



Determinants of pelvic organ prolapse in Ethiopia: Systematic review and meta-analysis

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ABSTRACT

Background: Pelvic organ prolapse (POP) is a significant cause of morbidity both in developed and developing countries. The burden of POP was much higher in lower-income countries like Ethiopia. However, the exact prevalence of POP and determinant factors are unknown in Ethiopia.

Objective: The main aim of this systematic review and meta-analysis is to estimate the pooled prevalence of POP and determinant factors associated with its occurrence in Ethiopia.

Methods: Electronic database searches were conducted through Google scholar, PubMed, Science Direct, and Cochrane Library. Essential data were extracted using a Microsoft Excel format and analyzed using STATA Version 14.0. Heterogeneity was checked using the heterogeneity I_2 test and p-values at ($I_2 = 98.9\%$, $p < 0.001$). Duval and Tweedie's Trim and Fill analysis were employed for the possible existence of significant publication bias ($p < 0.002$, Egger's, Begg's, $p < 0.015$).

Result: The pooled prevalence of pelvic organ prolapse in Ethiopia was 24.02% (95% CI: 13.52, 34.51). Age ≥ 40 years (AOR: 9.08; 95% CI: 6.89, 11.97), parity ≥ 4 (AOR: 5.40; 95% CI: 1.96, 14.88), home delivery (AOR: 10.84; 95% CI: 5.27, 22.28), and rural residence (AOR: 8.00; 95% CI: 5.28, 12.11) were determinant factors.

Conclusion: The pooled prevalence of pelvic organ prolapse was high in Ethiopia. Ages of mothers, parity, residence, and place of delivery for the last pregnancy were found to be determinants of pelvic organ prolapse. Attention should be given to those factors to curve the prevalence of pelvic organ prolapse and possible complications.

1. Introduction

A prolapse is a protrusion of an organ or structure beyond its normal confines (Dobbs, 2013; "Gynecology by Ten Teachers"). Pelvic organ prolapse is the descent of a pelvic organ into or outside of the vaginal canal which results from weakness or injury of the pelvic floor supports with resulting descent of one or more vaginal compartments (anterior, apical, and/or posterior) (Bureau & Carlson, 2017). It is caused and aggravated by the heavy physical burdens of daily work and severely affects women's lives in a low-income setting (Gjerde, Rortveit, Muleta, Adefris, & Blystad, 2017).

Pelvic organ prolapse (POP) is one of the major gynecologic problems which affect the quality of life of many women worldwide, especially of old ages (Siraneh & Workneh). For many women it can cause vaginal bulge and pressure, voiding dysfunction, defecator dysfunction, and sexual dysfunction, which may adversely affect the quality of life. POP decreased self-confidence and increase negative body image. This physical and emotional sequel can limit physical activity and decrease productivity (Tulikangas & GYNECOLOGY, 2019). Women with POP had also high depressive symptoms (Zelege, Ayele, Woldetsadik,

Bisetegn, & Adane, 2013).

Pelvic organ prolapse is a significant cause of morbidity both in developed and developing countries. According to a systematic review conducted in countries of different economy the mean prevalence of POP was 40%. The burden of prolapse was much significant in lower and lower-middle-income countries (42.44%) than countries with a higher economy (35.56%) (Paudel et al., 2019).

The etiology of POP has emerged from different contexts. Of these, intrinsic factors (genetics, age, postmenopausal status, positive family history, and ethnicity) and extrinsic factors (parity, BMI, carrying a heavy object, history of the previous hysterectomy, vaginal birth, fetal macrosomia, co-morbidities, and occupation) are the most components (Kudish et al., 2011; Lince, van Kempen, Vierhout, & Kluivers, 2012; Vergeldt, Weemhoff, IntHout, & Kluivers, 2015).

Many women with POP have not gotten timely treatment because of fear of disclosure due to social stigma and lack of money, especially in low-income countries (Adefris et al., 2017). Treatment choice depends on the type and severity of symptoms, age, and medical co-morbidities, desire for future sexual function and/or fertility, and risk factors for recurrence. It may be surgical or nonsurgical (Iglesia & Smithling,

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2017). Nonsurgical options are important for women for whom surgery is contraindicated or not preferred. Evidence from the literature indicates that pessary use and pelvic floor muscle training are effective options when conservative treatment is desired (Tso, Lee, Austin-Ketch, Winkler, & Zitkus, 2018).

