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Prevalence and determinants of repeat induced abortion in Ethiopia: A systematic review and meta-analysis

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ABSTRACT

Introduction: Repeat-induced abortion is the termination of pregnancy for more than one time using drugs or surgical intervention before the fetus reaches the age of viability. This study aimed to estimate the pooled prevalence of repeat-induced abortion and its determinants among women in Ethiopia.

Materials and methods: PubMed, HINARI and Google Scholar were systematically searched for eligible studies. A random effect model was used to estimate the pooled prevalence. The Cochrane Q-statistics and I^2 tests were used to assess heterogeneity between included studies.

Results: The estimated pooled prevalence of repeat-induced abortion was 30.89% (95% CI: 28.88–32.91). Alcohol consumption (POR = 3.60, 95%CI: 2.26–5.74), assuming the procedure painless (POR = 2.79, 95%CI: 1.77–4.39), no fertility awareness (POR = 3.45, 95% CI: 1.05–11.36), and women with multiple sexual partners (POR = 4.31, 95% CI: 3.36–5.53) were significantly associated with repeat-induced abortion.

Conclusion: The study revealed that about one in ten women who had a history of abortion experienced repeat-induced abortion. Alcohol consumption, no fertility awareness, assuming the procedure is painless, and having multiple sexual partners were significantly associated with repeat-induced abortion.

1. Background

Induced abortion is the termination of pregnancy for more than one time using drugs or surgical intervention before the fetus reaches the age of viability [1,2]. Repeat-induced abortion is termination of pregnancy for more than one time [3]. According to the World Health Organization (WHO), from 2015 to 2019, an average of 73.3 million induced abortions were performed worldwide [4]. It is also estimated that for every 1000 women at reproductive age, there were 35 induced abortions, and 25% of all pregnancies ended in induced abortion [4].

Induced abortion puts women's reproductive health at risk. For example, it can lead to postpartum death, genital infections, and severe and prolonged bleeding [5]. In addition, it increases the risk of low birth weight, and preterm birth in future pregnancies and psychological disorders like depression or mood disorders, self-harm attempts, and breast cancer [6–8].

Abortion rates have dropped by 41% over the past two decades, but not in developing countries [9]. Asia contributes half of the world's 25 million unsafe abortions [10]. The number of abortions in Africa increased from 4.6 million annually in 1990–1994 to 8.2 million in 2010–2014 [11]. The annual rate of abortion in Africa was estimated to be 34 per 1000 women [11]. The World Health

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Organization (WHO) says that abortion rates among married women in 2010–2014 were 73% [9]. Each year in Africa an estimated 15% of all pregnancies end in abortion. For instance, 42% of women seeking abortions in Tunisia had repeat-induced abortions [12]. In Nigeria, it ranges from 23 to 28% [13,14], and 9–16% in Kenya [12,15]. The studies in Ethiopia reported that the rate of repeat-induced abortion ranges from 20.30% to 35.4% [3,16–20]. Among the factors that were found to affect repeat-induced abortion were adverse childhood experiences, gender-based violence, marital status, physical or sexual violence, condom usage, age, educational status, and contraceptive usage [11,21–25].

Abortion is legal in Ethiopia under the following circumstances: to save the life of the woman, to preserve physical health, to preserve mental health, rape or incest, and fetal impairment [26]. In Ethiopia, women's knowledge of abortion laws influences the search for safe abortions, and lack of knowledge results in abortion outside health facilities [27]. In 2014, 53% of pregnancies were legally terminated in Ethiopia [28].

Although there have been previous meta-analysis study conducted in Ethiopia [29], the present one is different from the previous ones. In the previous study, the prevalence of repeat-induced abortion was pooled based on the results from six studies [,19,20,30–33]. In addition, we studied new variables which were not included in the previous meta-analysis. Moreover, we have extracted a total of eight studies (we estimated the pooled prevalence from six), whereas they only extracted five and determined the pooled prevalence from four only. In addition, they did not include one study that was published many years before they published this study. In this regard, our study can be considered as an update of the previous meta-analysis. Thus, this systematic review and Meta-analysis is intended to summarize the pooled prevalence to fill the gap of the previous study and to identify determinants of repeat-induced abortion in Ethiopia. The findings from this study will help policymakers and concerned bodies in the prevention or minimization of repeat-induced abortion.

