



Research article

Prevalence and determinants of unintended pregnancy in Ethiopia: narrative synthesis and meta-analysis

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ABSTRACT

Background: Unintended pregnancy has enormous health, social and psychological impacts. Thus, comprehensive local evidence is required to guide interventions to prevent the occurrence and consequences of unintended pregnancy. This systematic review was conducted to examine the prevalence and determinants of unintended pregnancy in Ethiopia.

Methods: The review was done following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and Synthesis Without Meta-analysis (SWiM) guideline. Electronic databases including Medline/PubMed, Cochrane Library, CINAHL, Google scholar, and African journal online were searched to retrieve studies published from January 1/1990 to October 30/2020. Grey literatures were accessed from the online libraries of academic institutions in Ethiopia using the Google search engine. The qualities of the studies were assessed using Joanna Briggs Institute critical appraisal checklists. The retrieved studies were analyzed using STATA software version 13. The prevalence of unintended pregnancy was pooled using the random-effects model. The evidences on the determinants of unintended pregnancy were summarized in a narrative format. The statistical heterogeneity between studies was quantified by using the I-square values. Sub-group analysis and meta-regressions were done to identify the sources of heterogeneity among studies.

Results: A total of 250 studies were retrieved of which 25 studies with 23,030 women were included for meta-analysis. Only 24 studies scrutinized the determinants of unintended pregnancy. The overall prevalence of unintended pregnancy was 30 % (95% CI; 27–33 %) with high heterogeneity among studies ($I^2 = 95.06$ %). The pooled prevalence of unwanted and mistimed pregnancy was 12 & 17% respectively. The study region was the source of heterogeneity whereas study setting, study year, sample size, and study quality score were not the sources of heterogeneity ($p > 0.1$). Unintended pregnancy was positively associated with a low level of education, poverty, multiparity, rural residence, extreme ages, being unmarried, lack of decision-making power, inaccessibility of health facilities, poor knowledge, and non-use of contraceptives.

Conclusions: The pooled prevalence of unintended pregnancy in Ethiopia was high. Empowering women and ensuring the accessibility of quality family planning services can reduce the prevailing high prevalence of unintended pregnancy. Interventions that target rural, poor, unmarried, multiparous, less-educated, and adolescent women are also important to avert unintended pregnancy in Ethiopia.

1. Introduction

The current 7.3 billion population are expected to reach 8.5 billion by the year 2030 and 9.7 billion by the year 2050. Most of the projected increase in the global population is expected from the sub-Saharan Africa region [1]. Illiteracy, family desire, social norms, and lack of access to modern contraceptives are the main reason for the higher contribution of the region to the global population [2, 3, 4, 5, 6, 7].

Unintended pregnancy is defined by the World Health Organization (WHO) as a pregnancy which is not wanted and/or not planned at the time of conception [8]. Likewise, the International Federation of Obstetricians and Gynecologists (FIGO) defines unintended pregnancy as a gestation that is unwanted or mistimed at the time of conception [9]. An unwanted pregnancy occurs when no children or no more children are desired. Mistimed pregnancies, on the other hand, occurs earlier than the desired time [10]. Globally, an estimated 44% of pregnancies were

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unintended in the year 2010–2014. The prevalence of unintended pregnancy remains high in developing countries. About 65 pregnancies per 1000 women in developing countries and 112 per 1000 in East Africa were unintended in the year 2010–2014 [11]. Unintended pregnancy is a major public health problem in Ethiopia [3, 5, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23].

According to the International Conference on Population and Development (ICPD), couples have the right to decide freely and responsibly the number and spacing of their children [24]. The high prevalence of unintended pregnancy in developing countries may indicate neglect of this fundamental right. On the other hand, It has been documented that preventing unintended pregnancy contributes to achieving this fundamental right [25]. Unintended pregnancy is also an issue of great public health concern because of its adverse health consequences for the mother and children [26, 27]. Unintended pregnancy is associated with induced abortion and eventually the complications which are usually due to poor abortion care services, especially in resource-constrained settings [28].

In addition to its health impacts, several studies have documented that it has huge socio-economic and psychological impacts [29, 30, 31]. For instance, it reduces the educational performance of both the women and children [29, 30], reduces the extent of mother to child relationships [29], leads to unstable marriage, depression, and anxiety [30].

Several studies are available on the magnitude and determinants of unintended pregnancy in Ethiopia [3, 5, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23]. Studies conducted in Ethiopia from 2001 to 2019 showed a wide variation of its prevalence, ranging from 13.7% to 42.4% [3, 5, 8, 15, 16, 17, 18, 19, 20, 21, 22, 23] across geographical areas. Various reasons for unintended pregnancies have been documented in Ethiopia. One of the reasons is the non-use of contraceptive methods [12, 15, 16]. Several studies have reported different predictors of unintended pregnancies, including socio-economic [5, 13, 16, 17, 19] and obstetric factors [3, 5, 13, 15, 16, 17, 19, 21, 23]. The determinants of unintended pregnancy also varied across geographical areas in Ethiopia.

Periodic Demographic and Health Survey reports (DHS) may provide nationally representative data on the prevalence of unintended pregnancy [12, 32]. However, well-organized and summarized national data on the determinants of unintended pregnancy is limited in Ethiopia. Moreover, the prevalence of unintended pregnancy needs to be better summarized by using study characteristics such as study region, setting, year, and methodological quality score. Nevertheless, DHS reports do not provide information about the prevalence of unintended pregnancy with different characteristics of the study population.

The aforementioned limitations could be addressed through systematically reviewing and pooling existing studies on the prevalence and determinants of unintended pregnancy in Ethiopia. Well-organized, pooled data on the prevalence and determinants of unintended pregnancy will enable policy-makers and other stakeholders to design strategies aimed at preventing unintended pregnancy. It will also help to monitor the progress of programs targeted at reducing unintended pregnancy. Therefore, the aims of this review were to estimate the pooled prevalence of unintended pregnancy and to examine its determinants between 1990 and 2020 in Ethiopia.

2. Methods

2.1. Setting

Ethiopia is located in the horn of Africa and it covers an area of 1,104,300 km². The country is divided into ten regional states and two city administrations. The 2019 population of Ethiopia was estimated to be 112,078,730 million. It is the second-most populous country in Africa next to Nigeria [33].

Ethiopia has made efforts to balance population growth and economic development. In this regard, the country introduced modern family planning in the 1960s and endorsed population policy in 1993. The national guideline for family planning services was launched in 2011 [34].

The country has made great efforts to improve the utilization of modern contraceptives over the last decades.

2.2. Review development

The system of reporting for this review was based on the PRISMA and SWiM guideline. The page numbers where each component of the PRISMA and SWiM guidelines are found in the main document is presented as additional files (Additional file 1 and 2). The presence of precursor meta-analysis, narrative synthesis and/or protocols on the topic of interest were checked from major databases for systematic reviews such as Cochrane Database of a Systematic Review, the National Institute for Health Research Centre Review and Dissemination Database, Health Technology Assessment (HTA) database, Joanna Briggs Institute Database of a Systematic Review and Implementation Reports (JBI-DSRIR), and the Campbell collaboration library and evidence for policy and practice information.

