

Pelvic Organ Prolapse in Countries of Different Economy: A Systematic Review

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ABSTRACT

Aims: This review was done to identify the reported prevalence rate of pelvic organ prolapse among the different world populations.

Methods: Systematic review of Pelvic Organ Prolapse (POP) using the PRISMA checklist; PubMed database was searched on reporting the prevalence of POP and its management measures in January 2020. Medical Subject Headings (MeSH) like "Pelvic Organ Prolapse" OR "Uterine Prolapse" OR "Vaginal Wall Prolapse" OR "Cystocele" AND "Prevalence" [key word/s] were used. Additional articles were identified through the reference list of the retrieved articles.

Results: Out of 91 screened articles, 46 full articles were eligible and only 15 satisfied by selection criteria for the systematic review. The methodological score rated for the quality of studies is 4.5 ± 1.7 (range=2-7) out of 8 points. The mean prevalence of POP diagnosis was 40%; with 42.44% in low and lower-middle-income countries, and 35.56% in upper-middle and high-income countries. Increasing age and parity, body mass index and fetal macrosomia were found to be the significant risk factors irrespective of the country's economy.

Conclusions: The low and lower-income countries have almost twice the burden of prolapse than the countries of the higher economy. The major risk factors associated with prolapse remain common in all countries irrespective of national income or development.

Keywords: pelvic organ prolapse, prevalence, risk factors, systematic review

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INTRODUCTION

Pelvic organ prolapse is characterized by the descent of one or more pelvic organs (such as the anterior vaginal wall, posterior vaginal wall, the uterus/cervix or the apex of the vagina) due to vaginal vault or cuff scar after hysterectomy from their normal position.¹ This results when a weakened pelvic musculature collapses due to aging, childbirth, gynecological cancer treatment or heavy lifting and can no longer support the proper positioning of the pelvic organs, most commonly the vagina and uterus.² Pelvic organ prolapse is considered to be a major cause of morbidity among women in both high-

income and low-income countries.³ A systematic review performed on the global burden of disease studies in 2010 illustrated that genital prolapse is present in about 316 million women worldwide with a prevalence of 9.3% globally.⁴ Similarly, another systematic review performed on thirty studies sampled in low-income and lower-middle-income countries notified that the mean prevalence for pelvic organ prolapse lies at 19.7% with the prevalence range of 3.4 to 56.4% in developing nations.⁵ The countries are classified into four categories as low income, lower-middle-income and upper-middle-income countries based on the Gross National Income per capita.⁶

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Pelvic organ prolapse leads to several consequences- difficulty in urination, painful intercourse, itching, and white-watery discharge, difficulty in lifting, walking and sitting, urinary tract infections, abdominal and back pain, lowered self-esteem, which in turn affect women's quality of life and have a social, psychological and sexual impact.^{7,8} The treatment options for prolapse depend on the severity of the symptoms like conservative non-surgical (pelvic floor exercise, biofeedback, electrical stimulation, and vaginal pessaries) to definite surgical modalities.^{9,10} The use of pessary can also yield significant improvements in women's quality of life which is similar to that of surgery as demonstrated by a systematic review performed by Coelho et al 2016.¹⁰⁻¹³ Based on the available literature, in the past years, there was no systematic review of studies to examine the disparity that lies between different nations and population characteristics in terms of pelvic organ prolapse. In light of this research gap, this review aims to identify the reported prevalence rate of pelvic organ prolapse among the different world populations.

METHODS

The search for the original research articles relevant to the prevalence of the POP was performed using the PRISMA checklist.¹⁴ The search was limited to publications indexed in the PubMed database and published between January 2000 to January 2020, reporting on the prevalence of POP. The search was performed using a combination of the Medical Subject Headings (MeSH) terms such as: "Pelvic Organ Prolapse" OR "Uterine Prolapse" OR "Vaginal Wall Prolapse" OR "Cystocele" AND "Prevalence" [key term/s]. Additional articles were identified through the reference list of the retrieved articles. Finally, we reviewed fifteen full texts which established the prevalence of POP and its risk factors. From the included publications, participant's demographic data, sample size, applied diagnostic instruments for prolapse and prevalence data were abstracted.

Quality evaluation of articles

The process of determining the studies to include in the

review was performed by two independent reviewers (AC and SP). Title and the abstracts of the identified studies were assessed for relevance to the topic, and the full texts of the appropriate studies were obtained for further evaluation. The included articles were read extensively using the critical appraisal tool provided by Loney and colleagues.¹⁵ This tool was adapted for critical appraisal of health research literature based on prevalence or incidence of health problems. Article scored one point for each of the following quality markers: (i) the study design and sampling method appropriate for research question, (ii) the study had appropriate and unbiased sampling frame, (iii) the study had adequate sample size, (iv) the study used objective, suitable and standard criteria to measure prolapse status in the sample population, (v) the study measured prolapse status by unbiased assessors, (vi) the study is provided with adequate response (>70%) or participant refusal is described, (vii) the study provided the confidence interval of estimated prevalence, and (viii) the study subjects and setting is described in detail.¹⁵

Search outcome

For this review, we collected 91 articles; out of them, 85 from PubMed and 6 articles from the reference list of retrieved articles. From the collected articles, 45 were excluded after assessing the title and abstract because they did not fit the inclusion criteria of this review: i) three articles had no abstract, ii) 10 studies didn't match the aim of study iii) 32 articles were the studies assessing prevalence of other factors in women with pelvic organ prolapse. After evaluating full texts of 46 articles, 31 studies were excluded because six were found to be review articles, 3 studies estimated prolapse based on population projection, 14 studies were found not aimed at estimating prevalence of prolapse, and six studies were focused on treatment of organ prolapse in affected women while two studies were performed in animal population. Thus, out of a total of 91 publications, only 15 studies satisfied all the inclusion and exclusion criteria [Figure-1]. Included studies were published from 2000 to 2020 with the samples drawn internationally.