2. Methods

2.1. Registration and protocol

The study protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO), the University of York Centre for Reviews and Dissemination (ID number: CRD42019136653). This review and meta-analysis was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guideline [34] (S1 Table).

2.2. Eligibility criteria

For eligibility criteria we used PICOT (P: Population, I: Indicator/Intervention, C: Comparison, O: Outcome, T: Timeframe/Type of Study).

2.3. Inclusion and exclusion criteria

All case-control and cross-sectional studies in Ethiopia conducted to examine the prevalence and or the determinants of repeat-induced abortion were compared against women having one induced abortion. All studies conducted on repeat induced abortion before the data extraction period were included. Both published and unpublished articles in the English language were considered. Case reports, case series, systematic reviews, and qualitative studies were excluded. Studies on repeat spontaneous termination and qualitative studies were not included.

3. Outcome measurement

The main outcome variable for this meta-analysis is the pooled prevalence of repeat-induced abortion and its determinants. Repeat-induced abortion was defined as the termination of pregnancy for more than one time using drugs or surgical intervention before the fetus reached the age of viability. Attempts were made to include cross-sectional, cohort, and case-control studies on outcomes of interest.

3.1. Information sources and search strategy

PubMed, Hinari, and Google Scholar searched for relevant articles and no date limit has been set. Google and National University Digital Libraries, such as the electronic library of Addis Ababa University were searched to include a grey literature. Hand-search strategies of the reference lists of all included studies were also conducted. For PubMed and Hinari the title and abstracts were searched. For Google Scholar, we searched by writing the words "repeat induced abortion" directly to the search box. The Boolean operators like "OR" and "AND" were used to combine the search terms. Afterward, the identified articles were directly transferred to the Endnote citation manager software. Search terms like "*prevalence*", "*magnitude", "factors", "determinants", "repeat"," induced abortion" and Ethiopia"* were used. Examples of searching strategies fit for the database search are available in supporting information (S2 Table).

The following procedures were followed in this systematic review. First, the electronic database search results were imported into reference management software (Endnote citation manager) and all duplicates were removed. In the second step, all articles were screened by their title, abstract, and full text for eligibility against the predefined inclusion and exclusion criteria. Third, a full document manuscript review was conducted and studies were removed via the predefined exclusion criteria. Finally, those included

articles were evaluated based on the Joana Brigg's Institute (JBI) quality assessment tool [34,35].

3.2. Data extraction

The data charting process was done independently by authors (KS and SM) using a Microsoft Excel format. Discordance between authors was fixed by discussion. The data extraction form for the prevalence included the name of the authors, year of publication, regions where the study was conducted, sample size, response rate, setting, type of study design, and prevalence with 95% confidence intervals. For the second outcome (determinant factors), the adjusted odds ratios with a 95% confidence interval were extracted.

3.3. Risk of bias

The quality of each article was appraised by the author (KS) using the Joana Briggs's Institute (JBI) critical appraisal checklist for cross-sectional and case-control studies having eight and ten checklist items, respectively.

Cross-sectional studies: were assessed using the JBI Critical Appraisal Checklist for Analytical Cross-Sectional Studies [34]. The checklist has 8 parameters: 1) criteria for inclusion in the sample clearly defined; 2) study subjects and the setting described in detail; 3) exposure measured validly and reliably; 4) objective, standard criteria used for the measurement of the condition; 5) confounding factors identified, 6) strategies to deal with confounding factors stated; 7) the outcomes measured validly and reliably; and 8) Was appropriate statistical analysis used? All articles had high scores and all of them were included in the study (**S3tab.**). The risk of bias assessment was done by SM.