The presence of precursor meta-analysis, narrative synthesis and/or protocols on the topic of interest were searched using combinations of key terms, including “unintended pregnancy”, “unwanted pregnancy”, “mistimed pregnancy”, Ethiopia, “meta-analysis”, “narrative synthesis” and protocols. The search of the above databases showed that there were no protocols and/or reviews on the topic of interest in Ethiopia.

2.3. Outcome measure

The outcome of interest is unintended pregnancy which is defined as a pregnancy either unwanted (no more children are desired) or mistimed (occurred sooner than desired) at the time of conception [10, 32].

2.4. Criteria for considering studies for the review

2.4.1. Inclusion criteria

- We included published and unpublished primary studies reported among participants residing in Ethiopia. Unpublished studies are studies that are not published in peer and non-peer-reviewed journals.
- For Meta-analysis of prevalence studies, we included observational studies that reported prevalence (cross-sectional and cohort studies). For narrative synthesis of the determinants of unintended pregnancy, we included analytical cross-sectional, case-control, and cohort studies.
- We included studies published/reported starting from January 1/1990 to October 30/2020. We included studies published after 1990 to provide a contemporary estimation of unintended pregnancy in Ethiopia. In addition, the cut-point was decided by the authors to compare the pooled prevalence of unintended pregnancy during the millennium development goals (MDGs) and after the launch of the sustainable development goals (SDGs).
- We included studies published/reported in the English language since the majority of studies in Ethiopia are reported in English. Furthermore, reading and understanding other languages are not feasible.

2.4.2. Exclusion criteria

- Studies that didn't report the definition/measurement of unintended pregnancy and/or didn't provide sufficient information of the study methods (study design and sample size) were excluded.
- Studies conducted among Ethiopian population living outside Ethiopia.
- Studies exclusively conducted on women seeking abortion care were excluded to minimize overestimation of the true prevalence. It is documented that the majority of abortion cases are related to unintended pregnancy [14, 35].
- Case report, case series, opinion pieces, letters, and qualitative studies were excluded.
- For information reported in more than one study, only the most recent version was included.

- Prevalence studies scoring <60% of the JBI methodological checklists for prevalence studies were not included in the meta-analysis. Furthermore, studies with a high risk of bias (<60% of the JBI methodological checklists for analytical studies) were also not included in the narrative synthesis.

2.5. Search strategy for identifying relevant studies

The searching strategy involved two stages:

Stage-1: Searching the bibliographic databases: The major bibliographic databases were searched to identify published articles starting from January 1/1990 to October 30/2020. The major databases searched were Medline/PubMed, Cochrane library, Cumulated Index to Nursing and Allied Health Literature (CINAHL), Google scholar and African journal online. Grey literatures were accessed from the online library of academic institutions in Ethiopia using the Google search engine. We used combinations of key terms, including “unintended pregnancy” or “unwanted pregnancy” or “mistimed pregnancy”. The above key terms were searched together with medical subject heading (MeSH) and/or CINAHL headings. Moreover, terms that describe prevalence and determinants such as magnitude, burden, associated factors, factors, and correlates were added to make the search more specific. The search strategies for the major databases (PubMed, and CINAHL) are found in additional files (Additional files 3 and 4).

Stage-2: Searching other sources: In this stage, the reference lists of all included studies were hand-searched to identify additional studies and reports.

2.6. Selection of studies for inclusion in the review

All articles identified from bibliographic databases were exported to Zotero version 5.0.57 for managing references. After removing the duplicated articles, two authors (KMK) and (ASB) independently screened articles based on title and abstract. Then, the two authors (KMK) and (ASB) independently assessed the full texts of included articles by strictly applying the inclusion and exclusion criteria. Any discrepancies between the two authors during the screening of titles, abstracts, and assessment of full texts were resolved through discussions and consensus. All the procedures for the selection of studies were done using the PRISMA flow diagram [36].

2.7. Data collection/extraction

Two authors (KMK&ASB) independently extracted data using data extraction format adapted from JBI [37]. Before the actual data extraction, the adapted data extraction format was piloted on randomly selected sub-groups of studies. Any discrepancy in the data extraction process was resolved through discussions with the third author (ASS). We extracted data pertaining to the followings:

- Study design: study type (case-control, cross-sectional, cohort), sampling methods (random or non-random)
- Publication details: publication year, publication status and first author's name
- Study population characteristics: region of the study, study setting, median/mean age, number of study participants, participants with an unintended pregnancy, unwanted pregnancy, and mistimed pregnancy and the time when pregnancy intention was asked.

2.8. Critical appraisal of included studies

We used the JBI critical appraisal checklists for prevalence and analytical cross-sectional studies [38, 39]. The JBI critical appraisal checklists for prevalence studies contain nine items which include: addressing the target population, appropriateness of participant recruitment, adequacy of sample size, detailed description of study subjects,

data analysis with sufficient coverage of the identified sample, use of valid methods for identification of the condition, measurement of the condition in a standardized and reliable way for all participants, use of appropriate statistical analysis and adequacy of response rate.

The JBI critical appraisal checklists for analytical cross-sectional studies contain eight items which include: clarity of inclusion criteria, detailed description of study subjects, validity, and reliability of exposure measurement, use of objective and standard criteria for measuring the condition, identification of confounding factors, description of strategies to deal with confounding, validity and reliability of outcomes measurement and use of appropriate statistical analysis methods. The items used for critical appraisal of prevalence and analytical cross-sectional studies are presented in additional files (Additional files 5 & 6). For prevalence studies, each study was evaluated from 100% and predetermined categories: >80 %, 71–79 %, 60–70%, and <60 were used to rate the quality of each study. The categories were roughly determined by the authors before the critical appraisal stage of the review process. Primary studies scored <60% of the methodological checklists were not included in the meta-analysis. Two authors (KMK & ASB) critically appraised the included studies. Any disagreement between KMK and SAB was resolved through discussion with the third author (ASS).

2.9. Data synthesis and assessment of heterogeneity for meta-analysis

The extracted quantitative data were exported from Microsoft excel 2007 to Stata software (Stata Corp V.13, Texas, USA) for analysis. The pooled prevalence of unintended pregnancy was estimated using the random-effects meta-analysis models. Random-effects models attempt to generalize findings beyond the included studies by assuming that the selected studies are random samples from a larger population [40]. A sensitivity analysis was also done by splitting unintended pregnancy into unwanted and mistimed pregnancy. Before pooling the data, the variance of the study-specific prevalence was stabilized with the Freeman-Tukey double arc-sine transformation [41]. The heterogeneity between studies was quantified statistically using the I-square values. According to Higgins JP *et al*, I-squared values of 25, 50, and 75% represent low, medium, and high heterogeneity, respectively [42]. The clinical heterogeneity was explored using sub-group analysis. A sub-group analysis was done to investigate the possible sources of heterogeneity using the following grouping variables: study region, study setting, and study year. Furthermore, meta-regression analyses were done using study-level covariates (sample size and methodological quality score) to explain methodological heterogeneity. The presence of publication bias was assessed using funnel plots and Egger's tests. In the absence of bias, the plot will look like a symmetrical inverted funnel. On the other hand, if there is bias, funnel plots will often be skewed and asymmetrical. In Egger's test, p-values less than 0.05 imply significant publication bias [43].