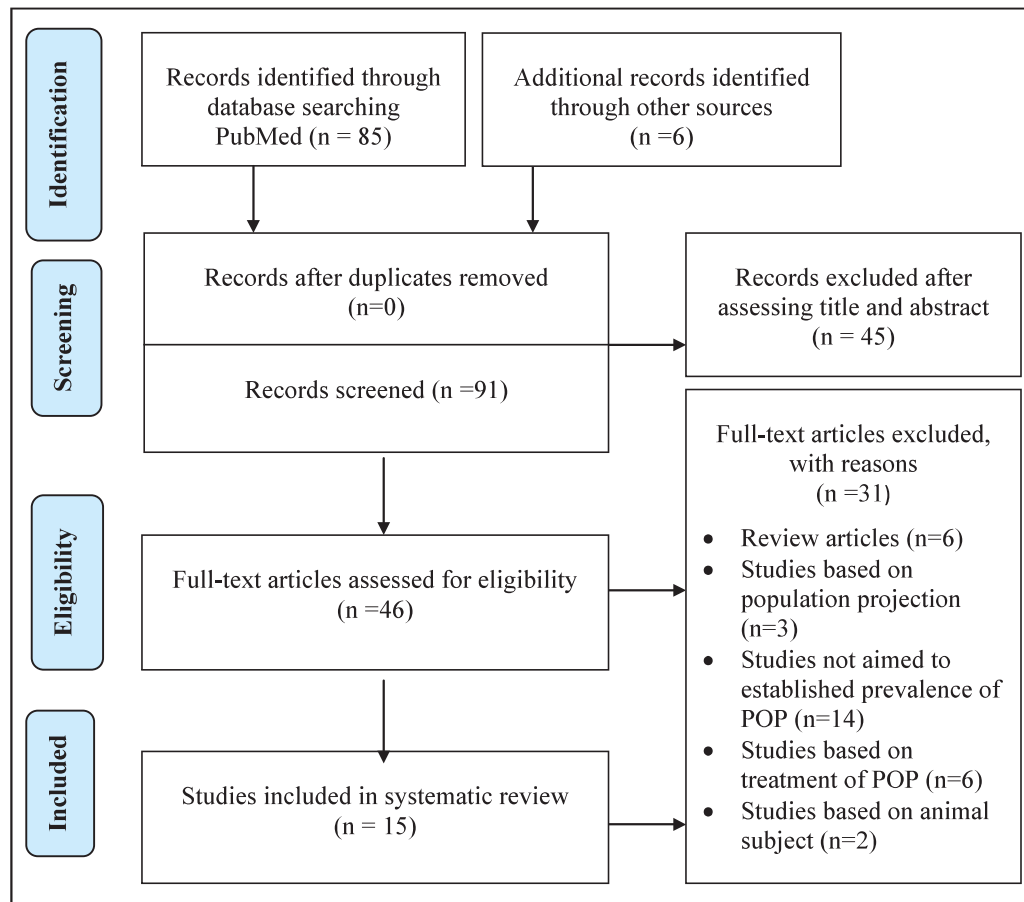


Figure-1: Literature search flow-chart

RESULTS

Study characteristics and quality appraisal

Out of 91 publications, only 15 studies satisfied all the inclusion criteria. Among the 15 studies included, the majority of them (n=9) had been carried out in low and lower-middle-income countries. Three studies were carried out in Nepal,^{7,16,17} one in Ethiopia,¹⁸ one in the Gambia,¹⁹ one in Lebanon,²⁰ one in Tanzania,²¹ one in Bangladesh²² and one in Ghana.⁸ Similarly, six studies had been sampled in upper-middle and high-income countries (one in Brazil,²³ one in China,²⁴ two in Iran^{25,26} one in Turkey,²⁷ and one in UAE²⁸).

All of the studies had adopted a cross-sectional design. The majority of studies (9) were conducted in community settings^{7,8,17,19-22,24,26} while five studies were conducted at healthcare institutions^{16,23,25,27,28} and one study was conducted in a working site of firewood sales.¹⁸ Almost half of the studies (n=7) used random sampling technique^{8,17,19-21,24,26} while eight studies

used convenience sampling technique.^{7,16,18,22,23,25,27,28} A range of measures were used to identify the status of pelvic organ prolapse in the target population by the studies included in this review. Valsalva maneuver performed in the dorsal lithotomy position or speculum examination and bimanual examination of pelvis were used to diagnose prolapse clinically by majority of the studies (n=12).^{7,8,16,17,19-21,23-27} Three studies only assessed the symptomatic prolapse by interviewing the participants on their experienced symptoms of prolapse without any further clinical examination.^{18,22,28}

The quality of all the 15 studies was evaluated according to the criteria demonstrated in [Table-1]. According to these criteria as provided by Loney and colleagues¹⁵ the maximum possible score for quality is eight. The total score of the studies ranged from two to seven, with a mean score of 4.5±1.7SD.

Table-1: Quality evaluation of studies

Study, setting and population characteristic	Sample size (n)	Sample design	Sampling frame	Measures	Unbiased assessors	Response rate and refusers	Prevalence rate	Score ^a and limitation
Li (2019) ²⁴ China – rural community (2014-16)	25864	Multistage stratified sampling	Census from the community registry office	Two phases of the design 1.Short form of PFDI-20 ^c 2.Pelvic examination in the dorsal lithotomy position	Diagnostic procedure not described	96.07% agreed for the pelvic examination Refusers described	POP* stage II-IV: 24.7% sPOP** – 9.23% Confidence interval not given	Score – 6 Confidence interval (CI) not given Diagnostic procedure not described
Masenga (2018) ²¹ Tanzania – Kilimanjaro region (2015). Women aged ≥ 18 years	1195	Random sampling of households	Tanzanian population census 2012 Household registration from the village office	Three phases of the design 1.Interview at household on symptoms of POP 2.POPDI-6 ^c and PFIQ ² at the clinic 3.Clinical examination of pelvis and staging through POP-Q ^b	Trained nurse for POPDI-6 ^c and PFIQ ^d Pelvic examination by resident and gynecologist	87.61% accepted clinical examination Refusers described	POP* stage II-IV: 62.7% Confidence interval not given	Score – 7 Confidence interval (CI) not given
Henok (2017) ¹⁸ Ethiopia – Bench Majizone (2016). Women aged >15 years	422	Convenience sampling: all women aged >15 years working on firewood sales with back-loading	All women in the zone working on firewood sales with back-loading	One phase of the design 1. WHO questions to assess symptomatic POP and women were asked if they had a history of certain signs and symptoms of POP	University students of midwives Negative screening not examined	100% response	POP* -56 (13.3%) Confidence interval not given	Score – 3 Closed group Convenience sampling Negative screening not examined Confidence interval (CI) not given Diagnosis not based on clinical examination
Horst (2017) ²³ Brazil – Jaraguá do Sul (2014-15). Women age ≥ 18 years seeking care in the municipal public health service network	432	Convenience sampling: Patients attending public health services	Public health service network records	Three phases of the design 1.PFDI-20 ^c (Portuguese translated) 2.Gynecological examination and staging through POP-Q 3.Pap smear examination	Gynecologist Negative screening not examined	100% response	POP* – 52.3% CI = 47.7-57.4 sPOP* – 33% CI=29.2 – 37.7	Score – 5 Convenience sampling Close group Negative screening not examined

