varying levels of safety, which may increase the risk of severe complications requiring PAC [35]. It may also be that women from nearby provinces travel to seek care for serious complications in the large tertiary hospitals in these provinces, because they are either referred or in the hope of better or more anonymous care.

Our abortion-related near-miss ratio appears to be consistent with estimates from recent studies. The 2013–14 ZDHS estimated the national maternal mortality ratio at 398 per 100,000 live births (95% CI 323–474) and a 2004 systematic review estimated an obstetric near-miss ratio of 380–1090 per 100,000 live births in studies using organ dysfunction criteria [36]. Abortion-related near-misses constitute a proportion of all maternal near-misses and the ratio should be higher than abortion-related mortality ratios. Similar to observations in other studies, hemorrhage accounted for the greatest proportion of near-misses and deaths [14,37,38]. In comparison with a study in South Africa by Rees and colleagues [20], our retrospective

validation study identified fewer cases than did prospective data collection. To our knowledge, no other studies of abortion-related morbidity using this methodology have attempted to assess the degree of underreporting.

4.1. Strengths and limitations

We think that ours is the first hospital-based study to focus on quantifying the burden of abortion-related near-miss morbidity and to use it as a measure of unsafe abortion. We extended the PMM framework by introducing a near-miss category based on standardized WHO criteria and incorporating anemia in all the categories. Our adaptations reflect the commonest complications of unsafe abortion and apply to low-income contexts where the burden is greatest. Although seasonal variation cannot be excluded, our study was longer (5 months) than most abortion morbidity studies (2–4 weeks), presumably improving the precision of our annual estimates [20,21,39,40].

Limitations include the higher proportion of public than private hospitals that participated, which might limit generalizability. We did not collect data on all women admitted with abortion complications and, despite efforts to ensure the eligibility criteria were applied correctly, we may have missed some cases. However, we screened hospital logbooks during supervision visits to identify missed cases and relevant data were retrieved if found. The quality of our data depended on the quality of records, which varied by type and level of facility and may have been subject to error. Although we collected information on referral to and from facilities, we treated each entrance to a health facility as a discrete case. Only 2% of cases were referred elsewhere and it is unlikely that double-counting was substantial.

5. Conclusions

The frequency of abortion-related near-miss morbidity and mortality suggests that access to abortion services in Zambia remains poor despite the favorable liberal abortion law. Although collecting comprehensive and representative data on abortion-related mortality is difficult, it was feasible to identify abortion-related near-miss cases, which are a useful indicator of the most unsafe abortions and a proxy for mortality. With reasonable adaptation, the WHO criteria can be applied to routine hospital records to obtain useful data. We recommend lowering the threshold for blood transfusion, incorporating severe anemia, and providing a standardized definition of septic shock to reflect the capabilities of health systems in low-resource contexts and to adequately capture the commonest causes of near-miss morbidity and mortality. To reduce avoidable maternal mortality and morbidity due to abortion, there is a need for concerted efforts to make women aware of the legal status of abortion and to de-stigmatize service provision and access. In addition, expanded access to modern contraceptives is essential to reduce unmet need and the occurrence of unintended pregnancies.

5.1. Details of ethics approval

The University of Zambia Biomedical Research Ethics Committee (UNZBREC) reviewed and approved the study on 3rd September 2013 (protocol ID: 016-04-13), the Population Council IRB on 16th January 2013 (protocol ID: 582), and the London School of Hygiene and Tropical Medicine Research Ethics Committee on 16 August 2013 (protocol ID: 6407). Ethics review authorities in two of the participating private hospitals independently reviewed and approved the study. Individual written consent was not required as no women or medical personnel were interviewed and data were extracted solely from hospital records.

Appendix A. Definition of terms

- **Abortion:** "Termination of pregnancy, expulsion of embryo/fetus before viability." The date of viability in Zambia is 28 weeks [20].
- **Maternal near-miss:** A woman who nearly died, but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy [9].
- **Abortion-related near-miss:** A maternal near-miss case that occurs due to miscarriage or termination of pregnancy.
- **Maternal death:** Death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes (*ICD-10*) [9].
- **Abortion-related maternal death:** Maternal death due to miscarriage or termination of pregnancy.
- **Live birth:** Birth of an offspring who breathes or shows evidence of life [26].
- **Woman of reproductive age:** Woman aged 15 to 49 years.
- **Abortion-related near-miss ratio:** Number of abortion-related near-miss cases per 100,000 live births. This indicator gives an estimate of the amount of care and resources that would be needed in an area or facility.
- **Abortion-related near-miss rate:** Number of abortion-related near-miss cases per 100,000 women of reproductive age.
- **Intra-hospital abortion-related near-miss ratio:** Number of abortion-related near-miss cases that occur in hospitals, per 100,000 live births.
- **Intra-hospital abortion-related mortality ratio:** Number of abortion-related maternal deaths that occur in hospitals, per 100,000 live births.