2.10. Data synthesis and assessment of heterogeneity for narrative synthesis

We assumed that reporting of the determinants of unintended pregnancy present high heterogeneity. Therefore, data on the determinants of unintended pregnancy were summarized in a narrative format. The SWiM guideline was used to report the narrative synthesis [44]. The SWiM guideline contains nine items: grouping studies for synthesis, standardized metric and transformation methods used, synthesized methods used, criteria used to prioritize results for summary and synthesis, investigation of heterogeneity in reported effects, the certainty of the evidence, data presentation methods, reporting results and limitations of the synthesis. The determinants of unintended pregnancy were grouped into positive and negative factors. The Adjusted Odds Ratio (AOR) and the corresponding Confidence Intervals (CI) were extracted to discuss the strength of association and level of confidence. The association between exposure variables and unintended pregnancy was synthesized using vote counting based on the direction of the association. In

the narrative analysis, the heterogeneity was assessed using the informal approach. In the informal approach, we categorized the negative and positive associated factors with the different sources of heterogeneity such as study region, setting, and population. We applied the constructs of the GRADE (Grading of Recommendation, Assessment, Development, and Evaluation) approach to assess the certainty in evidence in narrative synthesis [45]. The constructs of the GRADE include methodological limitations of the studies, indirectness, imprecision, inconsistency and likelihood of publication bias. The constructs and their illustrations are presented as an additional file (Additional file 7). Then, the overall certainty of the evidence was rated as high certainty, moderate certainty, low certainty, and very low certainty [45]. The results of narrative synthesis are presented in texts and tables.

3. Results

3.1. Study selection

The review included both published and unpublished studies conducted in Ethiopia between 01/01/1990 and 30/10/2020. A total of 250

studies (240 published and 10 unpublished) were retrieved. After the removal of 163 duplicated studies, 87 articles were left. The titles and abstracts of 87 articles were screened before assessing the full texts. About 52 articles were excluded on the basis of their titles and abstracts. The full texts of 35 articles were assessed by applying the eligibility criteria. Of the 35 articles, 2 were excluded because these studies were done among high-risk populations such as among women who came for abortion care [14] and among commercial sex workers [20]. Additionally, two studies were not included because they were exclusively qualitative [46, 47]. Two additional studies were excluded because they didn't report the definition or measurement of unintended pregnancy [48, 49]. Furthermore, 3 studies were not included in the meta-analysis and narrative synthesis because they were of poor methodological quality [50, 51, 52]. Finally, 25 studies with a total of 23,030 women were included in the meta-analysis. From the 25 included studies, two of them were unpublished studies [53, 54]. One study didn't assess the determinants of unintended pregnancy [22]. Therefore, only 24 studies were included in the narrative synthesis. The overall selection, screening, and inclusion process is presented using PRISMA flow diagram (Figure 1).

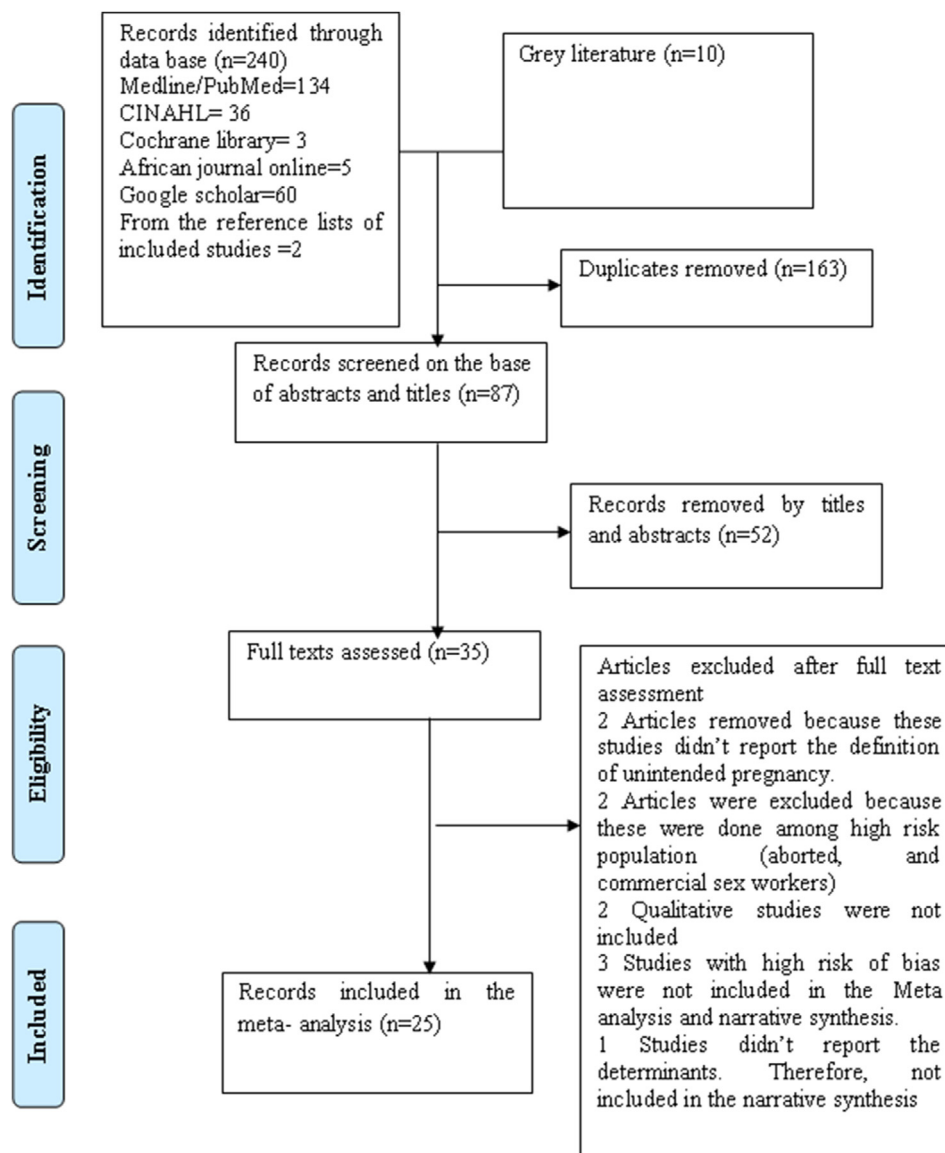


Figure 1. PRISMA flow diagram of the included studies for the meta-analysis and Narrative synthesis of the prevalence and determinants of unintended pregnancy in Ethiopia.