Akter (2016) ²² Bangladesh – rural community. Women aged >15 years	800	Convenience sampling to select household	All women aged >15 years living in 4 selected villages (2050 women)	One phase of the design 1. Interview: POP symptomatic assessment through WHO subgroup tool and Bangladesh Demographic and Health Survey (BDHS) questionnaire on risk factors of POP	Research Assistant Negative screening not examined	787 (98.37%) responded	sPOP** – 15.6% Confidence interval not given	Score – 4 Convenience sampling Diagnosis not based on clinical examination Research Assistants' details not provided Confidence interval (CI) not given Negative screening not examined
Elbiss (2015) ²⁸ UAE – Al Ain (2010-11). Emirati women >30yrs. of age attending any of the three family development centers in Al Ain	482	Convenience sampling: All eligible women visiting family development center	All women visiting family development center from 2010 to 2011	One phase design 1. Interview at the center consisting questionnaires on symptoms of POP	Trained healthcare provider	429 (89.0%) responded Refusers not described	sPOP* – 127 women (29.6%) reported symptoms of POP Confidence interval not given	Score – 2 Closed group Convenience sampling Investigator details not provided Diagnosis not based on clinical examination Refusers not described Confidence interval not given
Aytan (2014) ²⁷ Turkey – City of Mersin. Women attending the clinic between June-December 2008	3000	Convenience sampling: All women attending the university clinic in City of Mersin	Hospital database	Two phases of the design 1. Observation of medical history 2. Gynecological examination and POP-Q ^b staging	Investigators details not provided	1320 (44%) responded Refusers described	POP* stage II-IV: 27.1% Confidence interval not given	Score – 3 Close group Convenience sampling Poor response rate Investigators details not provided Confidence interval not given
Awwad (2012) ²⁰ Lebanon – rural community in Bakan valley. Every married woman aged 15-60 years	557	Census: One woman per household was enrolled with priority to the wife of the head of household	Census	Three phases of the design 1. Interview at household on symptoms of POP 2. Physical examination and gynecological examination in the dorsal lithotomy position 3. Laboratory examination	Primary care physicians and gynecologists Negative screening examined	90.8% responded Refusers described	POP* - 251 (49.8%) Confidence interval not given	Score – 7 Confidence interval not given

Lien (2012) ¹⁶ Nepal – rural community of 3 districts (Myagdi, Sindhupalchowk, Lamjung) in 2010	187	All women visiting healthcare services for general medical problems	All women visiting healthcare services in all 3 districts from March–May 2010	Two phases of the design 1. Women were interviewed using validated UDI-6 ^f 2. Pelvic examination in the dorsal lithotomy position and Valsalva maneuver	UDI-6 ^f administered by a trained healthcare worker Pelvic examination by a gynecologist	174 (93.0%) Responded Refusers described	POP* stage I or normal - 68 (39.1%) POP* stage II-IV: –106 (60.9%) Confidence interval not given	Score – 4 Close group Convenience sampling Small sample size Confidence interval not given Negative screening not examined
Tehrani (2011) ²⁶ Iran – community- based study (2008- 10). Women aged 18-45 years living in urban area	1252	Multistage random sampling	Household list available in the health department of each province	Two phases of the design 1. Interview on self-reporting of particular signs and symptoms of POP 2. Gynecological assessment (speculum examination and bimanual pelvic examination)	Trained staff of the medical university Gynecological assessment by Gynecologist Negative screening not examined	1117 (89.21%) Refusers not described	POP* 41.4% CI=39.8 – 44.5	Score – 6 Refusers not described Negative screening not examined
Wusu-Ansah (2008) ⁸ Ghana – rural community	200	Random sample: Cluster sampling	Not provided	Two phases of the design 1. Household interview using a translated version of PFDI ^c and PFIQ ^d in local language 2. Pelvic examination at the health center (speculum examination in left lateral position)	Personnel performing pelvic examination not defined Negative screening not examined	174 (87%) women responded Refusers not described	POP* - 21 (12.1%) Confidence interval not given	Score – 2 Small sample size Sampling frame not defined Personnel performing pelvic examination not defined Refusers not described Negative screening not examined Confidence interval not given
Gurung (2008) ¹⁷ Nepal. Women of reproductive aged 15-49 years	2849	Eduard Jongstra sampling	Census	Two phases of the design 1. Interview 2. Gynecological examination	Diagnostic procedure not described	2070 (72.6%) responded Refusers not described	POP* – 10% (207/2070) Confidence interval not given	Score – 5 Diagnosis procedure not described Refusers not described CI not given

