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REVIEW ARTICLE

Prevalence of symptomatic pelvic floor disorders in community-dwelling women in low and middle-income countries: a systematic review and meta-analysis

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Abstract

Introduction and hypothesis Pelvic floor disorders (PFDs), including urinary incontinence (UI), faecal incontinence (FI) and pelvic organ prolapse (POP), are common debilitating conditions globally, with considerable variation of prevalence reported in low and middle-income countries (LMICs). It was hypothesised that the variation could be due to both random and non-random errors. The aim was to determine the pooled prevalence estimates of PFDs among community-dwelling women in LMICs and to examine possible reasons for the variations of prevalence reported.

Methods A systematic search of MEDLINE, EMBASE, PsycINFO, CINAHL and Maternity & Infant Care was conducted to retrieve eligible studies. A meta-analysis with a random effects model and a meta-regression were performed. The manuscript was structured using the PRISMA checklist .

Results A total of 49 studies were included. The overall pooled prevalence of PFDs in LMICs was 25% (95% CI 22–29%). The pooled prevalence of UI, FI and POP was 30% (95% CI 25–35%), 8% (95% CI 4–11%) and 15% (95% CI 10–20%), respectively. A significant difference in the prevalence of UI was found between studies conducted in low and lower middle-income and upper middle-income countries and for FI between studies that used validated and non-validated questionnaires. Other methodological features did not show any effect on the variation of prevalence estimates of UI, FI and POP.

Conclusions PFDs affect a substantial proportion of women in LMICs. Since methodological heterogeneity was unexplained, this review suggests the need for large nationally representative population-based surveys to provide reliable estimates of the prevalence of PFDs in LMICs.

Keywords Faecal incontinence · Low and middle-income countries · Pelvic floor disorders · Pelvic organ prolapse · Urinary incontinence

Introduction

Pelvic floor disorders (PFDs), including urinary incontinence (UI), faecal incontinence (FI) and pelvic organ prolapse (POP), are common debilitating conditions among women worldwide [1–3]. In high-income countries (HICs), especially in the USA, about one quarter of women reported at least one PFD [4, 5]. Risk factors for PFDs in HICs include advancing age, obesity, parity and hysterectomy [6]. However, PFDs among women in low and middle-income countries (LMICs) are poorly understood [7]. It is anticipated that PFDs may be more prevalent in women in LMICs than in HICs for reasons such as increasing obesity and the ageing population in LMICs [8, 9]. Furthermore, higher parity associated with early marriage, greater numbers of vaginal deliveries and more frequent heavy manual work all result in

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mechanical stresses, which increase the risk of PFDs in women in LMICs [2, 7, 10–12]. Several of these factors are compounded by co-morbidities and under-nutrition [2].

A previous systematic review of POP and incontinence in LMICs found substantial variation in the reported prevalence of PFDs [2]. The authors noted considerable heterogeneity in study design, the age groups of women studied, definitions used and the methods for collecting data. However, the reasons for this variation were not examined in detail. The review was also limited by a narrow database search (using only MEDLINE) and the absence of meta-analyses. Moreover, the available information about PFDs in LMICs is limited. Therefore, the present study aimed to determine the pooled prevalence estimates of PFDs in community-dwelling women in LMICs and considered potential explanations for the variations of prevalence reporting.

Materials and methods

This study was undertaken in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist [13] and was registered with the international prospective register of systematic reviews (PROSPERO): CRD42016043881.