3.2. Characteristics of included studies

The characteristics of included studies are presented in an additional file (Additional file 8). All of the included studies were cross-sectional. From the 25 studies, one study used data from Kersa Demographic Surveillance and Health Research Center, East Ethiopia [19]. Two studies used the 2011 [17] and 2016 [55] Ethiopian DHS data respectively. All other studies were primary surveys. The majority of the studies were community-based and all of them used random sampling techniques. A majority of the studies were conducted in the two big regions of Ethiopia where nearly 70 % of the population resides: Amhara [13, 16, 23, 53, 56, 57] and Oromia [5, 8, 15, 21, 22, 58, 59]. Fifteen studies included both rural and urban populations [3, 5, 8, 13, 16, 17, 19, 21, 22, 23, 53, 55, 56, 60, 61]. Two studies included exclusively urban population [54, 62]. However, for the remaining 8 studies the numbers of urban and rural populations were not described [5, 15, 18, 20, 57, 58, 63, 64]. All of the included studies were conducted among reproductive-aged women (15–49 years old).

For seventeen studies, respondents were asked their pregnancy intention only during pregnancy [5, 8, 13, 15, 16, 17, 19, 23, 54, 56, 57, 59, 60, 61, 62, 64, 65]; whereas for 4 studies respondents were asked their pregnancy intention during pregnancy and after childbirth [3, 21, 53, 63]. For three studies, respondents were asked their pregnancy intention after childbirth [22, 55, 58]. Six studies didn't separately report the proportion of unwanted and mistimed pregnancy [15, 18, 63]. Furthermore, for one study, the time when respondents were asked about their pregnancy intention was not reported [18].

3.3. The methodological quality of prevalence studies

Using the JBI critical appraisal tools of prevalence studies, 18 scored >80 % [3, 5, 8, 13, 15, 17, 19, 21, 22, 23, 32, 55, 56, 57, 58, 59, 63, 64], 3 scored 71–79 % [16, 18, 61] and 5 scored 60–70% [20, 53, 54, 60, 62]. The quality of all primary prevalence studies assessed using the JBI critical appraisal checklists for prevalence studies is presented in an additional file (Additional file 9).

3.4. The pooled prevalence of unintended pregnancy

The crude prevalence of unintended pregnancy in the pooled sample of 23,033 reproductive age women was 30 % (95% CI; 27–33 %) (Figure 2). A sensitivity analysis of unintended pregnancy (splitting into unwanted and mistimed pregnancy) was also made. The prevalence of unwanted pregnancy in the pooled sample of 19,812 reproductive age women was 12 % (95% CI; 9–15 %) (Figure 3). The prevalence of mistimed pregnancy in the pooled sample of 19,812 reproductive age women was 17 % (95% CI; 15–20 %) (Figure 4). The heterogeneity between included studies was high for unintended ($I^2 = 95.06$; $p < 0.001$); unwanted ($I^2 = 96.99$; $p < 0.001$) and mistimed pregnancy ($I^2 = 95.55$; $p < 0.001$).

3.5. Assessment of publication bias for prevalence studies

Visual inspection of the funnel plot for both crude and sensitivity analysis suggested a slight asymmetry of the funnel plots. The funnel plots of unintended, unwanted and mistimed pregnancies are presented in an additional files (Additional files 10 to 12). However, the Egger regression of tests didn't confirm significant publication bias for both crude and sensitivity analysis ($P > 0.05$).

3.6. Assessment of heterogeneity for prevalence studies

The prevalence of unintended, unwanted, and mistimed pregnancy among sub-groups including assessment of heterogeneity and difference between sub-groups are presented in Tables 1, 2, and 3. As indicated in Tables 1, 2, and 3, the source of heterogeneity was their origin from the various regions of Ethiopia for both crude and sensitivity analysis ($p < 0.001$). The pooled prevalence of unintended pregnancy was low in the Amhara region and high in South Nations Nationalities and Peoples Region (SNNPR). Unwanted pregnancy was highest in SNNPR while mistimed pregnancy was highest in the Oromia region. The sub-group analysis of both crude and sensitivity analysis showed that study setting and year were not the sources of heterogeneity. Furthermore, the meta-regression of study-level covariates showed that sample size and

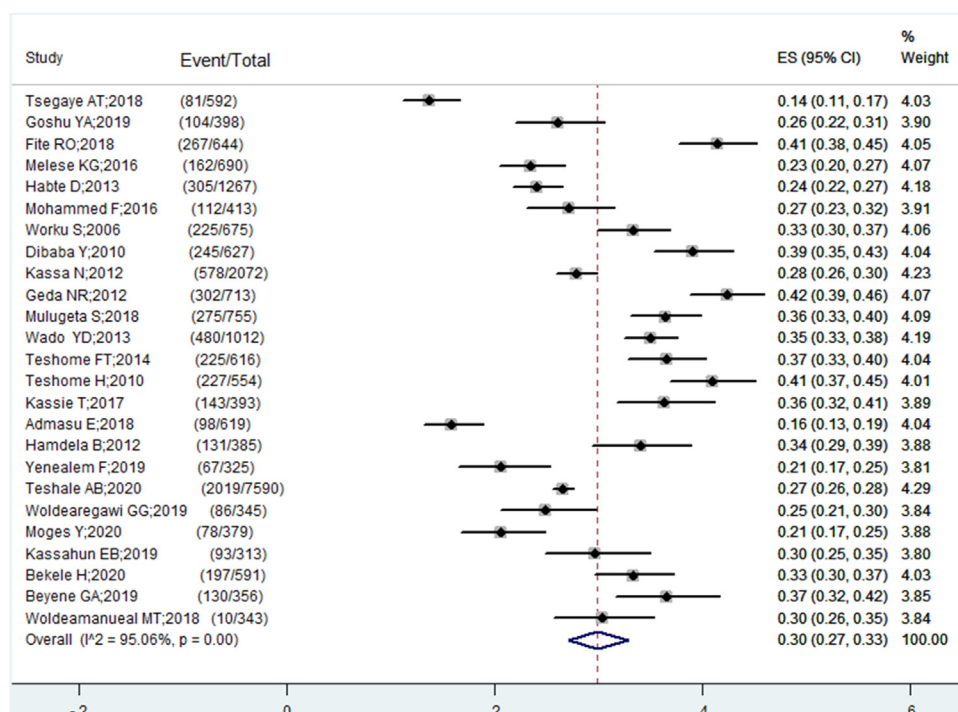


Figure 2. Meta-analysis and forest plot presentation of unintended pregnancy in Ethiopia from 1990 to 2020.