Garshabi (2006) ²⁵ Iran – 3 health care centers Women aged ≥ 18 years	4630	All women aged ≥ 18 yrs. visiting 3 PHC	Women scheduled for routine health examination between 2000 - 2002 at 3 PHCC	One phase design 1. Gynecological examination in the dorsal lithotomy position and POP-Q ^b staging	Physician, blinded to women's parity and history of vaginal delivery Negative screening not examined	3730 (80.6%) responded Refusers not described	Stage I – 23% Stage II – 18.3% Stage III – 11.6% Confidence interval not given	Score – 4 Convenience sampling Refusers not described Confidence interval not given Negative screening not examined
Bonetti (2004) ⁷ Nepal – ethnographic and clinic-based study (mixed study): Ethnographic study – 3 districts: Men and women aged 18-80 years. Clinic based study- women aged ≥ 12 years at 2 district in 2001	Clinic-based study n = 2702	Clinic-based study – convenience sampling	All women who came to the temporary clinic with the gynecological complaints in Achham and Doti district	Two phases of the design in a clinic-based study 1. Interview based on a questionnaire on women complaining infertility and genital prolapse 2. Gynecological examination	District level female health care workers and gynecologists Negative screening not examined	100%	POP* -518/2072 (25%) Confidence interval not given	Score – 4 Convenience sampling Negative screening not examined Confidence interval not given Gynecological examination details not provided
Scherf (2002) ¹⁹ Gambia – rural community (1999). Women aged 15-54 years of 40 villages	1348	Cluster sampling	Total population of 16,203 in 40 villages under constant surveillance by Medical Research Council since 1981	Two phases of the design 1. A questionnaire consisting of symptoms of POP 2. Gynecological examination: speculum examination of the pelvis and bimanual examination	Gynecologist Negative screening not assessed	57.02% 1067 women included for genital prolapse	POP* -46% (488/1067) Confidence interval not given	Score: 5 Confidence interval not given Poor response rate Negative screening not assessed

POP* = Pelvic Organ Prolapse; sPOP** = symptomatic Pelvic Organ Prolapse; a. Score = Methodological strength of the study (maximum 8); b. POP-Q = Pelvic Organ Prolapse Quantification System; c. PFDI = Pelvic Floor Disability Index; d. PFIQ = Pelvic Floor Impact Questionnaire; e. POPDI-6 = Pelvic Organ Prolapse Distress Inventory; f. UDI-6 = Urinary Distress Inventory

Prevalence of pelvic organ prolapse

A total of 40859 participants completed the study process in the selected 15 studies [Table-2 and 3]. The age of the participants ranged from 12 to 99 years. Among the total participants, one fifth (n=8130) participants had a certain degree of prolapse which was either symptomatic or clinically diagnosed. The prevalence of prolapse ranged from 9.23% to 93.4% in the selected fifteen studies^{7,8,16-28} with the mean prevalence of 35.91%, but this included prevalence estimation based on pelvic examination and symptomatic diagnosis without pelvic examination. However, in the context of a pelvic examination, a total of twelve studies^{7,8,16,17,19-21,23-27} performed clinical diagnosis to assess the prevalence of prolapse with a mean prevalence of 40.01% (ranged 9.23% - 93.4%) for prolapse of stage I-IV. Out of these twelve studies, only eight studies^{16,20,21,23-27} provided the prevalence of the different stages of prolapse which revealed the prevalence of clinically significant prolapse of stage II-IV ranging from 9.32% to 64.6% with the weighted mean prevalence of 33.27%.

Regarding the economy of the nation, twelve studies that diagnosed prolapse clinically, the low and lower-middle-income countries seem to have a higher prevalence than the upper-middle and high-income countries. The clinically diagnosed prolapse (stage I-IV) prevalence ranged from 10% to 93.4 % with

the mean of 42.44% in the context of low and lower-middle-income countries,^{7,8,16,17,19-21} whereas in upper-middle and high-income countries, it ranged from 9.23% to 53% with the mean prevalence of 35.56%.²³⁻²⁷ In the context of clinically significant prolapse (stage II-IV), out of eight studies that categorized prolapse status, three studies were sampled from low and lower-middle-income countries yielding a mean prevalence of 58.4% with the range of 49.8% to 64.6%.^{16,20,21} The remaining five studies were from upper-middle and high-income countries yielding a mean prevalence of 20.35% with a range of 9.23% to 29.9%.²³⁻²⁷

As regards to the sampling methodology used in all 15 studies, the range of prevalence reported from seven studies using a random sampling technique^{8,17,19-21,24,26} was 9.23% to 93.4% with the mean prevalence of 37.41%. This was slightly higher than the mean prevalence obtained from eight studies using convenience sampling,^{7,8,16,18,22,23,25,27,28} where the prevalence ranged from 13.3% to 60.9% with the mean of 34.6%. There was no notable difference found in the prevalence when comparing the studies having a small sample size (less than 300)^{8,16} with those having large sample size^{7,17-28} as the reported mean prevalence from these studies were found to be 36.50% and 35.82% respectively.

Table-2: Prevalence of pelvic organ prolapse in countries of low and low-middle income economy.

Study	The operational definition of POP	Prevalence	
		Frequency	Percentage
Tanzania (2018) ²¹ Age of women: Median:46 yrs. Range:18-90 yrs.	Defined POP based on POP-Q classification system: (0- No prolapse, I -The most distal portion of the prolapse is more than 1 cm above the level of the hymen, II-The most distal portion of the prolapse protrudes to 1 cm above and 1 cm below the hymen, The most distal portion of the prolapse protrudes more than 1 cm below the hymen but does not form a complete prolapse, IV-Complete vaginal vault eversion or procidentia uteri (complete prolapse))	Total (n)= 1047 Stage I:302 StageII: 666 Stage III:6 Stage IV:4 Stage≥II:674	28.8% 63.6% 0.6% 0.4% 64.6%
Ethiopia (2017) ¹⁸ Age of women: Median:46 yrs. Range:18-90yrs.	Pelvic organ prolapse is an anatomic support defect of the pelvic viscera which results in the downward displacement of structures that are normally located adjacent to the vaginal vault	n= 422 POP: 56	13.3%
Nepal (2012) ¹⁶ Age of women: Mean:40.4 yrs. Range:16-80 years	Defined for POP: stage 0 (no prolapse); stage I (most distal portion of the prolapse >1 cm above the hymen); stage II (most distal portion of the prolapse >1 cm proximal or distal to the hymen); stage III (prolapse >1 cm below the hymen), and stage IV (complete eversion of the length of the lower genital tract)	n= 174 Stage≥II:106	60.9%