Data sources and search strategy

A systematic electronic database search of MEDLINE, EMBASE, PsycINFO, CINAHL and Maternity & Infant Care was undertaken from inception to March 2017 and updated in March 2018 by two investigators (MRI and LR) to retrieve all English language studies that contained information on the prevalence of symptomatic PFDs in community-dwelling women in LMICs. LMICs include low income countries ($995 or less), lower middle-income countries ($996-$3,895) and upper middle-income countries ($3896-12,055) [13]. The classification of LMICs is based on per capita gross income as defined by the World Bank [14]. Additional searches were conducted in Google Scholar and in grey literature sources such as conference and government websites. Hand-searching and retrospective searching of relevant published literature were also undertaken. The search strategy included a combination of subject terms and free text terms. These terms were combined with 'OR' and 'AND' operators. The Medical Subject Headings (MeSH) terms included pelvic floor disorders, pelvic organ prolapse, genital prolapse, uterine prolapse, urinary incontinence, stress/urge/mixed urinary incontinence, faecal incontinence, anal incontinence, prevalence, developing countries, resource-limit or resource-poor or low-income or lower-middle-income or middle-upper income countries. The complete search strategy was reported in detail elsewhere [15].

Inclusion criteria

Observational studies, studies of women with symptomatic PFDs who were otherwise healthy, published in English language, conducted in community settings and in LMICs were included. If any study compared the prevalence of PFDs in an LMIC country with an HIC, information only for a LMIC country was used. Where multiple publications were generated from the same data with different outcomes including UI, FI and POP, each of those publications was included. However, if multiple publications were generated from the same data with the same outcome, only the most relevant publication was included.

Exclusion criteria

Studies that evaluated treatments for PFDs, studies of women with co-morbidities such as diabetes, lower urinary tract symptoms, fistula and breast cancer, and studies conducted to assess quality of life of women with any PFDs, which did not assess the prevalence of PFDs, were excluded. Studies in employed women only, conducted in hospital/clinical settings or including migrant women from LMICs living in HICs were also excluded. Reasons for exclusion of these studies were: studies in hospital/clinical settings are likely to be highly selective (i.e. selection bias) resulting in inaccurate estimations of the true prevalence of PFDs in the community; professional women, working outside home, are more likely to be well educated, use health care services regularly and do not represent community-dwelling women, and the prevalence of PFDs in women who migrate from LMIC to developed countries is likely to reflect the prevalence in their host country, not their country of origin. This is due to exposure to better health systems available in host countries [16, 17]. Editorials, letters, opinion articles, narrative or systematic reviews, brief communications, conference abstracts and posters were also excluded.

Data extraction

Two of the authors (RMI and JO) extracted data independently using a standardised data extraction form developed on the basis of the Cochrane Good Practice Data Extraction Template [18]. All papers finally selected were cross-checked by two other authors (MNK and JR). Any disagreement on a particular paper was resolved by discussion before inclusion in the study. Data were abstracted into evidence tables and summarised descriptively.

Risk-of-bias and quality assessment

A risk-of-bias tool was used to assess external and internal validity, developed explicitly for systematic reviews of

prevalence studies [19]. Two review authors (MNK and JR) assessed risk of bias independently; inconsistencies were identified and resolved through discussion involving a third author where necessary. The risk-of-bias tool has ten items: (1) national representativeness, (2) target population representativeness, (3) random selection or census undertaken, (4) minimal nonresponse bias, (5) data collected from subjects, (6) acceptable case definition used, (7) valid and reliable study instrument used, (8) same mode of data collection for all subjects, (9) length of the shortest prevalence period and (10) appropriateness of numerator(s) and denominator(s) for the parameter. Items 1 to 4 assess external validity (selection and nonresponse bias) and items 5 to 10 assess internal validity (measurement and analysis bias). All of these items are rated high or low. Item 11, the summary assessment, evaluates overall risk of study bias and is based on the author's subjective judgement given responses to the preceding ten items rated as low, moderate or high risk.

Assessment of heterogeneity

The I^2 statistic was used as a measure of heterogeneity both within and between studies using each of the three sets of PDFs. $I^2 > 75\%$ was labelled as high heterogeneity [20].