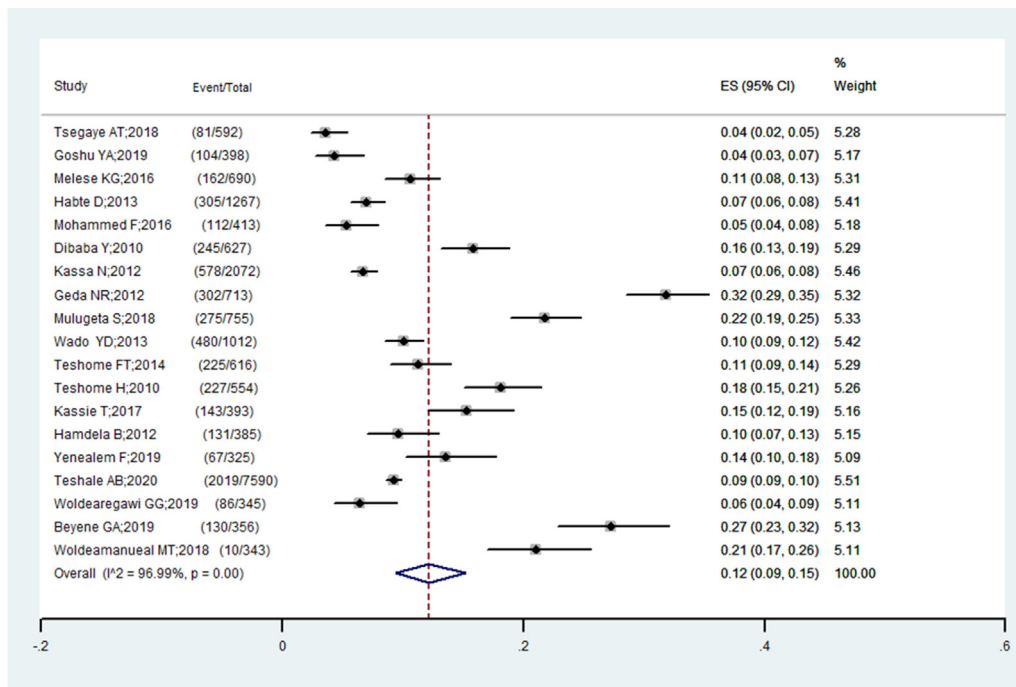


Figure 3. Meta-analysis and forest plot presentation of unwanted pregnancy in Ethiopia from 1990 to 2020.

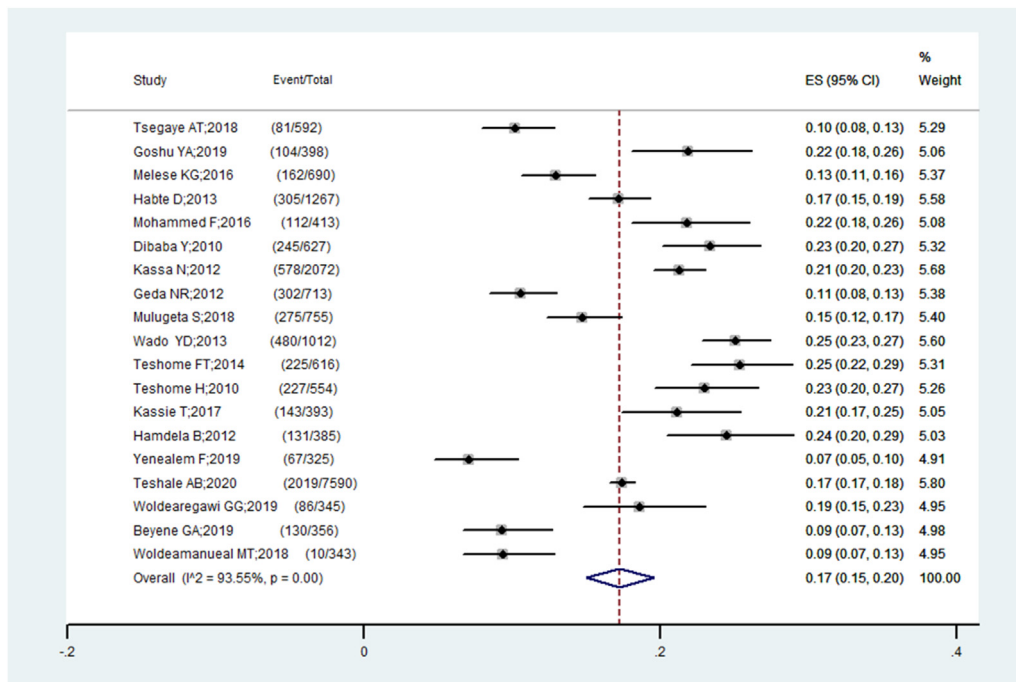


Figure 4. Meta-analysis and forest plot presentation of mistimed pregnancy in Ethiopia from 1990 to 2020.

study quality score were not the sources of heterogeneity ($p > 0.1$) (Tables 1, 2, 3, and 4).

3.7. Determinants of unintended pregnancy

3.7.1. Textual description of studies

A total of 24 studies scrutinized the determinants of unintended pregnancy [3, 5, 8, 13, 15, 16, 17, 18, 19, 20, 21, 23, 53, 54, 55, 56, 57, 58, 59, 60, 61, 63, 64]. Most studies assessed the

socio-demographic and economic determinants of unintended pregnancy. Women's autonomy and decision-making power as determinants of unintended pregnancy were investigated in the 13 studies [3, 8, 15, 17, 21, 23, 53, 54, 56, 60, 62, 63, 65]. Nine studies investigated the association between access to health facilities or family planning clinics and unintended pregnancy [3, 15, 19, 21, 23, 55, 60, 63, 65]. Fifteen studies assessed the association between contraceptive knowledge/use and unintended pregnancy [8, 13, 15, 17, 19, 23, 53, 54, 56, 58, 59, 60, 61, 62, 64, 65].

Table 1. Sub-group analysis of the prevalence of unintended pregnancy in Ethiopia, 1990–2020.

Sub-group	Number of studies	Number of participants	Number of cases	Prevalence, % (95% CI)	I ² , %	p-heterogeneity	p-difference
Study region							
Overall	25	23033	6734	30 (27–33)	95.06	P < 0.001	P < 0.001
Amhara	6	3178	739	23 (16–31)	96.47	P < 0.001	
Oromia	7	4617	1656	36 (33–39)	78.66	P < 0.001	
All region	2	8865	2324	26 (25–27)	-	-	
Harari	2	2747	803	29 (28–31)	-	-	
SNNPR	3	1853	708	38 (33–43)	-	-	
Addis Ababa	2	736	247	34 (30–37)	-	-	
Tigray	3	1037	257	25 (20–30)	-	-	
Study setting							
Overall	25	23033	6734	30 (27–33)	95.06	P < 0.001	P = 0.42
Community	17	19858	5817	31 (27–34)	96.45	P < 0.001	
Health facility	8	3175	917	28 (25–32)	79.88	-	
Study year							
Overall	25	23033	6734	30 (27–33)	95.06	P < 0.001	P = 0.35
Before 2015 (before MDG)	15	11447	3558	31(27–35)	95.41	P < 0.001	
2016–2019 (post MDG)	9	11559	3159	28 (24–33)	93.8	P < 0.001	

NA = Not applicable; MDG = Millennium Development Goal.