Lebanon (2012) ²⁰ Age of women: 15-60 yrs.	POP stage defined based on POP-Q classification system:(I: Reference point remains at least 1 cm above the hymenal remnants; II: Reference point descends to an area within 1 cm up and down the hymeneal remnants; III: Reference point descends greater than 1 cm past the hymeneal remnants, without complete vaginal eversion; IV: Complete vaginal eversion and uterine procidentia)	n= 504 StageII:170 Stage III:73 Stage IV:8 Stage≥II:251	33.7% 14.5% 1.6% 49.8%
Nepal (2008) ¹⁷ Age of women: 15-49 years	Not defined	n= 2070 POP: 207	10%
Nepal (2004) ⁷ Age of women ≥12 yrs.	Not defined	n= 2072 POP: 518	25.1%
Gambia (2002) ¹⁹ Age of women: 15-54 yrs.	Anterior prolapse- Mild cystocele (only visible after speculum insertion); Moderate cystocele (vaginal mucosa overlying bladder just visible at introitus without separating labia); Severe cystocele (protrusion of bladder with an overlying vaginal wall outside of the introitus); Urethrocele. Uterine prolapse- Mild: 1st degree (into the vagina); Moderate: 2nd degree (cervix visible at introitus without labial separation); Severe: 3rd degree, uterine descent outside of the introitus (partial or complete procidentia). Posterior prolapse- Mild rectocele: rectum protruding towards the anterior vaginal wall; Moderate: rectocele (vaginal mucosa overlying the rectum visible at the introitus without manual separation of labia); Severe rectocele (protrusion of rectum with an overlying vaginal wall extending outside the vaginal introitus); Enterocele	n= 1067 POP: 488	46%
Bangladesh (2016) ²² Age of women:>15 years Mean±SD:40.1±9.0	The presence of symptomatic POP was ascertained by the single question: “Do you feel anything coming out of your vagina?” from the WHO subgroup	n= 787 POP: 123	15.6%
Ghana (2008) ⁸ Age of women :> 15 yrs.	Symptomatic prolapse was defined with a “yes” response to any of the questions assessing the symptoms of prolapse.POP was defined as the protrusion of the pelvic organs into or out of the vaginal canal and was classified into regions, i.e., anterior, posterior, cervix, and apical/cuff. The various combinations were noted.	n= 174 POP: 21	12.1%

Table-3: Prevalence of pelvic organ prolapse in the upper-middle and high-income economy

Study	The operational definition of POP	Prevalence	
		Frequency	Percentage
China (2019) ²⁴ Age of women: 20- 99 yrs. Mean ± SD: 45.40 ± 15.77	The definition of symptomatic POP was an affirmative response to any of the eight questions and the presence of stage ≥2 POP upon a physical examination in the dorsal lithotomy position	n= 24848 Stage II: 1875 Stage III: 378 Stage IV: 40 Stage≥II:2293	7.55% 1.52% 0.16% 9.23%
Brazil (2017) ²³ Age of women:≥18 yrs.	POP stage defined based on POP-Q classification system POP was defined as the descent of one or more of the anterior vaginal walls, posterior vaginal wall, the uterus (cervix) or the apex of the vagina (vaginal vault or cuff scar after hysterectomy (anatomical definition of the sign of POP).	n= 432 Stage I: 119 Stage II: 100 Stage III: 7 Stage IV: 0 Stage ≥II: 107	27.5% 23.1% 1.6% 0% 24.7%

Turkey 2014) ²⁷ Age of women not specified	The staging of pelvic organ prolapse was done with POP-Q (pelvic organ prolapse quantification) system. Women with stage 2 prolapse were considered as having genital prolapse	n= 1320 POP \geq II: 358	27.1%
Iran (2011) ²⁶ Age of women:18-45 years Mean \pm SD: 33.2 \pm 7.7	Pelvic organ prolapse (clinical examination): descending of anterior and/or posterior vaginal wall and/or uterus below their normal position using the standard protocol. POP stage defined based on the POP-Q classification system.	n= 967 Stage I :296 Stage II :77 Stage III :24 Stage IV :3 Stage \geq II:104	30.6% 8.0% 2.5% 0.3% 10.8%
Iran (2006) ²⁵ Age of women: Mean: 36 Range: 18 – 68 yrs.	POP-Q system stage defined as follows: stage 0, showing no prolapse being demonstrated; stage 1, the most distal portion of prolapse >1 cm above the hymen; stage 2, the most distal portion of prolapse >1 cm proximal or distal to the plane of the hymen; stage3, the most distal portion of prolapse >1 cm below the plane of the hymen but protrudes no further than 2 cm less than the total vaginal length; and stage 4, eversion of total lower genital tract being essentially complete	n= 3730 Stage I: 862 Stage II: 683 Stage III: 433 Stage IV: 0 Stage \geq II:1116	23.1% 18.3% 11.6% 0% 29.9%
UAE (2015) ²⁸ Age of women :>30 yrs.	The women were asked if they had a dragging lump coming down in the vagina, lump coming out of vagina or lump felt or seen outside the vagina. The presence of any of these symptoms was considered to indicate the presence of POP	n= 429 POP: 127	29.6%

Risk factors related to pelvic organ prolapse

Out of the twelve studies that identified the prolapse status based on a gynecological examination, nine studies discussed the factors that were associated with prolapse.^{8,16,19-21,23-25,27} Increasing age^{8,19-21,23-25,27}, number of parity^{8,16,19-21,24,25,27}, body mass index^{19,20,24,27} and fetal macrosomia^{20,23,27} were found to be the significant risk factors for prolapse in majority of the studies, irrespective to the country's economy. In context to the studies that assessed the associations of menopause with prolapse status, all three studies sampled in lower and lower-middle-income country suggested that menopause status increase the risk of prolapse^{8,16,20} while in case of upper-middle-income country two studies found no significant relationship between prolapse and menopause^{23,27} and only one study suggested the odds of prolapse increase (odds ratio (OR) 5.13; 95% CI 1.90-7.43) with menopause.²⁵