In Ethiopia, the exact prevalence of POP is unknown. Because of the presence of multiple risk factors (early marriage and delivery, high fertility, high proportion of home delivery, high incidence of obstructed labor, high prevalence of malnutrition, the majority of rural women engagement in heavy physical work), but the prevalence of POP in Ethiopia is expected to be among the highest in the world (Health, 2016). Therefore; the main aim of this systematic review and meta-analysis was to estimate the pooled prevalence and determinant factors of pelvic organ prolapse in Ethiopia including factors that were not addressed by the previous study (Gedefaw & Demis, 2020). Findings from the current study could serve as a benchmark for institutional health care policymakers to know the current figure of POP prevalence and associated factors. The finding is important for clinicians to plan an appropriate intervention on determinant factors of POP. It also helps future researchers to do an interventional study to overcome the prevalence and determinates of POP in the country.

2. Research questions

- (1) What is the pooled prevalence of pelvic organ prolapse in Ethiopia?
- (2) What are possible determinant factors for pelvic organ prolapse in Ethiopia?

3. Methods and materials

3.1. Search strategy

For the purpose of this review, searching of original research articles relevant to the prevalence and associated factors of pelvic organ prolapse was done by using the PRISMA checklist (Hutton et al., 2015). Both published and unpublished articles on the prevalence of pelvic organ prolapse and its associated factors among Ethiopian women were considered. Extensive database searches were conducted to identify studies that are relevant to the objective of this study through Google scholar, PubMed, Science Direct, and Cochrane Library. Unpublished studies were retrieved as gray literature through Google and Google Scholar. The search was using the following terms separately and in combination: "pelvic floor disorder" OR "pelvic organ prolapses" OR "uterine wall prolapses" OR "uterovaginal prolapse" OR "cystocele" OR "vault prolapse" AND "Ethiopian". All studies conducted in Ethiopia up to January 30/2020 and reported the prevalence of POP or at least one adjusted associated factor of pelvic organ prolapse was included in this review.

3.2. Selection criteria

Studies were included if they (1) were conducted in Ethiopia; (2) were observational studies (cross-sectional, cohort, and case controls), (3) published in the English language, (4) Defined the method of pelvic organ prolapse examination and (5) Both published and unpublished. Studies that were not fully accessed during the selection process were excluded. However, earlier excluding the articles several attempts were done to contact the primary author through email contact.

3.3. Data extraction

The three authors (AB, SD, and LG) were extracted all the necessary data using an identical data extraction format prepared in Microsoft Excel. For the primary outcome, the data extraction format includes first author, study period, study year, publication year, study design, data

collection method, study settings, age of participant, region, and area in the country where the studies were conducted, sample size, response rate and prevalence of Pelvic organ prolapse. For the second outcome (determinant factors), a data extraction format was prepared for each specific factor (age; <40 and \geq 40, parity; <4 and \geq 4, residence; urban and rural, place of delivery).

3.4. Quality assurance of articles

The process of evaluating the studies to include in the review was performed by three independent reviewers (AB, SD, and LG). The title and abstract of the identified studies were assessed for relevance to the study objectives, and the full text of appropriate studies was obtained for further evaluation.

Newcastle-Ottawa Assessment Scale (NOS) for observational studies was used to assess the methodological quality of a study and to determine the extent to which the study has addressed the possibility of bias in its design, conduct, and analysis (Peterson, Welch, Losos, & Tugwell, 2011). Articles scoring \geq 7 were included in this review.

3.5. Measurement of the outcome variables

This systematic review and meta-analysis have two paramount outcomes. The primary outcome was to assess pelvic organ prolapse among Ethiopian women. The second outcome of the study was to identify determinant factors of pelvic organ prolapse. The prevalence of pelvic organ prolapse was calculated by dividing the number of participants by the total sample size multiplied by 100. The pooled log odds ratios were calculated from raw data of primary studies to identify determinant factors. Measurement of outcome was measured and included from studies report of POP based on POP-Q stage or traditional classification of POP (Manonai et al., 2011).