Table 2. Sub-group analysis of the prevalence of unwanted pregnancy in Ethiopia, 1990–2020.

Sub-group	Number of studies	Number of participants	Number of cases	Prevalence, % (95% CI)	I ² , %	p-heterogeneity	p-difference
Study region							
Overall	19	19812	2185	12 (9–15)	96.99	P < 0.001	P < 0.001
Amhara	5	2559	255	9 (4–15)	95.72	P < 0.001	
Oromia	5	3382	424	13 (8–19)	95.63	P < 0.001	
All region	2	8865	786	9 (8–9)	-	-	
Harari	1	2072	138	NA	NA	NA	
SNNPR	3	1853	428	20 (10–33)	-	-	
Addis Ababa	2	736	132	18 (15–21)	-	-	
Tigray	1	345	22	NA	NA	NA	
Study setting							
Overall	19	19812	2185	12 (9–15)	96.99	P < 0.001	P = 0.35
Community	14	17920	1992	13 (10–17)	97.47	P < 0.001	
Health facility	5	1081	193	10 (4–16)	95.02	-	
Study year							
Overall	19	19812	2185	12 (9–15)		P < 0.001	P = 0.94
Before 2015 (before MDG)	14	10772	1279	12 (9–16)	97.11	P < 0.001	
2016–2019 (post MDG)	5	9040	906	12 (6–20)	96.99	P < 0.001	

NA = Not applicable; MDG = Millennium Development Goal.

3.7.2. Grouping of studies

Based on previous reviews in developing countries [66, 67], we categorized the determinants of unintended pregnancy into four categories: socio-demographic & economic, women's autonomy and decision-making power, accessibility-related determinants, and knowledge & use of contraceptives. Furthermore, we grouped the determinants into positively and negatively associated factors. The negatively and positively associated factors with corresponding AOR, CI, or P-values are presented in an additional file (Additional file 13).

3.7.3. Investigation of heterogeneity for the determinants of unintended pregnancy

We examined heterogeneity in reported AOR or CI by grouping the determinants with the various study characteristics such as study region, population, and setting. This informal way of investigating the heterogeneity is presented in Table 5 and elaborated in the socio-economic women's autonomy, accessibility, knowledge, and use of contraceptive sub-sections.

3.7.4. Socio-demographic and economic determinants of unintended pregnancy

This category included age, level of education, marital status, wealth, parity, birth interval, and family size. As indicated in Table 5, the association between age and unintended pregnancy varied across study settings and population. In the community-based studies where the majority of the participants were rural, advanced age was strongly and positively associated with unintended pregnancy [3, 15, 23, 53, 60, 62]. On the contrary, a study done by Worku *et al* [18] among all sexually active urban reproductive-aged women revealed that adolescents were more likely (AOR; 4.23(CI; 1.42–10.54)) to experience unintended pregnancy.

Irrespective of study population and settings, several studies found weak (AOR; 1.15(P = 0.004)) [3], moderate (AOR; 1.85(CI; 1.23–2.79)) [58] and strong AOR; 7.4 (1.93,28.94) [54] association between education level (being illiterate) and unintended pregnancy. In the predominantly urban population, Worku *et al* and Kassie *et al* found moderate (AOR; 1.65(CI; 1.01–2.6)) [18] and strong association (AOR;

Table 3. Sub-group analysis of the prevalence of mistimed pregnancy in Ethiopia, 1990–2020.

Sub-group	Number of studies	Number of participants	Number of cases	Prevalence, % (95% CI)	I ² , %	p-heterogeneity	p-difference
Study region							
Overall	19	19812	3591	17 (15–20)	93.55	P < 0.001	P < 0.001
Amhara	5	2559	386	14 (9–21)	94.39	P < 0.001	
Oromia	5	3382	768	21(16–26)	92.83	0.47	
All region	2	8865	1538	17(17–18)	-	-	
Harari	1	2072	440	NA	NA	NA	
SNNPR	3	1853	280	16(10–24)	-	-	
Addis Ababa	2	736	115	15 (13–18)	-	-	
Tigray	1	345	64	NA	NA	NA	
Study setting							
Overall	19	19812	3591	17(15–20)	93.55	P < 0.001	P = 0.61
Community	14	17920	3235	17 (14–20)	94.74	P < 0.001	
Health facility	5	1892	356	18 (14–23)	87.35	P < 0.001	
Study year							
Overall	19	19812	3591	17 (15–20)	93.55	P < 0.001	P = 0.27
Before 2015 (before MDG)	14	10772	2054	18(15–21)	94.21	P < 0.001	
2016–2020(post MDG)	5	9040	1537	15(11–19)	90.80	P < 0.001	

NA = Not applicable; MDG = Millennium Development Goal.

Table 4. Meta-regression analysis of study-level covariates to explain the sources of heterogeneity for meta-analysis of the prevalence and determinants of unintended pregnancy in Ethiopia, 1990–2020.

	Variables	exp(b)	95% CI	P-value
Unintended pregnancy	Sample size	0.9999947	(0.9999738–1.000016)	0.606
	Quality score	0.9993412	(0.9961832–1.002509)	0.671
Unwanted pregnancy	Sample size	0.999992	(0.9999708–1.000013)	0.436
	Quality score	0.9989376	(0.9954348–1.002453)	0.532
Mistimed pregnancy	Sample size	1.000001	(0.9999868–1.000015)	0.878
	Quality score	0.9996036	(0.9969364–1.002278)	0.758

7.91(CI, 1.29–48.64)) [56] between unintended pregnancy and primary or vocational level of education.

Studies conducted among predominantly urban population showed moderate [18] and strong [8, 15, 16, 57, 62] association between being single and unintended pregnancy. Mohamed *et al* also found a strong association (AOR; 5.5(CI; 2.25–13.64)) [5] between being single and unintended pregnancy in predominantly rural population. On the other hand, community-based studies showed that married women were less likely to experience unintended pregnancy [55, 63]. Irrespective of study settings, several studies showed that high family size/parity was strongly and positively associated with unintended pregnancy [3, 5, 8, 13, 15, 16, 19, 21, 59, 60, 61, 64].

In the majority of the studies, residence and wealth were not significantly associated with unintended pregnancy. However, community-based studies among rural dominated populations revealed that unintended pregnancy was moderately associated with rural residence (AOR; 2.6(CI; 1.5–4.6)) [23] and poor wealth index (AOR; 1.47(CI; 1.14–1.90)) [19].