Case-control study: was assessed using the JBI Critical Appraisal Checklist for case-control Studies [35]. The checklist has a maximum of 10 points with a score of 0, 1, unclear, and not applicable. The parameters include: 1) Were the groups comparable other than the presence of disease in cases or the absence of disease in controls? 2) Were cases and controls matched appropriately? 3) Were the same criteria used for the identification of cases and controls? 4) Was exposure measured in a standard, valid, and reliable way? 5) Was exposure measured in the same way for cases and controls? 6) Were confounding factors identified? 7) Were strategies to deal with

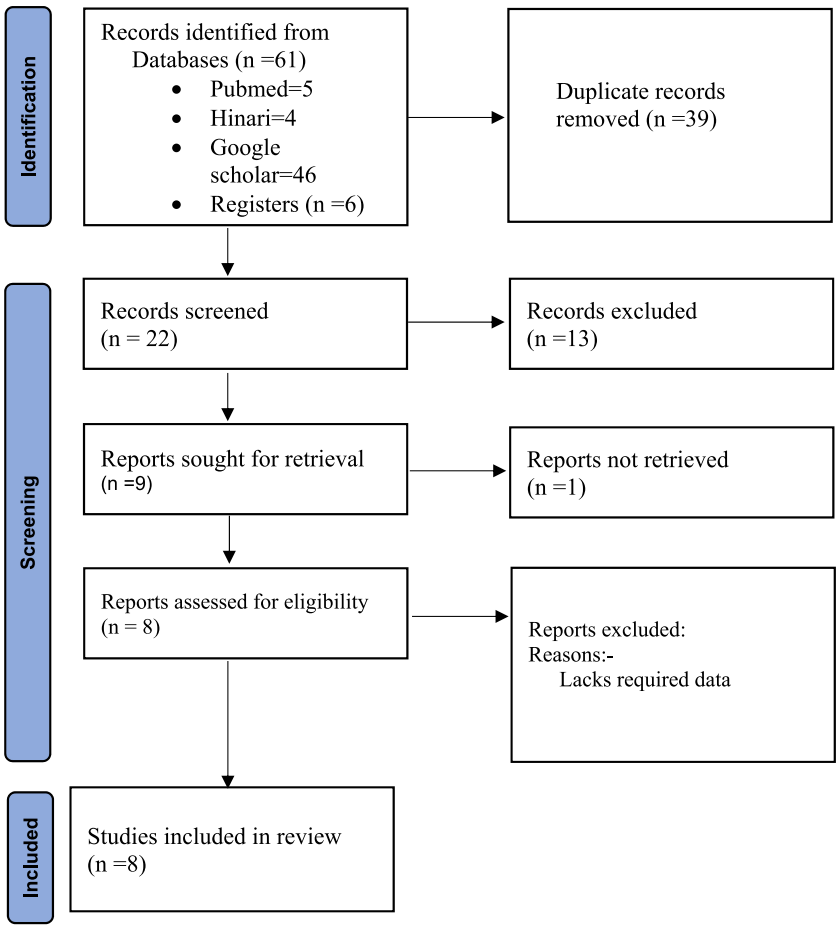

Fig. 1. Preferred reporting System for meta-analysis and systematic review flow chart of the overall phases for the prevalence of repeat-induced abortion.

confounding factors stated? 8) Were outcomes assessed in a standard, valid, and reliable way for cases and controls? 9) Was the exposure period of interest long enough to be meaningful? 10) Was appropriate statistical analysis used?

3.4. Data synthesis

The prevalence of repeat-induced abortion was computed by dividing the number of repeat-induced abortions by the total number of induced abortions. The standard error for the first outcome variable (prevalence) was calculated using the formula SE = $\sqrt{pq/n}$. The heterogeneity of reported prevalence was assessed by computing Cochrane Q-statistic and I^2statics. I^2 test statistics results of 25%,50%, and 75% were declared as low, moderate, and high heterogeneity respectively [36]. The test statistic for the pooled prevalence showed significant heterogeneity among the studies (I^2 = 85.3, p=<0.001), and as a result, the random-effect model was used for the meta-analysis test result. For the second outcome (determinants), data were computed by pooling adjusted odds ratio with its 95% CI reported in the original studies. The odds ratio was then log transformed to normalize the distribution and stabilize the variance. STATA version 14 software (StataCorp LP.2015, College Station, TX: USA) was used for all statistical analyses.

3.5. Publication bias

Egger's test and funnel plot were used to assess publication bias. A P-value of less than 0.05 was used to declare the publication bias.

3.6. Sensitivity analysis

Leave-one-out sensitivity analysis was performed to assess the influence of a single study on the overall pooled estimate. The result of the sensitivity analysis is presented in Fig. 4.