Statistical analysis

Meta-analysis was performed to synthesise the prevalence estimate for PFDs and its subtypes. The decision to perform a meta-analysis was made a posteriori to ensure that sufficient studies with similar characteristics were available for meta-analysis. Prevalence rates were calculated from raw proportions reported in included studies. Investigators were contacted for those studies in which raw data were missing or unclear. The random-effects pooled estimate was calculated using weights based on inverted variances of estimates from each study sample. Meta-regression was used to investigate pooled prevalence differences between PFD subtypes, economic level of countries (low-income vs middle-income countries), sample size of the study (large vs. small sample size), sampling techniques used (random vs. convenience), questionnaire validation (validated vs. non-validated), type of validated questionnaire used (the International Consultation on Incontinence Questionnaire vs. other questionnaires) and publication year (2010 to recent years vs. years before 2010). The 'large sample size' was defined as having ≥ 384 women included in the study as suggested by Naing et al. [21]. The 'recent years' were defined as years from 2010 to 2018. All analyses were performed using Stata statistical software packages (version 15.0; StataCorp LP, College Station, TX, USA).

Results

Characteristics of included studies

A total of 2879 papers were initially identified from which 364 duplicates were removed, and 49 met the inclusion criteria (Fig. 1). All included studies were cross-sectional, published between 2000 and 2018. Thirty-one studies (63%) were from upper middle-income countries, 15 (30.6%) from lower middle-income countries and 3 (7.5%) from low-income countries (Table 1). The sample size of included studies varied from 123 to 19,024 participants, with a total of 100,264 women providing data across the 49 independent studies.

The prevalence of UI, FI and POP was reported independently in 78%, 6% and 10% studies, respectively. Two-thirds of the studies (69.4%) used a random sampling procedure. Over half of the studies (57.1%) used a validated questionnaire, of which 64.3% studies used questionnaires that were linguistically validated. Of 24 studies that reported UI independently and used a validated questionnaire, 45.8% used the International Consultation on Incontinence Questionnaire, 12.5% used Questionnaire for Urinary Incontinence Diagnosis, 8.3% studies each used the Bristol Female Lower Urinary Tract Symptoms questionnaires, Incontinence Quality of Life questionnaire or Urogenital Distress Inventory short form (Table 1). For FI and POP different validated questionaries were used for each study.

Prevalence of PFDs

The overall random-effects pooled prevalence of PFD in LMICs was 25% (95% CI 22–29%) (Fig. 2). The pooled prevalence of UI, FI and POP was 30% (95% CI 25–35%), 8% (95% CI 4–11%) and 15% (95% CI 10–20%), respectively.

Meta-regression showed a significant difference of the pooled prevalence estimate between UI and FI [21.5% (95% CI 9.8–33.3%); $p < 0.0001$] and between UI and POP [14.7% (95% CI 4.2–25.1%); $p = 0.006$] but no statistically significant difference between FI and POP [6.9% (95% CI -7.7–21.4%); $p = 0.354$]. The overall heterogeneity was significant (I^2 = 99.69%, $p < 0.0001$) as was the 'between group' heterogeneity ($p < 0.0001$).

There was a significant difference in pooled prevalence estimates of UI between studies that were conducted in 'upper middle-income' and 'low and lower middle-income countries' [11.3% (95% CI 1.6–21.0%); $p = 0.022$] (Supplementary Figure 3a; Table 2). There was a significant difference in pooled prevalence estimates of FI between studies that used validated and non-validated questionnaires (13.2%, 95% CI 6.3–20.2%; $p < 0.0001$) (Supplementary Figure 4d; Table 2). There were no significant differences in pooled prevalence estimates of UI by sample size, sampling techniques,