3.7.5. Women's autonomy and decision-making power as determinants of unintended pregnancy

Studies in Oromia (AOR; 2.93(CI; 1.65–5.19)) [15] and SNNPR (AOR; 4.27(p < 0.0001)) [3] showed a strong association between unintended pregnancy and lack of autonomy to choose contraceptives. Irrespective of study settings, disagreement on the family size was

significantly associated with unintended pregnancy [16, 60, 64]. Furthermore, Teshome *et al* found a strong association (AOR; 3.96(p < 0.001)) [53] between husbands' disapproval of family planning and unintended pregnancy among studies of predominantly rural populations. Tsegaye *et al* [23] reported that women who decided on family planning either by themselves (AOR; 0.4(0.2–0.8)) or with their husbands (AOR; 0.2(0.1–0.40)) were less likely to experience an unintended pregnancy.

3.7.6. Accessibility related determinants of unintended pregnancy

Studies conducted among the predominantly rural populations showed that women who traveled more than an hour to reach the health facilities were more likely to experience unintended pregnancy [19, 21]. Although they didn't control for knowledge and decision making power, Melese *et al* reported a strong association (AOR; 3.56(CI; 1.69–7.53)) [16] between unintended pregnancy and traveling more than an hour to reach the health facilities among the predominantly urban population. Community-based studies in Oromia (AOR; 0.63(CI; 0.42–0.95)) [60] and SNNPR (AOR; 0.30(p < 0.0001)) [3] showed that women who had never been visited by health or family planning workers were more likely to report unintended pregnancy. Woldearegawi *et al* also confirmed that women who had never been visited by health extension workers for reproductive health services were more likely to experience unintended pregnancy(AOR = 1.7 (CI(1.09–5.128)) [65]. Moreover, two studies [3, 53] revealed that women who were not exposed to mass media were more likely to experience unintended pregnancy.

3.7.7. Contraceptive use and knowledge as determinants of unintended pregnancy

In both community and health facility-based studies, women who didn't know or had less knowledge about contraceptives were more likely to report unintended pregnancy [53, 56, 59]. However, we noted that these studies didn't control for the confounding effect of the accessibility of family planning clinics. One community-based study in the Oromia region showed that low contraceptive knowledge was strongly associated (AOR; 3.76(CI; 2.37–5.96)) [60] with unintended pregnancy even after controlling for the accessibility of family planning clinics. Community based studies among predominantly rural populations revealed that unintended pregnancy was moderately (AOR; 2.04(p = 0.031)) [53] and strongly (AOR; 4.53(CI; 3.05–6.75)) [58] associated with non-use of contraceptives.

Table 5. Sub-group analyses of positively and negatively associated factors of unintended pregnancy with study characteristics in Ethiopia (1990–2020).

		Study region						Study population			Setting		Reference	
		All regions	Amhara	Oromia	Harari	SNNPR	Addis Ababa	Tigray	Pregnant women	Pregnant and who gave birth	All reproductive age women	Community		Health facility
Positively associated	Live in rural area		✓						✓				✓	[13]
	Advanced age		✓	✓		✓		✓		✓		✓		[3, 15, 23, 53, 60, 62]
	Age 15-19				✓						✓	✓		[18]
	Marital status(single)		✓	✓	✓		✓	✓	✓		✓	✓	✓	[5, 15, 18, 34, 54, 57, 61, 65]
	Wealth (poor)				✓				✓			✓		[19]
	Not discussing pregnancy related issue with husband		✓				✓		✓			✓	✓	[23, 56]
	Large family size	✓	✓	✓				✓	✓	✓		✓	✓	[8, 55, 57, 59, 61]
	High parity/gravidity	✓	✓	✓	✓	✓			✓	✓		✓	✓	[3, 5, 8, 13, 15, 16, 19, 21, 55, 60, 64]
	Illiterate women		✓	✓		✓	✓		✓	✓		✓	✓	[3, 54, 58]
	Primary level of education	✓			✓				✓		✓	✓		[17, 18]
	Technical school						✓		✓				✓	[56]
	Don't know any methods of contraceptive/low knowledge		✓	✓			✓		✓	✓		✓	✓	[53, 56, 59, 60, 68]
Positively associated	Long walking distance		✓		✓	✓		✓	✓		✓			[16, 19, 21]
	Never use contraceptives		✓	✓			✓	✓	✓		✓	✓		[53, 54, 58]
	No health professional visited			✓				✓		✓	✓	✓		[15, 65]
	Ever use of family planning	✓						✓			✓			[17]
Negatively associated	Middle age (30–34 years)	✓						✓			✓			[17, 55]
	Exposed to mass media					✓		✓			✓			[3]
	Marital status(married)	✓	✓							✓	✓			[15, 63]
	Decision on family planning(herself)		✓							✓	✓			[23]
	Decision on family planning(both)		✓							✓	✓			[23]
	Secondary level of education		✓					✓				✓		[13]
	Family planning worker visited		✓		✓		✓	✓		✓				[3, 60]

✓ indicates the variable was significantly associated with unintended pregnancy in that study level characteristics.

3.7.8. Strength of evidence for the determinates of unintended pregnancy

The strength of evidence for narrative synthesis is presented as an additional file (Additional file 14). Using the JBI critical appraisal checklists for analytical cross-sectional studies, we judged that eight studies had a low risk of bias [8, 15, 17, 19, 21, 55, 59, 60]. Three studies [50, 51, 52] had a high risk of bias and therefore were not included in the narrative synthesis. The risk of bias assessment for individual studies included in the narrative synthesis is presented in an additional file (Additional file 15). The participants and exposure variables in the studies all provided direct evidence to the question at hand. Therefore, the indirectness is not serious. For most studies, the confidence interval was not large and the total participants were fairly large (>400). Therefore, we judged the evidence had no serious imprecision. The strength and direction of association varied across the different studies. As a result, we judged that the evidence had inconsistencies. Moreover, both published and grey literatures were searched from major data databases and online libraries. Therefore, we did not strongly suspect publication bias. Overall, we judged that the certainty of the evidence was moderate.

4. Discussions

The aims of this review were to estimate the pooled prevalence and synthesis the determinants of unintended pregnancy in Ethiopia between 1990 and 2020. This review revealed that unintended pregnancy is a major public health problem in Ethiopia. One-third of pregnancies among reproductive-age women were unintended between 1990 and 2020. The narrative synthesis showed that illiterate, single, multiparous, poor, and rural women were more likely to experience an unintended pregnancy. Lack of access to family planning clinics, lack of decision-making power, poor knowledge of contraceptives, and non-use of contraceptives contributed to the high pooled prevalence of unintended pregnancy in Ethiopia. The finding from this review may provide valuable insights for programmers, policymakers, and implementers to design strategies that can address the identified factors.