3.5.1. POP-Q stage

Stage-0 "no prolapse"

Stage I is when the most distal portion (leading surface) of the prolapse is 1 cm above the level of the hymen (-1cm)

Stage II is when the most distal portion (leading edge) of the prolapse is #1cm proximal to or extends 1 cm through the plane of the hymen (\$-1cm, but #+1cm)

Stage III is when the most distal portion of the prolapse is .1cm below hymen but no further than 2 cm less than the TVL (there is no complete vaginal eversion)

Stage IV is when there is complete eversion of the total length of the pelvic organ, meaning the pelvic organ protrudes at least the total vaginal length minus 2 cm beyond the hymen.

3.5.2. The traditional classification of POP

1st: Descent within the vagina

2nd: Descent to the introitus

3rd: Descent outside the introitus

Pelvic organ prolapse: Any pelvic disorder at least reported any of one of the pelvic floor disorders (uterovaginal prolapse, rectocele, cystocele, vault prolapse) with any stages were considered as the primary outcome of the study.

Anterior compartment prolapse (cystocele): Hernia of the anterior vaginal wall is often associated with the descent of the bladder.

Posterior compartment prolapse (rectocele): Hernia of the posterior vaginal segment is often associated with the descent of the rectum.

Apical compartment prolapse (uterine prolapse, vaginal vault prolapse): Descent of the apex of the vagina into the lower vagina, to the hymen, or beyond the vaginal introitus

3.6. Statistical analysis

Essential data were extracted using a Microsoft Excel format and

analyzed using STATA software Version 14.0. The original articles were described using a table as well as a forest plot. The standard error of prevalence for each original article was calculated by the binomial distribution formula. Heterogeneity among the reported prevalence of studies was checked by using the heterogeneity I^2 test and the p-values. There were significant heterogeneity among the studies if ($I^2 = 98.9\%$, $p < 0.001$).

A random-effects meta-analysis model was used to estimate the Der Simonian and Laird's pooled effect. Moreover, a univariate meta-regression model was conducted by taking study setting, study region, and year of publication to identify the possible source of heterogeneity, and the variation of the sample size was found the possible source of heterogeneity. Publication bias was assessed graphically by funnel plot and statistically using Egger's and Begg's tests. Both graphical and statistical test results showed the possible existence of a significant publication bias ($p < 0.002$, Egger's, Begg's, $p < 0.015$). Duval and Tweedie's Trim and Fill analysis was employed. Subgroup analysis was done by the

study setting (facility-based and community-based), data collection type (interviewer-administered and document review), and study regions.

4. Result

4.1. Search result

A total of 290 articles were initially identified and retrieved from the databases mentioned in the PRISMA flow diagram (Fig. 1). After removing duplicates and further screening the titles and abstracts 13 papers were included in the full-text screening step. From those 13 papers which were included for the full-text screening process, five articles were not well measured the outcome variable and two articles were removed due to incomplete data. Finally, a total of 6 papers were included in this review (Table1).