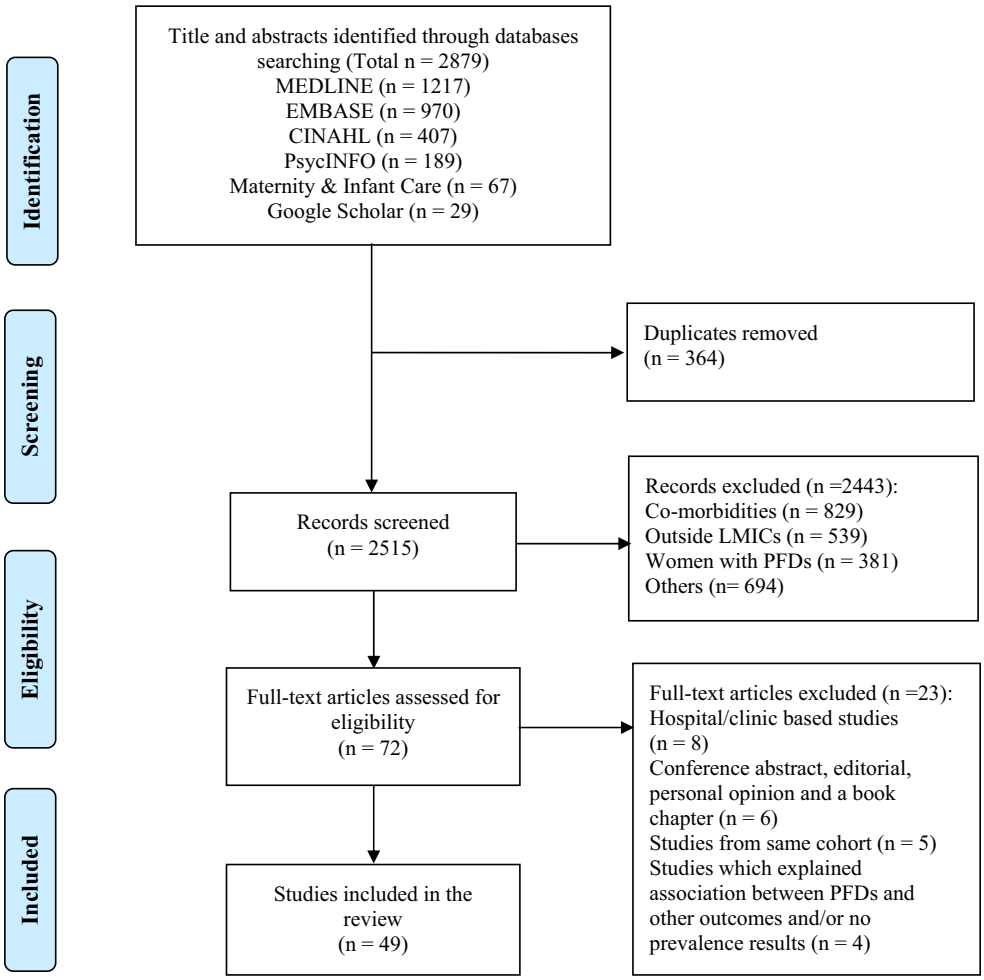

Fig. 1 Study flow diagram. MEDLINE: International Biomedical Bibliographic Database; EMBASE: International Biomedical and Pharmacological Bibliographic Database; CINAHL: Cumulative Index to Nursing and Allied Health Literature; PsycINFO: Psychological Information Database; Maternity & Infant Care; LMIC: low and middle income countries; PFDs: pelvic floor disorders

questionnaire validation, types of validated questionnaire used and publication year (Supplementary Figure 3b, c, d, e, f; Table 2).

There were no significant differences in pooled prevalence estimates of FI by economic status of a country, sample size, sampling techniques, types of validated questionnaire used and publication year (Supplementary Figure 4a, b, c, d, e; Table 2).

There were no significant differences in pooled prevalence estimates of POP between studies by economic status of a country, sample size, sampling techniques, questionnaire validation, types of validated questionnaire used and publication year (Supplementary Figure 5a, b, c, d, e; Table 2). The heterogeneity for all sub-group analyses was very high ($I^2 > 75\%$).

Risk of bias of the studies

A high risk of bias for eight of the ten items was identified assessed by the risk-of-bias tool (Table 1): national representativeness, target population representativeness, random selection or census undertaken, non-response bias, acceptable case definition, validated study instrument, prevalence period and the appropriateness of the numerator and denominator.

The risk of bias for each study is shown in Table 3. One study had a high risk of bias for both the external and internal validity. Twenty-two studies had low ratings for risk-of-bias items for both external and internal validity. Two studies were free from any sort of bias.