Three studies conducted in the upper-middle-income countries suggested that cesarean section could be a protective factor for prolapse in comparison to vaginal delivery^{23,24,27} while one study suggested that having more than three vaginal deliveries, history of

a vaginal delivery without episiotomy and history of operative delivery increases the odds of contacting prolapse.²⁵ However, in the context of low and lower-upper income countries, no study analyzed the odds of prolapse among vaginal delivery or cesarean section. However, one study found that about hospital delivery, delivering at home or health center increased the odds of prolapse (odds ratio (OR) 1.2; 95% CI 0.83-1.75).²¹ One study from Nepal suggested that there is statistical significant association between prolapse and factors such as age of first delivery (<20 years), delivery in squatting or standing position (P<0.05)¹⁶ and one study suggested that odds of prolapse increase if there is a history of problems with pregnancy (unadjusted odds ratio (UOR) 1.54; 95% CI 1.18-1.99), mild (adjusted odds ratio (AOR) 1.29, 95% CI 0.94-1.78) or moderate/severe (AOR 2.12; 95% CI 1.33-3.4) anemia and lower reproductive tract infection (UOR 1.34, 95% CI 1.03-1.75).¹⁹ The summary of hypothesized risk factors and significant risk factors analyzed in the selected studies are illustrated [Table- 4 and 5].

Table-4: Risk factors associated with clinically diagnosed POP in low and lower-middle-income countries.

Study	Hypothesized risk factors	The result from significant risk factor
Tanzania; Masenga et al (2018) ²¹ Statistical test: Logistic regression	Age: 18-34, 35-44, 45-54, 55-90 Occupation: Farmer, Business, Others Heavy work per day: 0-1 hrs, 2-4 hrs, 5+ hrs BMI: <24, 24-29, 30+ Parity: 0-2, 3-4, 5 Age first delivery: 10-19, 20-29, 30-40 Place of 1 st delivery: home or health center, Hospital Duration of 1 st labour: <24 hours, ≥24 hours	Age: Women age 35–44 (OR 1.62; 95%CI 1.07–2.47) and age of 45–54 years (OR 1.87; 95%CI 1.21–2.90) had higher odds of having a POP. Occupation: Being a farmer (OR 3.46; 95%CI 1.24–9.63) and in business (OR 3.22 95% CI 1.17-8.86) Parity: having delivered 3–4 times (OR 2.51; 95%CI 1.49–4.23) and 5 times or more (OR 6.10; 95% CI 3.48–10.7) Place of first delivery: delivering at home or health center (OR 1.21; 95% CI 0.83-1.75)
Nepal; Lien et al (2012) ¹⁶ Statistical test: Chi-square test	Age: 15-25, 26-35, 36-45, 46-55, >55 Parity>2 Age at 1 st delivery: <20 years Menopause Squatting /standing position during delivery The interval from delivery to work: 4 week	Parity>2 (P<0.05) Age at 1 st delivery:<20 years (P<0.05) Menopause: (P<0.05) Squatting or standing position during delivery: (P<0.05) The interval from delivery to work: ≤4 weeks (P<0.05)
Lebanon; Awwad et al(2012) ²⁰ Statistical test: Logistic regression	Age: 40.42 ± 9.34, 31.78± 9.56 years Vaginal Parity: 6.38 ± 2.77 vs 3.53 ± 2.57 Increased BMI: >24 kg/m ² , ≤24 kg/m ² Fetal macrosomia: ≥4,000 g, <4,000 g Miscarriage: One or more, None Cesarean delivery: Yes, No Operative vaginal delivery: Yes, No Anemia: Hemoglobin <12, Hemoglobin ≥12 Smoking status: Ever smoker, Never smoker Previous gynecological surgical operation; Menopause status; Metabolic disorders; Hypertension; Oral contraceptive use: Yes, No	Age: 40.42 ± 9.34 (RR=1.0940 P<0.0001) BMI: >24 kg/z ² (UOR 2.997; 95% CI 1.990-4.54, RR=1.6242 P=0.0483) Fetal macrosomia: ≥4,000 g (2.430; 95% CI 1.146-5.153) Miscarriage: ≤1 (UOR 2.490; 95% CI 1.738-3.569, RR=1.0832 P=0.2943) Menopause status: Present (UOR 3.297; 95% CI 1.888-5.755) Previous gynecological surgical operation: Present (UOR 1.797; 95% CI 1.243-2.599) Metabolic disorders: Present (UOR 2.735; 95% CI 1.239-6.035) Hypertension: Present (UOR 2.735; 95% CI 1.239-6.035) Anemia: Hemoglobin <12 (UOR 1.105; 95% CI 0.587-2.081) Smoking status: Ever smoker (UOR 1.360; 95% CI 0.954-1.939)

Gambia; Scherf et al (2002) ¹⁹ Statistical test: Logistic regression	Age (years): 15–24, 25–34, 35–44, 45–54 Marital status: Monogamous, Polygamous, Widowed/divorced, Single Grouped parity: Nulliparous, Para 1–3, Para 4–7, Para 8+ Currently pregnant: No, Yes History of problems with pregnancy: No, Yes Deficient perineum: No, Yes BMI: Normal, Underweight (< 18), Overweight/obese (BMI >25) Anaemia: Not anemic, Mild ((Hb< 11 (pregnant), Hb< 12 (non-pregnant)), Moderate/severe ((Hb< 9 (pregnant), Hb< 10 (non-pregnant)) Lower reproductive tract infection: No, Yes	Age: 25-34 (AOR 1.29; 95% CI 0.83–2.01), 35-44 (AOR 1.6; 95% CI 0.98–2.59), 45-54 (AOR 1.87; 95% CI 1.09–3.2) Marital status: Polygamous (UOR 1.72; 95% CI 1.33–2.22), Widowed/divorced (UOR 1.1; 95% 0.52–2.29), Single (UOR 0.17; 95% CI 0.02–1.42) Grouped parity: Para 1–3(AOR 6.39; 95% CI 2.24–18.22), Para 4–7 (AOR 11.69; 95% CI 4.0–34.13) , Para 8+ (AOR 14.95; 95% CI 4.94–45.24) Currently pregnant: Yes (AOR 1.62; 95% CI 1.11–2.38) History of problems with pregnancy: Yes (UOR 1.54; 95% CI 1.18–1.99) Deficient perineum: Yes (AOR 2.01; CI 1.52–2.64) BMI: Underweight (UOR 0.91; 95% CI 0.63–1.31), Overweight/obese (UOR 1.33; 95% CI 0.86–2.04) Anaemia: Mild (AOR 1.29, 95% CI 0.94–1.78), Moderate/severe (AOR 2.12; 95% CI 1.33–3.4) Lower reproductive tract infection: Yes (UOR 1.34, 95% CI 1.03–1.75)
Ghana; Wusu-Ansah(2008) ⁸ Statistical test: Logistic regression	Age: 15–24, 25–34, 35–44, 45–54, ≥55 Menopause: No Yes Parity: Nulliparous 0, 1–3, 4–6, ≥7	Age: 25–34 (OR 5.6; 95% CI 0.7–26.5), 35–44 (OR 3.4; 95% CI 0.3–182.1), 45–54 (OR 16.9; 95% CI 1.7–86.6), ≥55 (OR 27.8; 95% CI 1.1–1469.1) P<0.01 Menopause: Yes (OR 27.8; 95% CI 1.1–1469.1) P=0.02 Parity: 1–3 (Ref), 4–6 (OR 2.3; 95% CI 0.7–7.2), ≥7 (OR 4.0; 95% CI 1.1–14.8) P<0.01