4. Results

4.1. Selection of sources of evidence

Sixty-one studies were identified through our initial search. Of these, 39 studies were excluded for duplication reasons. From the remaining 22 articles, 13 articles were excluded after reviewing their titles and abstracts confirmed non-relevance to this review. Nine articles were sought for retrieval. One was removed and 8 articles that fulfilled the eligibility criteria were included in the final analysis (Fig. 1).

4.2. Characteristics of the included studies

There are eight studies included in this review, of which six of them were cross-sectional study by design [3,16–20] and two was case-control [37,38]. The total sample size of original studies included in this meta-analysis ranges from 309 which is from the study conducted in the Tigray region [37] to 1200 in the study conducted in Addis Ababa [16] (Table 1). The highest and lowest prevalence of repeat-induced abortion was reported from the studies conducted in the Amhara region and Southern nation, nationalities and peoples of the region, which was 35.40 (95% CI:30.8–40.0) [20] and 20.30 (95% CI: 16.14–24.46) respectively [3]. Regarding the response rate, all studies had a high response rate (>94%).

4.3. Prevalence of repeat-induced abortion among ethiopian women

As described in Fig. 2, the current Meta-analysis showed the pooled prevalence of repeat-induced abortion was 30.82% (95% CI: 26.59–35.04) with a significant heterogeneity (I^2 = 85.3, p=<0.001) and Cochran's Q test ($chi^{2=}$ = 34.12, p < 0.001). Egger's tests showed that there is no statistically significant publication bias with p-value = 0.77. However, the funnel plot test seems asymmetrical (S1fig), even though the funnel plot test is not recommended for studies smaller than 10 [39].

We performed the subgroup analysis based on the region of the study to check for the source of the variation. Accordingly, the highest heterogeneity reported was from the Amhara region ($I^{2=}$95.9%, P < 0.001). Zero heterogeneity was reported from the study

Table 1
Summary characteristics of studies included in the study of the prevalence of repeat-induced abortion among women of Ethiopia.

	Authors	year	Region	Setting	design	sample	Prevalence
1	Prata et al.	2013	Addis Ababa	Health facility	Prospective cross-sectional	986	30 (27.45,32.55)
2	Alemayew et al.	2017	Tigray	Health facility	Case-control	309	
3	Getachew	2014	Addis Ababa	Health facility	cross-sectional	355	31 (26.20,35.80)
4	Alemayehu B et al.	2015	Addis Ababa	Health facility	cross-sectional	429	33.6 (29.09,38.11)
5	Behulu et al.	2019	Amhara	Health facility	cross-sectional	355	20.3 (16.14,24.46)
6	Waktola et al.	2020	Amhara	Health facility	Cross-sectional	547	34.9 (30.90,38.90)
7	Girma et al.	2022	SNNPR	Health facility	Cross-sectional	410	35.4 (30.7–40)
8	Binayew et al.	2022	Sidama	Health facility	Case control	350	

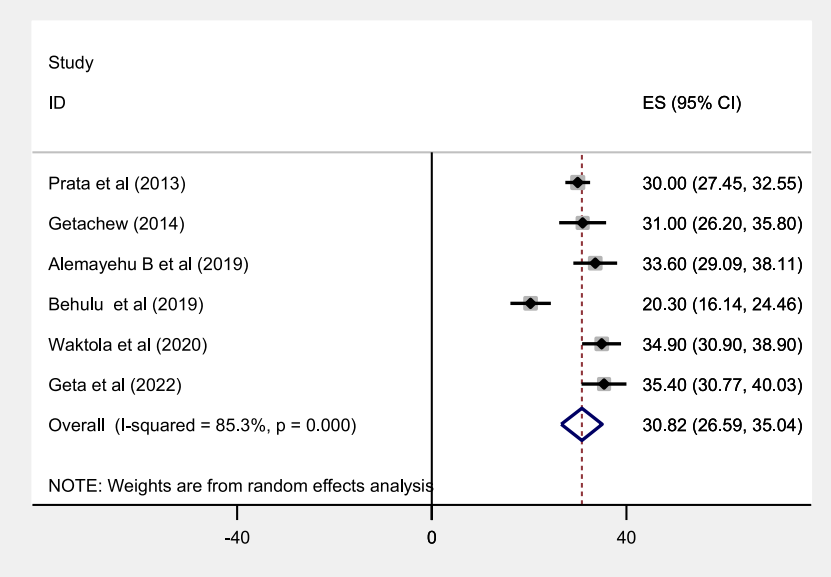

Fig. 2. Forest plot showing the overall pooled prevalence of repeat-induced abortion among women in Ethiopia.

conducted in Addis Ababa ($I^{2=}$0.0, P = 0.395) (Fig. 3).