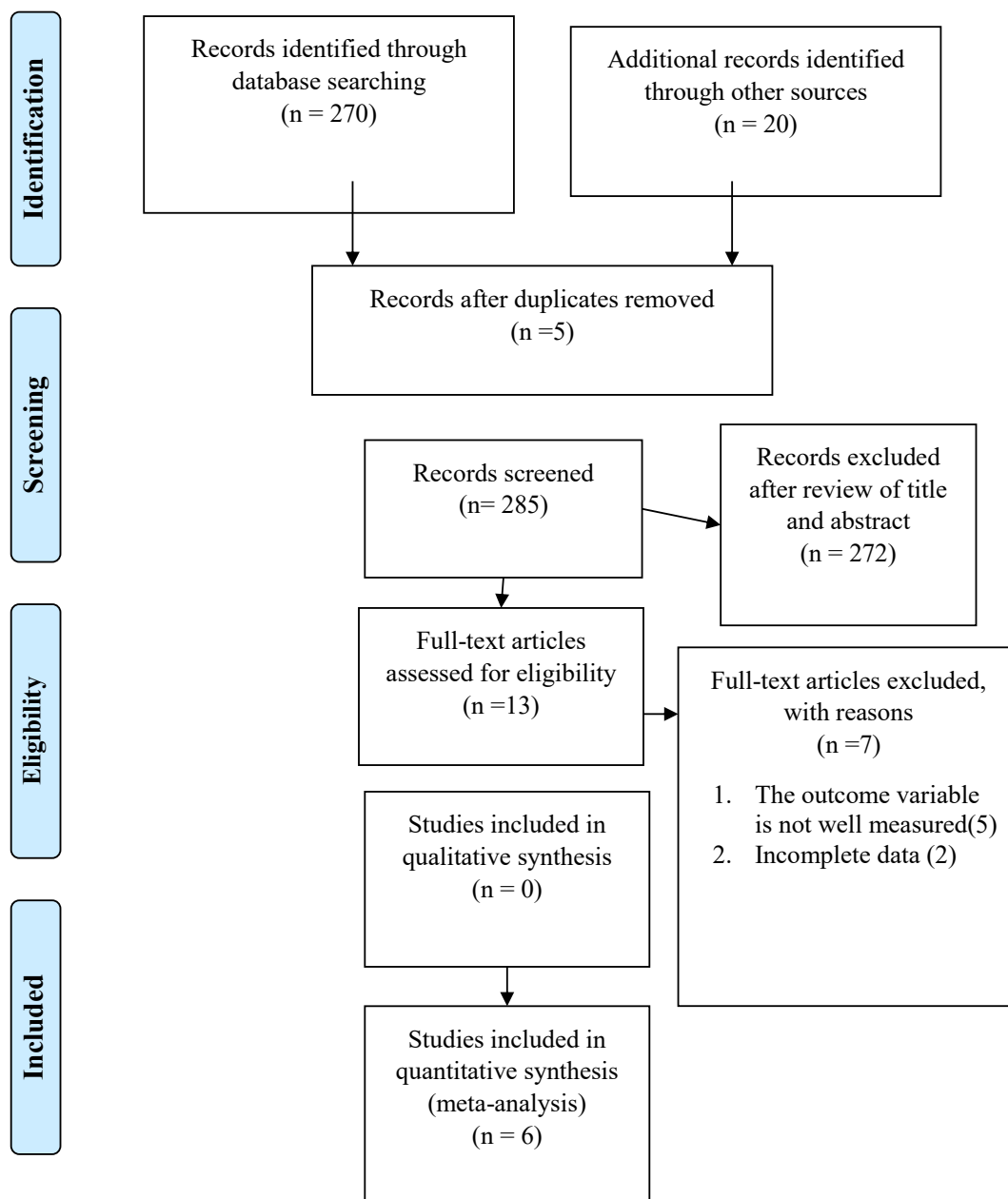


Fig. 1. Flow diagram showing the procedure of selecting studies for meta-analysis of pelvic organ prolapse, in Ethiopia, 2020.

Table 1

Characteristics of six studies reporting pelvic organ prolapse and its associated factors among Ethiopian women: A systemic review and meta-analysis, 2020.

Authors	study period	pub/ year	data collection type	study setup	age of participant	participant	area	sample	Response %	Prevalence %
(Dheresa et al., 2018)	August10 to September 4, 2016	2018	Interviewer administered	Community basedCross sectional	36.5 (+13) years	ever married women	Kersa	3444	99.5	20.5
(Akmel & Segni, 2012)	NA	2012	document review	facility based C/sectional	42.43 ± 10.4 years	women gynecological cases	Jimma	143	90.2	40.7
(Asresie, Admassu, & Setegn, 2016)	July to October 2014	2016	document review	Facility based C/ sectional	43 years ± 12 SD	gynecologic patients	Bahir Dar	370	94.3	33.5
(Henok, 2017)	January to March 2016.	2017	Interviewer administered	Community based C/ sectional	34.84 + 12.75 years.	Pedestrian Back-Loading Women	Bench Maji Zone	422	100	13.3
(Belayneh, Gebeyehu, Adefris, Rortveit, & Awoke, 2020)	April to May/ 2018	2019	Interviewer administered	Community based C/ sectional	35 median yrs.	women aged ≥ 18 years	Dabat	880	93.6	28.1
(Lema & Yemane Berhane, 2015)	June to August 30/2013	2015	Interviewer-administered	Case control	41.9 + 13.8yrs.	All women with gynecological cases	wolaita zone	318	100	0.5