In this review, the identified studies are fairly sufficient to address the objectives of the review. However, except one study [19], all other studies didn't separately assess the determinants of unwanted and mistimed pregnancy. Therefore, it is difficult to comment on whether different factors accounted for unwanted and mistimed pregnancy in this review. However, studies in Africa showed that women who experienced mistimed pregnancy are younger than those who experienced unwanted pregnancy [19, 69]. Moreover, the time when pregnancy intention was asked has a significant effect on the prevalence of unintended pregnancy. For instance, women may give a positive response if they are asked about pregnancy intention after childbirth. A smiling baby may result in a more positive memory of past intention [10, 70]. As 4 studies [3, 21, 53, 63] measured pregnancy intention both during pregnancy and after childbirth, we could not do a subgroup analysis to examine the difference in prevalence between after and before childbirth.

This review included large numbers of participants for meta-analysis. Therefore, it provides a more precise national prevalence of unintended pregnancy than estimation from individual studies. The studies included for both meta-analysis and narrative synthesis didn't show serious risk of bias. However, the narrative synthesis may suffer from inconsistency as the strength and direction of association varied across the different studies. Overall, the evidence generated from the narrative synthesis was moderate.

The current review showed that the pooled prevalence of unintended pregnancy in Ethiopia was high and comparable with the average prevalence of unintended pregnancy in developing countries estimated between 1990 and 2015 (35%) [66]. However, it is lower than the prevalence of unintended pregnancy estimated in developing countries between 2010 & 2014 (65.5%) [11]. The observation of high prevalence of unintended pregnancy in developing countries between 2010 & 2014 may be due to the inclusion of high-risk population such as women who

came for abortion care services [11]. In the current review, studies conducted among high-risk populations were excluded. Inclusion of high-risk populations may overestimate the prevalence of unintended pregnancy.

The pooled prevalence of unwanted and mistimed pregnancy was also high in Ethiopia. More than one in ten and nearly one in five pregnancies over the last three decades were unwanted and mistimed respectively. This is a critical concern for policy makers and clinicians as risky behaviors and adverse birth outcomes are common among women with mistimed and unwanted pregnancy [71].

As indicated in the sub-group analysis, the prevalence of unintended pregnancy was not influenced by study setting, the methodological quality of included studies, sample size, and study year ($p > 0.1$). However, a significant difference across study regions in Ethiopia was observed. The lowest prevalence of unintended pregnancy was observed in the Amhara region; this may be partly explained by the high contraceptive coverage [32]. The most recent DHS of Ethiopia showed that modern contraceptive utilization was high in the Amhara region (47%) [32]. However, this should be cautiously interpreted as certain regions in Ethiopia (Afar, Gambella, and Somalia) were not represented by individual studies.

In the narrative synthesis, we identified several demand and supply-side related determinants of unintended pregnancy. This implies that a single intervention may not be effective in preventing unintended pregnancy in Ethiopia. The contemporarily available evidence also showed that there is no single best intervention/strategy to prevent unintended pregnancy [72, 73, 74]. A recent review suggested that a combination of interventions such as the provision of contraceptives and comprehensive sex education can reduce the prevailing unintended pregnancy [72].

Ideally, Ethiopian health services are assumed to be on the doorsteps of everyone. On the other hand, the current narrative synthesis revealed that illiterates, poor, unmarried, rural, and women with high parity were more likely to experience an unintended pregnancy. This may indicate the toll of the high unmet need for family planning among these groups. Poor, illiterate, and rural women may not easily access modern contraceptive services as well as information regarding the risks of unintended pregnancy.

The current review showed that unintended pregnancy was significantly associated with higher parity and extremities of ages (old-age and adolescents). A systematic review of studies on the prevalence and determinants of unintended pregnancy in developing countries also found similar findings [66]. A significant association between the extremities of ages and unintended pregnancy may suggest programmers focus on these groups of women. More importantly, the type of unintended pregnancy may differ among adolescents and old-aged women. Mistimed pregnancy is more common among adolescents, whereas unwanted pregnancy is more common among older reproductive-age women [10, 71]. Furthermore, this review identified that unmarried women were more likely to experience unintended pregnancy than married women. Unmarried women may not use modern contraceptives [75] because they feel ashamed of their sexual activity [76]. This risky sexual behavior may, in turn, expose them to unintended pregnancy.

In addition to socio-demographic variables, unintended pregnancy was significantly associated with decision-making power and women's autonomy. Men are often considered the ultimate decision makers in the patriarchal society of developing countries like Ethiopia. Women living in such societies are given fewer opportunities to self-support and are economically dependent on men. Observers found that women with low social status and autonomy are less likely to control their fertility [77, 78]. Hence, empowering women to decide by their own selves or jointly may enable them to access modern family planning and other reproductive health care services [68, 79].

Studies that included predominantly rural population, showed that women living a far distance from the health facilities were more likely to experience an unintended pregnancy. This may suggest that although Ethiopia has made remarkable efforts to improve the accessibility of

health services, still health services are not accessible to the rural population. The health extension program (HEP) has been introduced to improve the accessibility of basic health services including family planning to the rural population in Ethiopia [80, 81]. Health extension workers (the backbone of this program) have been deployed in rural areas to enhance the accessibility of health services. Nevertheless, they may be overburdened with various activities [80, 82] so that they may not counsel and provide modern contraceptives to most marginalized women. Furthermore, various contraceptive options may not be available in remote areas.

Finally, the narrative synthesis showed that poor knowledge and non-use of contraceptives were significantly associated with unintended pregnancy. Lack of knowledge of contraceptive options and non-use of contraceptives have been significant contributing factors for unintended pregnancy in developing countries [66]. A study showed that contraceptive failure can also contribute to the high burden of unintended pregnancy [83]. We couldn't identify studies that assess the association between pregnancy intention and contraceptive failure. But, it can be assumed that method failure might have increased unintended pregnancy in Ethiopia. This is because significant proportion of women in Ethiopia use short-acting contraceptives which are prone to method failure [32]. A significant association between contraceptive knowledge and use with pregnancy intention implies the importance of raising the knowledge of women on the available contraceptive options and side effects.

5. Strengths and limitations of the review

This review is the first and up-to-date review of unintended pregnancy in Ethiopia. The review has certain strengths and limitations. It included both published and unpublished studies and the PRISMA and SWiM guidelines were strictly followed at each stage of the review process. Health facility-based data may not be representative of the general population. However, in this review, the majority of the studies were community-based. Therefore, the finding of this review is more likely to be representative of the general population. In this review, studies reported only in the English language were included. Therefore, the introduction of language bias is expected. However, publishing studies in other languages are uncommon in Ethiopia. Therefore, the introduction of language bias is unlikely.

6. Conclusions

The pooled prevalence of unintended pregnancy in Ethiopia was high. The determinants of unintended pregnancy were both demand and supply side implying that a single intervention may not be effective in preventing unintended pregnancy. Empowering women and ensuring the accessibility of quality family planning services can reduce the prevailing high-unintended pregnancy. Interventions that target poor, rural, unmarried, multiparous, adolescents and less-educated women are also important to avert unintended pregnancy in Ethiopia.

Declarations

Author contribution statement

Kindie Mitiku Kebede and Alemayehu Sayih Belay: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Abyot Asres Shetano: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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The authors declare no conflict of interest.

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