Discussion

This systematic review and meta-analysis was undertaken to determine the pooled prevalence estimates of PFDs among community-dwelling healthy women in LMICs and to consider potential explanations for the variations of prevalence reporting. This review highlights that one in every four women from LMICs experienced some form of PFD. A unique contribution is the demonstration of statistically significant variation in the prevalence estimates between UI and FI and between UI and POP, with no significant variation between POP and FI. Exploration of variation in the prevalence estimates of each PFD were performed based on the economic

Table 1 Characteristics of included studies

Authors/year	Country	Economic level	Study settings	Sampling procedure	Questionnaire validation/linguistically validated	Age in years	Outcome/s	Sample size	Existing cases	Prevalence	Risk-of-bias items[a]
Aguilar-Navarro et al. 2012 [22]	Mexico	UMIC	Urban + rural	Random	Non-validated/no	70+	UI	1124	202	18	1, 4, 9
Ahmadi et al. 2010 [23]	Iran	UMIC	Urban	Random	Unclear/no	40+	UI	800	307	38.4	1, 4, 7, 9
Akter et al. 2016 [10]	Bangladesh	LMIC	Rural	Random	Non-validated/no	15+	POP	787	123	15.6	1, 7
Alimohammadian et al. 2014 [24]	Iran	UMIC	Urban	Random	Unclear/no	40+	FI	800	147	18.4	1, 7
Araujo et al. 2009 [25]	Brazil	UMIC	Rural	Unclear	Validated (ICIQ-SF, POP-Q)/yes	12–77	UI/FI/POP	377	22/01/30	5.8/0.3/8	1, 3, 4, 9
Aslan et al. 2009 [26]	Turkey	UMIC	Urban	Unclear	Non-validated/no	60+	UI	392	170	43.4	1, 3, 7,9
Badejoko et al. 2015 [27]	Nigeria	LMIC	Semi-urban	convenience	Validated (QUID)/yes	20–100	UI	1250	65	5.2	1, 3, 9
Bodhare et al. 2010 [28]	India	LMIC	Rural	Random	Validated (ICIQ)/no	35+	UI	552	53	9.6	1, 4
Burti et al. 2012 [29]	Brazil	UMIC	Urban	Random	Non-validated/no	65+	UI	388	149	38.4	1, 7, 9
Demir et al. 2017 [30]	Turkey	UMIC	Urban	Unclear	Validated (ICIQ-SF)/no	18–85	UI	719	362	50.3	1, 3
de Gouveia Santos et al. 2014 [31]	Brazil	UMIC	Urban	Random	Validated (BFC)/yes	40–60	FI	1203	48	4	1, 9
de Souza Santos et al. 2010 [32]	Brazil	UMIC	Urban	Random	Non-validated/no	18+	UI	342	112	32.9	1, 4, 7, 9
Dogan et al. 2015 [33]	Turkey	UMIC	Urban	Unclear	Validated (3IQ)/no	65+	UI	508	277	54.5	1, 3
El-Azab et al. 2007 [34]	Egypt	LMIC	Urban + rural	Random	Validated (UDI-6)/yes	20+	UI	1652	905	54.8	1
Feng et al. 2005 [35]	China	UMIC	Urban	Random	Validated (BFLUTSQ)/yes	20+	UI	4684	889	19	1
García-Pérez et al. 2012 [36]	Mexico	UMIC	Urban	Random	Validated (SWAN)/yes	25–54	UI	1307	240	18.4	1, 9