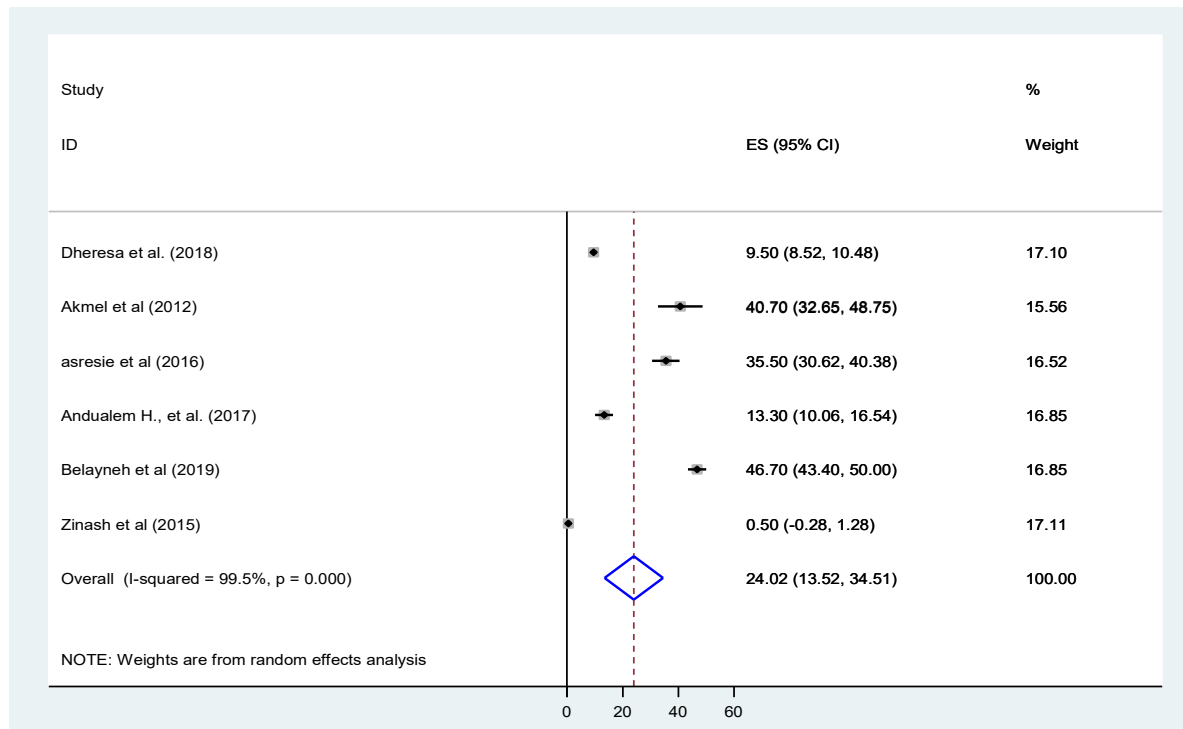


Fig. 2. The pooled prevalence of pelvic organ prolapse in Ethiopia, 2020.

Table 2

Shows univariate meta-regression result to identify the possible sources of heterogeneity of pelvic organ prolapse in the current meta-analysis.

Variables	Coefficient	P-value ≤ 0.05
Sample	28.60	0.055
Response	436.77	0.009

4.2. Meta-analysis and review

The pooled prevalence of pelvic organ prolapse in Ethiopia was 24.02% (95% CI: 13.52, 34.51) (Fig. 2). Because of I² test showed high heterogeneity (I² = 99.5%, p < 0.0001), the random effect model was used. Subgroup analysis was done to identify the possible sources of

heterogeneity. Considering, the response and sample size as a possible factor of variation a univariate meta-regression model was done. The test result indicated that sampling variation was the possible source of heterogeneity (Table 2).

4.3. Publication bias

Publication bias was checked by funnel plot, Begg’s, and Egger’s test. The funnel plot appeared asymmetrical (Fig. 3) which indicates the presence of publication bias. The Egger’s (p < 0.056) and Begg’s (p < 0.26) test also showed the presence of publication bias. As a result, trim and fill analysis was performed to adjust the pooled prevalence of pelvic organ prolapse (Fig. 4).