Table-5: Risk factors associated with clinically diagnosed POP in upper-middle-income countries.

Study	Hypothesized risk factors	The result from significant risk factor
China; Li et al(2019) ²⁴ Statistical test: Logistic regression	Age: 20–29, 30–39, 40–49, 50–59, 60–69, ≥ 70 BMI: Normal (18.5–23.9), Underweight (<18.5), Overweight (24–27.9), Obese (≥28) Parity: Primiparous (=1), Nulliparous, Multiparous (=2), Multiparous (≥3) Delivery pattern: Vaginal spontaneous delivery, Vaginal assisted delivery, Cesarean section Job: Physical labor, Mental labor Alcohol consumption: No, Yes Smoking: No, Yes Cough (>3 weeks): No, Yes Constipation (>1 year): No, Yes Gynecological disease: No, Yes Pelvic surgery: No, Yes	Age: 30–39 (AOR 1.18; 95% CI 0.95–1.48), 40–49 (AOR 1.75; 95% CI 1.42–2.17), 50–59 (AOR 1.86; 95% CI 1.46–2.37, 60–69 (AOR 1.59; 95% CI 1.21–2.10), ≥ 70 (AOR 1.27; 95% CI 0.94–1.69) BMI: Underweight (AOR 0.80; 95% CI 0.62–1.03), Overweight (AOR 1.21; 95% CI 1.09–1.33), Obese (AOR 1.37; 95% CI 1.16–1.61) Parity: Nulliparous (AOR 0.12; 95% CI 0.06–0.22), Multiparous (AOR 1.60; 95% CI 1.42–1.80), Multiparous (AOR 2.18; 95 % CI 1.88–2.43) Delivery pattern: Vaginal assisted delivery (AOR 1.66; 95% CI 1.54–2.62), Cesarean section (AOR 0.34, 95% CI 0.33-0.49) Smoking: Yes (AOR 1.88; 95% CI 1.57–2.24) Alcohol consumption: Yes (AOR 1.09; 95% CI 1.01–1.14) Cough (>3 weeks): Yes (AOR 1.64; 95% CI 1.04–2.51) Constipation (>1 year): Yes (AOR 2.12; 95% CI 1.86–2.41) Gynecological disease: Yes (AOR 2.08; 95% CI 1.89–2.29)

Brazil; Horst et al (2017) ²³ Statistical test: Logistic regression	Age (years): 18–25, 26–35, >35 BMI: 18.5–24.9, 25.0–29.9, ≥30 History of vaginal delivery: No, Yes Birthweight(g): ≤4,000, >4,000 Hysterectomy: No, Yes Menopausal status: No, Yes Hormone replacement therapy: No, Yes Diabetes: No, Yes; Asthma: No, Yes Hypertension: No, Yes Constipation: No, Yes; Smoking: No, Yes	Age (years): 26–35 (AOR 1.9; 95% CI 0.8–4.4), >35 (AOR 5.8; 95% CI 2.6–13.0) P<0.01 History of vaginal delivery: Yes (AOR 6.7, 95% CI 4.0–11.4) P<0.01 Birthweight(g): >4,000 (AOR 2.0; 95% CI 1.0–4.2) P=0.04 Hysterectomy: Yes (AOR 2.8; 95% CI 0.9–8.4) P=0.06 Diabetes: Yes (AOR 2.7; 95% CI 1.0–7.4) P=0.04
Turkey; Aytan et al (2014) ²⁷ Statistical test: t-test, Chi square test	Age, years (mean ± SD) Body mass index, kg/m ² (mean ± SD) Waist-hip-ratio (mean ± SD) Parity (mean ± SD) Cesarean delivery rate Maximum birth weight, g (mean ± SD) Postmenopausal [n, (%)] Chronic diseases [n, (%)] Smoking [n, (%)]	Age: No Prolapse (39.0+11.1) vs Prolapse (42.8+9.4) P<0.001 BMI: No Prolapse (26.3+4.6) vs Prolapse (27.8+4.8) P<0.001 Waist-hip-ratio: No Prolapse (0.78+0.06) vs Prolapse (0.80+0.07) P<0.001 Parity: No Prolapse (1.8+1.5) vs Prolapse (3.2+1.8) P<0.001 Cesarean delivery rate: No Prolapse (200 (20.8%)) vs Prolapse (38 (10.6%)) P<0.001 Maximum birth weight, g : No Prolapse (3490+389) vs Prolapse (3584+574) P<0.001
Iran; Garshabi et al(2006) ²⁵ Statistical test: Logistic regression	Age: ≥50 (year) Parity: >3 Gravidity: >3 Number of abortions: ≥2 Number of vaginal delivery: >3 History of home delivery History of a vaginal delivery without episiotomy History of operative delivery History of giving birth to the macrocosmic infant Menopausal status	Age: ≥50 (yr) (OR 4.46; 95% CI 2.06 – 18.63) P<0.0001 Parity:>3 (OR 3.02; 95% CI 2.06 – 18.63) P<0.0004 Gravidity:>3 (OR 2.45; 95% CI 1.63 – 6.71) P<0.0003 Number of vaginal delivery:>3 (OR 5.90; 95% CI 2.46 – 10.87) P<0.0005 History of a vaginal delivery without episiotomy (OR 2.91; 95% CI 1.9-6.94) P<0.002 History of operative delivery (OR 2.41; 95% CI 1.5 – 3.75) P<0.005 Menopausal status (OR 5.13; 95% CI 1.90-7.43) P<0.0001