Ge et al. 2011 [37]	China	UMIC	Urban + rural	Random	Validated (ICIQ)/no	20+	UI	3058	675	22.1	1, 8
Gözükara et al. 2014 [38]	Turkey	UMIC	Urban	Random	Non-validated/no	15–49	UI	300	118	39.3	1, 7
Islam et al. 2016 [39]	Bangladesh	LMIC	Urban + rural	Random	Validated (QUID, POPDI-6, CRADI-8)/yes	30–59	UI/FI/POP	1586	376/83/258	23.7/5.3/16.2	–
Jokhio et al. 2013 [40]	Pakistan	LMIC	Rural	Random	Unclear/yes	15+	UI	5064	581	11.5	1
Juliato et al. 2017 [41]	Brazil	UMIC	Urban	Random	Validated (ICIQ-SF)/yes	45–60	UI	749	177	23.6	1, 9
Kaşıkçı et al. 2015 [42]	Turkey	UMIC	Urban	Random	Non-validated/no	65+	UI	1094	564	51.6	1, 7
Kocak et al. 2005 [43]	Turkey	UMIC	Urban + rural	Random	Validated (ICIQ-SF)/yes	18+	UI	1012	242	23.9	1, 9
Komeilifar et al. 2017 [44]	Iran	UMIC	Urban + rural	Convenience	Validated (ICIQ-SF)/Yes	15–49	UI	2000	1154	57.7	1, 3
Kumari et al. 2000 [45]	India	LMIC	Rural	Convenience	Non-validated	15+	POP	2990	227	7.6	1,2,3,4,6,7,9
Lien et al. 2012 [12]	Nepal	LIC	Rural	Convenience	Validated (UDI-6 POP-Q)/	16–80	POP (UP)	174	37	21.3	1, 3
Liu et al. 2014 [46]	China	UMIC	Urban + rural	Random	Validated (ICIQ-LF)/yes	20+	UI	5433	1265	23.3	1
Lu et al. 2016 [47]	China	UMIC	Urban	Random	Validated (ICIQ-SF)/no	40–65	UI	1067	397	37.2	1, 7
Manonai et al. 2006 [48]	Thailand	UMIC	Rural	Random	Validated (I-QOL)/yes	15–100	UI	1126	410	36.5	1, 4
Marques et al. 2015 [49]	Brazil	UMIC	Urban	Convenience	Non-validated/no	60+	UI	1089	395	36.3	1, 3, 7
Megabiaw et al. 2013 [50]	Ethiopia	LIC	Urban + rural	Random	Validated (Norwegian EPINCONT, S-POPQ)/no	15+	UI/FI/POP	405	31/2/25	7.8/0.5/6.2	1, 9
Ojengbede et al. 2010 [51]	Nigeria	LMIC	Urban + rural	Random	Non-validated/No	18>	UI	5001	140	2.8	1, 7
Onur et al. 2009 [52]	Turkey	UMIC	Urban + rural	Random	Validated (UDI-6)/yes	17–80	UI	2275	1054	46.3	1, 4, 9
Özdemir et al. 2018 [53]	Turkey	UMIC	Urban + rural	Convenience	Non-validated/no	20–49	UI	1161	830	71.5	1,3,4,6, 7
Özerdogoan et al. 2004 [54]	Turkey	UMIC	Urban	Random	Validated (I-QOL)/yes	20+	UI	625	161	25.8	1
Pathiraja et al. 2017 [55]	Sri Lanka	LMIC	Urban + rural	Random	Validated (KHQ)/yes	18–90	UI	2354	1308	55.5	1, 4, 9
Paneru 2013 [56]	Nepal	LIC	Rural	Random	Non-validated/no	16–35	POP	360	109	35.97	1, 7
Prabhu et al. 2013 [57]	India	LMIC	Rural	Random	Non-validated/no	20+	UI	353	90	25.5	1, 7
Reigota et al. 2016 [58]	Brazil	UMIC	Urban	Random	Non-validated/no	50+	UI	622	325	52.3	1
Sampaio et al. 2017 [59]	Brazil	UMIC	Urban	Convenience	Validated (ICIQ)/yes	31–40	UI	827	103	12.5	1, 3