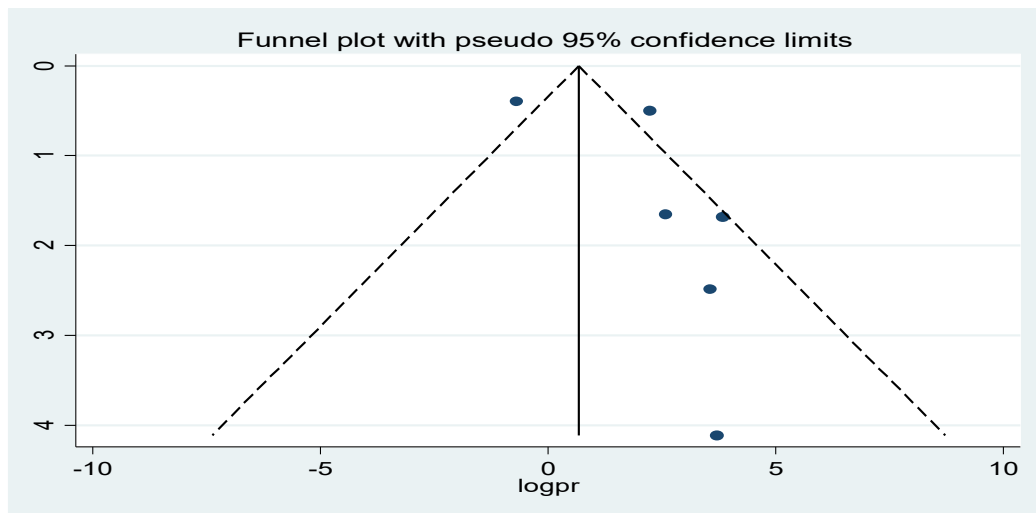


Fig. 3. The funnel plot to test publication bias among six studies.

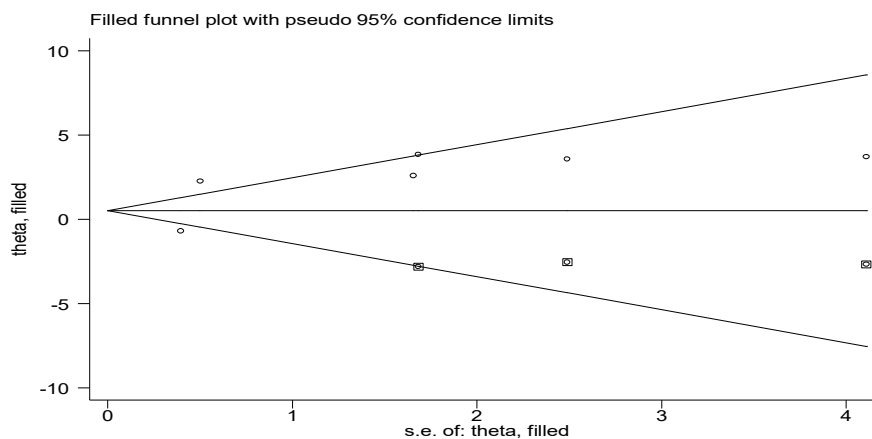


Fig. 4. Duval and Tweedie’s Trim and Fill analysis for 6 studies.

Table 3
Results of subgroup analysis of the prevalence of pelvic organ prolapse in Ethiopia, 2020 (n = 6).

Variables	Characteristics	Number of studies	Total participants	Prevalence with 95% CI
Region	SNNPR	2	740	6.80 (-5.74,19.34)
	Oromia	2	3587	24.83 (-5.74,55.40)
	Amhara	2	1250	41.25 (30.28,52.22)
Data collection type	Document review	2	513	37.07 (32.39,41.75)
	interviewer-administered	4	5064	17.38 (5.58,29.08)
Study setup	Facility based	3	831	25.41 (-3.74,54.56)
	community	3	4746	23.13 (1.87,44.40)