- **Intra-hospital mortality index:** Number of maternal deaths in hospitals divided by the number of women with life-threatening conditions in hospitals (i.e., maternal near-miss cases plus maternal deaths) expressed as a percentage. The higher the index, the more women with life-threatening conditions who die: an indicator of quality of care [9].

Appendix B. Description of the pilot study

The pilot was conducted by O.O. in October 2012. Data were extracted from 122 patient files at the largest public tertiary hospital in Zambia providing PAC and from 11 patient files at a private hospital. Thereafter, O.O. analyzed the pilot data and amended the tool accordingly.

Seventy-one percent of cases were of low severity, 20% moderate, 4% near-miss and 5% (*n*=6) suspected near-miss.
Suspected near-miss cases included the following:

- 2 women who were clinically managed for shock, but for whom records of pulse rate or blood pressure were missing, such that we could not use the study definition of shock
- 4 women who were transfused with a unit of blood, had clinical signs of anemia-pallor or cold extremities, or were admitted for more than 24 h but did not have pulse rates, blood pressures or hemoglobin measurements recorded in their case files

After the pilot, we removed some questions which were usually unavailable in case files. These included woman's occupation, date of termination if abortion was induced, time of PAC procedure performed and time of discharge.
We also revised the massive blood transfusion criteria to ≥2 units of blood and introduced a suspected near-miss category to accommodate clinically severe cases with incomplete information in case-files. These included the following:

- Cases managed as near-miss with organ compromise (managed as hypovolemic or septic shock, but with incomplete clinical signs in case files and perceived by hospital clinicians to be near-miss).
- Women who received a unit of blood with insufficient additional information in the case-file (hemoglobin level, pulse rate and blood pressure) to classify them objectively as having severe anemia or shock
- Women who fell within the WHO criteria for severe anemia (4.0–6.9 g/dL) who were not transfused when it was requested by the managing clinician.

These criteria were discussed with our local investigator, B.V., who is head of obstetrics and gynecology at the largest tertiary hospital in Zambia and has extensive experience practicing in rural areas. They were also discussed with doctors, nurse-midwives and clinical officers during the data collectors' training, and there appeared to be consensus that these cases counted as near-miss.

Table A1

Differences between WHO near-miss morbidity criteria and criteria used in the study, adapted for abortion-related complications in Zambia

Near-miss severity	
WHO near-miss criteria	Adapted near-miss criteria for study
Clinical criteria	
Shock	Hypovolemic shock *Persistent systolic blood pressure <90 mmHg with pulse rate of at least 120 beats per minute); with or without blood hemoglobin 7–9.9 g/dL or*

Table A1 (*continued*)

Near-miss severity	
WHO near-miss criteria	Adapted near-miss criteria for study
	mucocutaneous signs
	Septic shock
	Clinical diagnosis of septicemia or one of the following: t>39°C, t<36°C, genital infection AND one of the following: systolic BP <90 mmHg, icterus, altered consciousness, oliguria <100 mL in 4 h
Oliguria not responsive to fluid or diuretics	Oliguria not responsive to fluid or diuretics *Uterine output <30 mL/h for 4 h or <400 mL/24 h*
Cardiac arrest	Cardiac arrest
	Generalized peritonitis, tetanus, gangrenous uterus
	Major trauma
	Uterine perforation, bowel injury
Management-based criteria	
Hysterectomy following infection or hemorrhage	Hysterectomy following infection or hemorrhage
Massive blood transfusion (*Transfusion of ≥5 units of blood*)	Massive blood transfusion *Transfusion of ≥2 units of blood* Hemoglobin <4 g/dL Hemoglobin 4.1–6.9 g/dL with ≥1 unit blood transfused

Suspected near-miss

Clinically suspected case of organ/systemic compromise with incomplete documentation
Cases transfused with 1 unit of blood and clinical symptoms/signs of anemia, with hemoglobin level missing from the case-file, and insufficient information to objectively classify in a near-miss category
Hemoglobin between 4 and 7 g/dL with no blood transfusion given