4.4. Sensitivity analysis

The leave–one–out sensitivity analysis was used to check for the effect of a single study on the overall pooled prevalence. The test did not show the effect of a single study on the overall pooled prevalence. The pooled odds ratio ranged from (OR = 29.94, 95% CI: 25.25–34.62) to (OR = 32.65, 95%CI: 30.30–35.00) (Fig. 4).

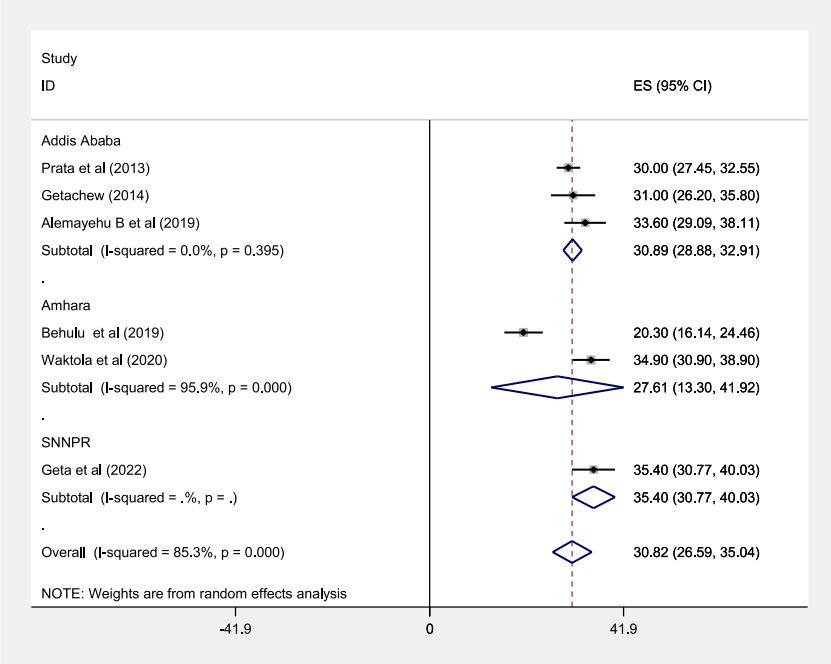

Fig. 3. Forest plot consisting the subgroup analysis of the pooled prevalence of repeat-induced abortion by region of the study.

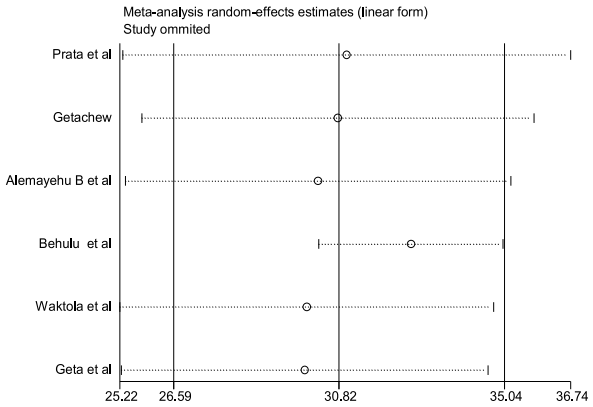

Fig. 4. Forest plot showing the sensitivity analysis.

4.5. Factors associated with repeat-induced abortion

4.5.1. Association of alcohol consumption and repeat-induced abortion

The association between alcohol consumption and repeat-induced abortion was examined based on the findings of two studies [19,20,]. The pooled odds ratio (AOR: 3.60, 95% CI: 2.26–5.74) showed that alcohol consumers were at higher risk of repeat-induced abortion than non-consumers. The studies showed moderate heterogeneity (I^2 = 27.3% and p < 0.001) (Fig. 5). Hence a random effect model was employed to do the final analysis.