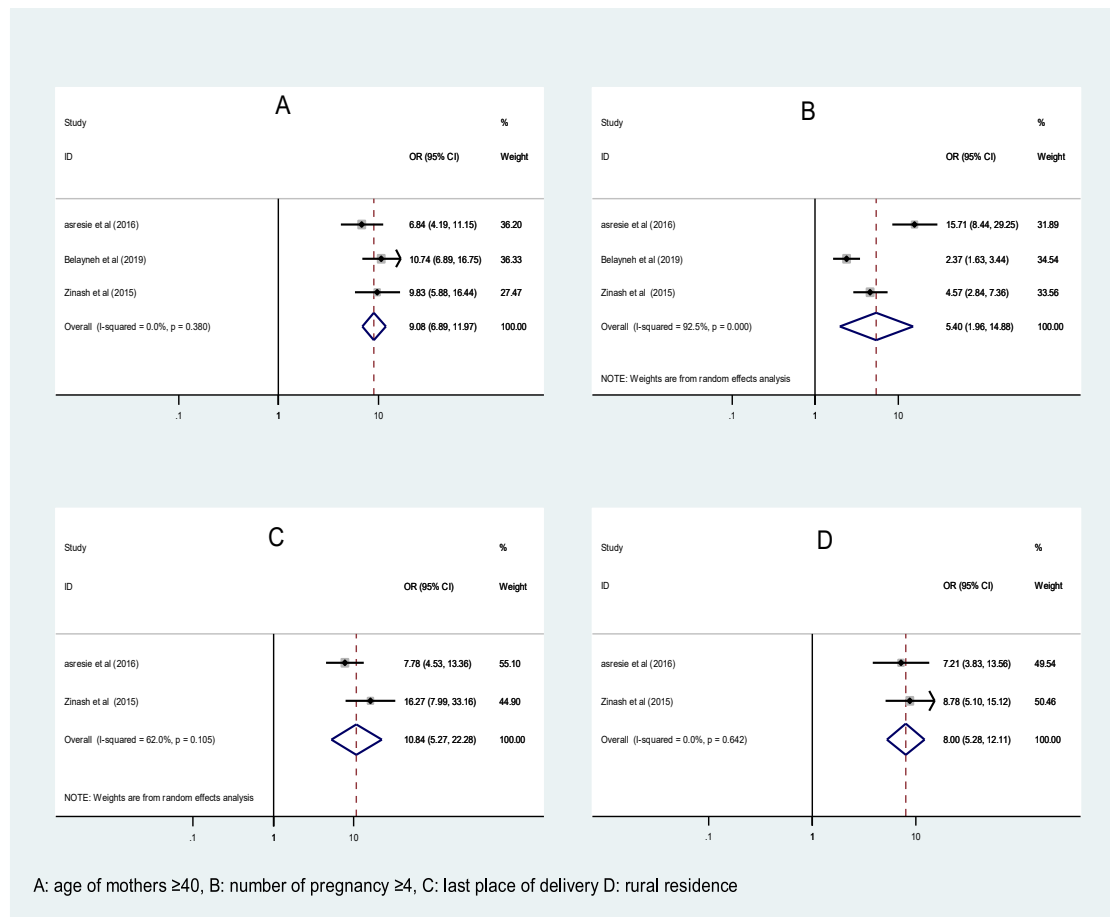
4.4. Subgroup analysis

Subgroup analysis was done due to possible causes of heterogeneity. Accordingly the result of the analysis showed that the highest prevalence of pelvic organ prolapse was in Amhara 41.25(30.28, 52.22)

whereas the least prevalence of pelvic organ prolapses in SNNPR was 6.80(5.74, 19.34) based on study region (Table 3). Concerning data collection type and study setup, data collected by the interviewer-administered were lower than data collected by the document review. In the same way, data collected from the community were lower as compared to the data collected from the facility (Table 3).

4.5. Determinants of pelvic organ prolapse

Age of mothers, parity, and place of delivery for the last pregnancy and residence were found to be the determinant factors for pelvic organ prolapse. The pooled odd ratio of three studies indicates that women who were greater or equal to forty years old were more than nine times more likely to have pelvic organ prolapse (AOR: 9.08: 95% CI: 6.89, 11.97) as compared to those who were less than forty years old. (Fig. 5a). The three studies of the pooled odds ratio of the women Para four or more were more than five times more likely to have pelvic organ prolapse (AOR: 5.40: 95% CI: 1.96, 14.88) when it compared to the counterpart (Fig. 5b). In this review and meta-analysis, two studies were analyzed to see the effect of place of delivery for the last pregnancy. Women who delivered at the home for the last delivery were near to eleven times more likely to develop pelvic organ prolapse (AOR: 10.84: 95% CI: 5.27, 22.28) compared with those who delivered their last pregnancy in a health institution (Fig. 5c). The pooled effect of two



A: age of mothers ≥40, B: number of pregnancy ≥4, C: last place of delivery D: rural residence

Fig. 5. Forest plot depicting pooled odds ratio (log scale) of the associations between pelvic organ prolapse and its associated factors (a: Age of mothers greater or equal to 40, b: number of parity greater than or equal to 4, c: place of delivery for the last pregnancy d: rural residence of the mother).

studies also showed that women who had lived in the rural area were eight times more likely to develop pelvic organ prolapse (AOR: 8.00: 95% CI: 5.28,12.11) related to those who had lived in the urban areas (Fig. 5d).