More to the findings of the selected studies, one study conducted in Nepal using ethnographic study and clinical study mixed design illustrated that among those women who knew about their prolapse status, one in four women reported trying traditional remedies. These remedies included ingesting special herbs or foods, hanging upside down, or inserting alcohol and herb-soaked cloth into the vagina regularly as well as visiting traditional healers (sudenis). They conducted special ceremonies and prescribed herbs and special foods along with instructing women on how to insert pessaries of alcohol and herbs.⁷ Similar to these findings, study sampled in one of the upper-middle-income countries, Iran demonstrated that only 25 out of 151 women with stress incontinence sought standard interventions, whereas the other affected women used traditional methods or ignored the symptom considering it to be a usual symptom that every woman bears who had given birth.²⁶

DISCUSSION

The current review has included 15 studies published between January 2000 and January 2020 reporting on the prevalence and risk factors of pelvic organ prolapse in countries of a different economy. The average prevalence of pelvic organ prolapse (stage I-IV) lies at 40.01% while the clinically significant prolapse (≥Stage II) average at 33.27%.^{7,8,16,17,19-21,23-27} Similarly, the studies that assessed prolapse status based on expressed symptoms found the prevalence of symptomatic prevalence to be at 19.5%.^{18,22,28} A similar phenomenon was observed in another systematic review by Barber et al²⁹ which noted that the prevalence of pelvic organ prolapse defined by the symptoms ranged at 3-6% which in case of the vaginal examination was up to 50%. This suggests that there is a chance of under-reporting of prolapse prevalence when it is only measured based on symptomatic measures. Furthermore, in this review, we noted that

the higher burden of clinically significant prolapse (\geq Stage II) is directed towards the countries of the low and lower-middle economy with an average of 58.8% which in case of the higher economy lies at 20.35%.^{16,20,21,23-27} The prevalence of prolapse in the low and lower-middle-income countries in this study was also higher in comparison to a systematic review performed on thirty studies from developing nations, which reported mean prevalence of the POP at 19.7% with the prevalence range of 3.4% to 56.4%.⁵

In this review, it has been noted that articles adopting probability sampling reported a slightly higher prevalence (37.41%) of prolapse compared to studies using less rigorous sampling (34.60%),^{7,8,16-28} perhaps because those suffering from prolapse are less likely to volunteer in studies using a convenience sample. This suggests that many studies may underestimate the prevalence of prolapse as women with prolapse might not be visiting the health institutions during the time of the study. Different measures were used to diagnose and categorize POP status in the 15 publications included in this review. Eight studies used procedure of Valsalva maneuver performed in the dorsal lithotomy position to diagnose prolapse which was followed by Prolapse Quantification System (POP-Q) for the staging of POP illustrating the weighted prevalence of 33.27% (range: 9.23 - 64.6%) for prolapse of stage II-IV.^{16,20,21,23-27} Two studies performed speculum examination and bimanual examination of pelvis without staging prolapse through POP-Q thus yields a mean prevalence of 35.1% (range: 12.1%-46%) for prolapse of stage I-IV.^{8,19} Two studies didn't provide detailed information on the gynecological examination.^{7,17} Two studies reported the use of the WHO subgroup tool to assess symptomatic prolapse^{18,22} and one study diagnosed prolapse status based on symptoms expressed by the participants,²⁸ providing the mean prevalence of symptomatic prolapse at 19.5% (range: 13.3% - 29.6%).

The risk factor for prolapse such as increasing age, number of parity, body mass index, and fetal macrosomia remains the major associated factors for prolapse in all nations, irrespective to their economy.^{8,16,19-21,24,25,27} However, some factors are more prevalent at in low and lower-middle income countries such as the age of first delivery, home delivery, delivery in squatting or standing position,

anemia, history of pregnancy complication, an occupation that are more prevalent in countries with lower economy.^{16,19-21} These additional risk factors are mostly the consequences of poor service delivery system and standard of living as compared to countries of the higher economy. Increased age and parity were also found to be related to the prevalence of POP in a systematic review performed in thirty studies sampled in developing countries.⁵ Additionally, some studies also suggested that there is statistically significant relationship that exists between prolapse status and certain behavior characteristics and chronic conditions such as smoking,^{20,24} alcohol consumption,²⁴ hypertension,²⁰ chronic cough,²² diabetes,²³ metabolic disorders,²⁰ and constipation.²⁴ However, some studies also suggested that no statistically significant relationship exists between these attributes such as smoking, hypertension, constipation or any chronic diseases.^{23, 27}

Despite the intensive review, this review encountered several limitations. We confined our search only on the free accessed literature and limited paid assessed articles searched through the PubMed database and the study covers studies published in the last two decades. So, this paper may not cover all the published literature reporting prevalence and risk factors of pelvic organ prolapse. Out of the assessed literature, this paper primarily concentrated on the original articles either conducted in the community or health care facilities, while some of the studies followed convenience sampling making the findings less generalizable. For further assessment of the scientific literature on pelvic organ prolapse in different nations of varying economies, we suggest more systematic reviews on interventional studies and meta-analyses.

CONCLUSIONS

The low and lower-income countries have almost twice the burden of pelvic organ prolapse than the countries of the higher economy. The major risk factors associated with prolapse remains common in all countries irrespective of national income or development. However, the low- and lower-income countries have higher prevalence as they face additional risk factors which are mostly associated with service delivery and other health conditions. In this scenario, more priorities should be given for the prevention and management of prolapse and research in countries with low and lower-upper income economies.

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