4.5.2. Association assuming the procedure painless and repeat-induced abortion

Four studies [,20,38,40] reported the association between assuming the procedure painless and the risk of repeat-induced abortion. It indicated that assuming the procedure painless has a statistically significant association with repeat-induced abortion. The pooled

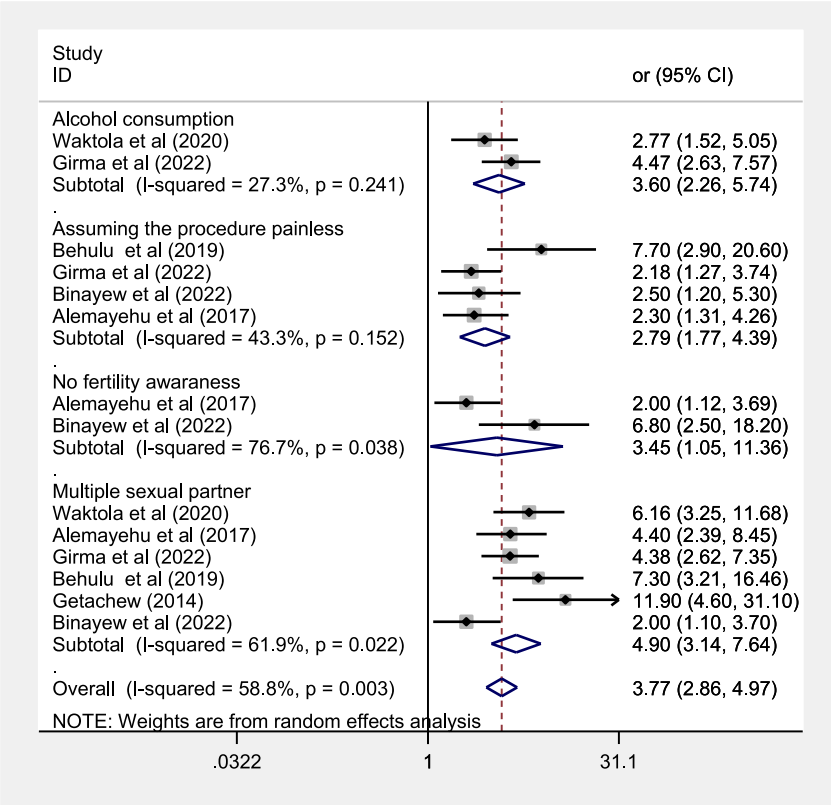

Fig. 5. The pooled odds ratio of the determinants of repeat-induced abortion among women in Ethiopia.

result of these studies showed that women assuming the procedure painless were 2.79 times (OR: 2.79, 95% CI: 1.77–4.39) more likely to repeatedly induce abortion compared to their counterparts. The study exhibited moderate heterogeneity (I = 43.3, p = 0.152) (Fig. 5).

4.6. Fertility awareness and its association with repeat-induced abortion

The Meta-analysis to test the association between repeat-induced abortion and the absence of fertility awareness was based on the results of two studies [38,40]. The pooled odds ratio (AOR = 3.45, 95% CI: 1.05–11.36) showed that the absence of fertility awareness has a statistically significant association with repeat-induced abortion. The I^2 test showed the existence of moderate heterogeneity (I2 = 76.7%, p = 0.038) (Fig. 5).

4.6.1. Association between the number of partners and repeat-induced abortion

This study assessed the association between a number of partners and repeat-induced abortion using four studies [3,17,19,20,37,38]. The result of this meta-analysis showed that having more than one sexual partner was positively associated with repeat-induced abortion. The pooled odds ratio showed that women having more than one partner had 4.9 times (AOR: 4.9, 95%; CI: 3.14–7.64) higher odds of RIA compared to their counterparts. The included studies showed moderate heterogeneity ($I^2 = 61.9\%$ and $p < 0.022$) (Fig. 5).

5. Discussion

This systematic review and meta-analysis was conducted to determine the pooled prevalence and determinants of repeat-induced abortion (RIA) among Ethiopian women. The estimated pooled prevalence of RIA in the study was 30.82%. According to this study, about one in ten women who had an abortion had a repeat-induced abortion. This indirectly indicates a high number of previous abortions. It may also indicate the presence of a weak health system or the inability of family planning programs to prevent unwanted pregnancies in the study area [41].