Moderate severity

PMM	Adapted study criteria
Temperature 37.3–37.9°C	Temperature ≥37.3°C and other signs of infection, e.g., chills and rigors, foul-smelling discharge
Offensive products	Offensive products
Localized peritonitis	Localized peritonitis Hemoglobin 7–9.9 g/dL alone or with blood transfusion

Low severity

PMM	Adapted study criteria
Temperature ≥37.2°C	Temperature <37.3°C (but >36°C)
No clinical signs of infection	No clinical signs of infection
No system or organ failure	
No suspicious finding on evacuation	No suspicious findings on evacuation Hemorrhage not requiring any blood transfusion Hemoglobin 10–10.9 g/dL

Table A2
Comparing between the level of morbidity among cases in the original study and the validation study

Complication severity	Women included in both the original and validation dataset	Women included in only the original dataset	Women included in only the validation dataset	Total number of women
Low	32 (65%)	7 (14%)	7 (14%)	49 (100%)
Moderate	20 (69%)	4 (14%)	5 (17%)	29 (100%)

Table A2 (continued)

Complication severity	Women included in both the original and validation dataset	Women included in only the original dataset	Women included in only the validation dataset	Total number of women
Near-miss	44 (85%)	8 (15%)	0	52 (100%)
Death	0	1 (33%)	2 (67%)	3 (100%)
Total	96 (74%)	20 (15%)	14 (11%)	130 (100%)

Table A3

Sociodemographic and reproductive characteristics of 2406 women seeking PAC

	Total
Age (y)	26.7
Mean (95% CI)	(26.4–27.9)
Number of pregnancies	3
Mean (range)	(0–15)
Number of births	2
Mean (range)	(0–13)
Number of pregnancy losses	1
Mean (range)	(0–7)
Reported use of contraception at time of conception	12.8
Proportion (95% CI)	(11.6–14.2)
Termination attempt reported or detected	4.8
Proportion (95% CI)	(4.0–5.8)
Gestational age	
Proportion (95% CI)	
First trimester	41.0 (39.1–43.0)
Second trimester	25.1 (23.4–26.8)
28 weeks to 28 weeks 6 days	0.04 (0.02–0.08)
Missing[a]	33.5 (31.6–35.4)

[a] These cases were analyzed as eligible cases with gestational ages less than 28 weeks, based on other clinical information on procedures used to evacuate the uterus.

Table A4

Clinical conditions in abortion-related near-miss cases and abortion-related deaths

Causes (not mutually exclusive)	Near-miss (n=392), n (%)	Abortion-related death (n=14), n (%)
Severe anemia	173 (44)	4 (29)
Massive blood transfusion	94 (24)	4 (29)
Cardiac arrest	1 (<1)	6 (43)
Hypovolemic shock	104 (26)	2 (14)
Septic shock	39 (10)	7 (50)
Oliguria	1 (<1)	3 (21)
Trauma to bowel or uterus	3 (1)	0
Generalized peritonitis	0	1 (7)

Table A5

Overlap between blood transfusion and hemoglobin levels based on WHO near-miss criteria and Zambia study-adapted criteria

Hemoglobin level	Massive blood transfusion according to WHO near-miss criteria (>5 units of blood), n (%)	Massive blood transfusion adapted for Zambia near-miss study (≥2 units of blood), n (%)
Very severe anemia (≤4 g/dL)	3 (60)	21 (22)
Severe anemia	0 (0)	34 (36)

Table A5 (continued)

Hemoglobin level	Massive blood transfusion according to WHO near-miss criteria (>5 units of blood), n (%)	Massive blood transfusion adapted for Zambia near-miss study (≥2 units of blood), n (%)
(4.1–6.9 g/dL)		
Moderate anemia (7–9.9 g/dL)	2 (40)	8 (8)
Missing	0 (0)	31 (33)
Total	5 (100)	94 (100)

Table A6

Near-miss outcome indicators by province

Location	Number of women aged 15–49 y, 2014[a]	Number of near-miss[b] cases, 2014	Incidence of near-miss morbidity[b] per 100,000 women of reproductive age, 2014	Number of live births, 2014[a]	Incidence of near-miss morbidity[b] per 100,000 live births, 2014
Central Province	329,506	182	55	65,995	280
Copperbelt Province	506,280	329	65	75,747	430
Lusaka Province	575,160	509	88	83,933	610
3 provinces	1,410,945	1022	72	225,674	450

[a] Derived from Zambian 2010 Census projections using a medium level multiplier and the Zambia 2013/14 DHS for live births.

[b] Near-miss consists of both near-miss and suspected near-misses within the study.

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