5. Discussion

Based on this systematic review and meta-analysis the pooled prevalence of pelvic organ prolapse in Ethiopia was 24.02% (95% CI: 13.52, 34.51). The result of this study is higher than studies done in Sweden (Tegerstedt, Maehle-Schmidt, Nyrén, & Hammarström, 2005), Pakistan (Jokhio, Rizvi, & MacArthur, 2020), Gambia (Scherf et al., 2002), low and middle-income countries (Islam, Oldroyd, Rana, Romero, & Karim, 2019), and in developing countries (Walker & Gunasekera, 2011) but it is lower than studies done in Turkey (Aytan et al., 2014), Korea (Seo & Kim, 2006) and Tanzania (Masenga, Shayo, & Rasch, 2018). This discrepancy might be due to differences in sample size, socio-cultural differences, the difference in health care-seeking behavior, and methods of POP classification and diagnostic approaches.

In this review and meta-analysis, women who were greater or equal to forty years old were more than nine times more likely to have pelvic organ prolapse (AOR: 9.08: 95% CI: 6.89, 11.97) as compared to those who were less than forty years old. This finding is supported by the study conducted in India (Patil, 2013), in different parts of Nigeria (Eleje, Udegbunam, Ofojebe, Adichie, & research, 2014; Onowhakpor, Omo-Aghoja, Akani, & Feyi-Waboso, 2009). This might be due to the fact that; pelvic muscle; ligaments and different pelvic bones are weakening as age advances because of hormonal and bone mineral changes related

to advanced age.

In this review and meta-analysis, the women Para four or more were more than five times more likely to be pelvic organ prolapsed (AOR: 5.40: 95% CI: 1.96, 14.88) when it compared to the counterpart. This finding is also supported by the study conducted in Turkey (Aytan et al., 2014), India (Patil P, 2013), different parts of Nigeria (Eleje et al., 2014; Onowhakpor et al., 2009), and Nepal (Thapa, Angdembe, Chauhan, Joshi, & Research, 2014). This might be due to the fact that repeated pregnancy and birth damages sphincter muscles and ligaments. These muscles and ligaments fail to regain their strength and elasticity especially when there was no spacing between pregnancies.

In this review and meta-analysis, Women who delivered in the home for the last delivery were nearly eleven times more likely to develop pelvic organ prolapse (AOR: 10.84: 95% CI: 5.27, 22.28) as compared to those who delivered in health institutions. This finding is also supported by the study conducted in Tanzania (Masenga et al., 2018). This might be due to the fact that home deliveries were not managed by skilled birth attendants. Therefore, women would be suffering from prolonged labor, obstructed labor, pelvic muscle laceration, and pelvic sphincter damage.

In this review and meta-analysis, women who had lived in the rural area were eight times more likely to develop pelvic organ prolapse (AOR: 8.00: 95% CI: 5.28, 12.11) than those who had lived in the urban areas. This might be due to difficulty accessing antenatal care services, killed delivery services, and postnatal care services. It might also be due to lack of awareness about risk factors, low coverage of family planning, and heavier physical workload among people residing in sub-Saharan Africa.

6. Conclusion

The pooled prevalence of pelvic organ prolapse was high in the study area. Age of mothers and modifiable factors like parity, residence, and place of delivery for the last pregnancy was found to be determinant factors for pelvic organ prolapse. Attention should be given to those modifiable factors to curve the prevalence of pelvic organ prolapse and possible complications.

7. Author's contribution

1. Alemu Basazin Mingude
 - Conceived and designed analysis
 - Conduct data extraction
 - Contribute data analysis tool
 - Wrote the paper
2. Samuel Derbie Habtegiorgis
 - Conduct data extraction
 - Performed the analysis
3. Lemma Getacher
 - Conduct data extraction
 - Edit the paper

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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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijans.2022.100396>.

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