The finding of this meta-analysis is similar to those of a preliminary study in Switzerland (30.1%) [42], Vietnam 31.7% [43], and Canada (31.7%) [23]. However, it is higher than the primary studies conducted in Kenya (16%) [15], Nigeria (23%) [14], Finland (14.1%) [44], Vietnam (11.5%) [22] and Norway (11.7%) [45]. This finding is lower than the study conducted in Tunisia (42.2%) [46], Sweden (35%) [47], Estonia (58%) [48], and Georgia (70%) [25]. This difference may be ascribed to the differences in abortion laws and availability of services.

In this study, the authors also tried to identify determinants of repeat-induced abortion among Ethiopian women. Accordingly, Alcohol consumption, assuming the procedure is painless, no fertility awareness, and women having multiple sexual partners were significantly associated with RIA.

This meta-analysis study revealed that women consuming alcohol were more likely to repeatedly induce abortion than non-consumers. This is similar to the study conducted in the United States of America [49], and Russia [50]. The effect of alcohol on repeat abortion is multifaceted. In a study conducted elsewhere, it was found that alcohol consumption increases the behavior of sexual risk-taking like engaging in unprotected sexual intercourse, having multiple sexual partners, and lesser use of contraception [51], because it removes pressure, relaxes, and reduces stress [52], hence leading to unprotected sex and unplanned pregnancy [53]. However, the risk of repeat abortion among alcohol consumers was dose-dependent. It was also hypothesized that alcohol use leads to abortion by increasing substance abuse[50] and substance use increases the likelihood of unplanned pregnancy and subsequent abortion [54]. Supporting this is another study conducted in Russia [52].

Assuming the abortion procedure painless was also found to have a positive relation with repeat induced abortion. If abortion is not seen as painful, it can be considered as a family planning method. Therefore, family planning methods cannot be used to prevent unwanted pregnancies in the first place. However, whether assuming the abortion procedure is painless or negligence to use family planning that leads to unwanted pregnancy needs further investigation.

Lack of fertility awareness, as evidenced by the current study was associated with the likelihood of increased repeat induced abortion. The possible reason behind this may be ascribed to the absence of knowledge regarding the fertile period during the monthly cycle and the return of fertility after birth might lead to unplanned pregnancy. The study conducted in 29 African countries indicated that incorrect knowledge of ovulation was a significant predictor of unintended pregnancy [55]. There is evidence that shows the relationship between fertility awareness and family planning usage and the preferred time of having children [56].

This meta-analysis shows that women who have multiple sexual partners are more likely to have repeat-induced abortions. This is in line with the study done in Cambodia [57] and the USA [58]. The possible explanation is that having multiple sexual partners will expose a woman to unstable relationships and several sexual episodes in sex, which leads to irregular use of contraceptives and unintended pregnancy, and subsequent abortion [19,57,59,].

5.1. Limitations of the study

There may be underreporting of the issue during the primary study due to the sensitivity of the topic. Secondly, because of the absence of studies that were conducted in a community, the current finding may not be generalizable to the whole women in the country. In addition, the primary studies included in this meta-analysis were conducted only in four regions of Ethiopia. Hence, all regions in Ethiopia were not equally represented. Moreover, the presence of high heterogeneity was also sought as a limitation.

5.2. Sexual and reproductive health implication

Safe abortion and access to family planning services are women's right. Worldwide about 218 million women have an unmet need for family planning. Reducing an unmet need for family planning reduces unwanted pregnancies and unsafe abortions. The presence of repeat-induced abortion in this study may indicate the unmet need for family planning. This implies low coverage of sexual and reproductive health services.

6. Conclusion

This systematic review and meta-analysis revealed that about one in ten women who had a history of induced abortion experienced repeat-induced abortion. Being alcohol consumers, absence of fertility awareness, assumption of abortion induction as a painless procedure, and having multiple sex partners were significantly associated with repeat-induced abortion. Reproductive health and contraceptive education are recommended for older women and for women's having multiple sex partners.

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Author contribution statement

Kenbon Seyoum: Conceived and designed the experiments; Performed the experiments; Analyzed, and interpreted the data; wrote the paper. Sheleme Mengistu: Analyzed and interpreted the data, materials, analysis tools or data; Wrote the paper.

Data availability statement

Data included in article/supplementary material/referenced in article.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Not applicable.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e20277.

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