Table 1 (continued)

Authors/year	Country	Economic level	Study settings	Sampling procedure	Questionnaire validation/linguistically validated	Age in years	Outcome/s	Sample size	Existing cases	Prevalence	Risk-of-bias items[a]
Seshan et al. 2013 [60]	India	LMIC	Urban + rural	Convenience	Non-validated/no	20–60	UI	598	202	33.8	1, 3, 4, 7
Sharfina et al. 2017 [61]	Indonesia	LMIC	Rural	Random	Validated (QUID)/no	20–59	UI	191	38	19.9	1,4
Sidik 2010 [62]	Malaysia	UMIC	Rural	Random	Non-validated/yes	60+	UI	123	4	3.3	1, 7, 9
Sumardi et al. 2014 [63]	Indonesia	LMIC	Urban + rural	Convenience	Unclear	10+	UI	1720	232	13.5	1, 3, 4, 7
Suyasa et al. 2015 [64]	Indonesia	LMIC	Urban	Random	Validated (ICIQ-B)/no	60+	FI	303	68	22.4	1, 4
Townsend et al. 2017 [65]	Mexico	UMIC	Urban	Unclear	Non-validated/no	30–82	UI	15,296	2115	14.0	1, 3, 4, 7, 9
Wusu-Ansah et al. 2008 [66]	Ghana	LMIC	Rural	Convenience	Validated (PFDI, PFIQ)/no	15+	POP	174	21	12.07	1, 3, 7
Zhu et al. 2008 [67]	China	UMIC	Urban	Random	Validated (ICIQ)/yes	20+	UI	5221	2010	38.5	1
Zhu et al. 2009 [68]	China	UMIC	Urban + rural	Random	Validated (BFLUTSQ)/no	20–99	UI	19,024	5878	30.9	–

3IQ 3 Incontinence Questions; *BFC* Bowel Function in the Community; *BFLUTSQ* Bristol Female Lower Urinary Tract Symptoms Questionnaires; *CRADI-8* Colorectal-Anal Distress Inventory-8; *FI* faecal incontinence; *ICIQ* International Consultation on Incontinence Questionnaire; *ICIQ-B* International Consultation on Incontinence Questionnaire-Bowels; *ICIQ-LF* International Consultation on Incontinence Questionnaire-Long Form; *ICIQ-SF* International Consultation on Incontinence Questionnaire-Short Form; *I-QOL* Incontinence Quality of Life; *LIC* low-income countries; *LMIC* lower middle-income countries; *KHQ* King's Health Questionnaire; *PFDI* Pelvic Floor Distress Inventory; *PFIQ* Pelvic Floor Impact Questionnaire; *POP* pelvic organ prolapse; *POPDI-6* Pelvic Organ Prolapse Distress Inventory-6; *POP-Q* Pelvic Organ Prolapse Quantification; *QUID* Questionnaire for Urinary Incontinence Diagnosis; *S-POPQ* Simplified Pelvic Organ Prolapse Quantification; *SWAN* Women's Health Across the Nation baseline questionnaire; *UI* urinary incontinence; *UMIC* upper middle-income countries; *UDI-6* Urogenital Distress Inventory short form

[a] Each number reported in the last column represents areas where risk of bias exists

level of the countries, sample size, sampling technique used, questionnaire validation, types of validated questionnaire used and publication year. The review did not show any effect on the pooled prevalence estimates based on these factors, except for a significant difference in pooled prevalence estimates of UI between studies that were conducted in low and lower middle-income and upper middle-income countries and prevalence estimates of FI between studies that used validated and non-validated questionnaires.

Meta-analysis demonstrated that the pooled prevalence of UI and POP is higher but FI is lower in LMICs compared with HICs [4, 5, 69–71]. The National Health and Nutritional Examination Survey reported that the prevalence of UI, FI and POP in women in the USA was 17.1%, 9.4% and 2.9%, respectively [5], while this review found that the corresponding prevalence was 30%, 8% and 15%, respectively, in women in LMICs. Reasons for the higher prevalence of UI and POP in women in LMICs are likely due to the higher parity, greater numbers of vaginal deliveries with unskilled birth attendants and more heavy manual work during pregnancy and post-delivery [2, 10, 11, 39]. The higher prevalence of FI in women in HICs may be exacerbated by co-morbidities, obesity and longer life expectancy [5]. Given that many LMICs are at the beginning of the socioeconomic transition, these factors are unlikely to contribute to FI in LMIC populations now, although this may change as non-communicable diseases and co-morbidities increasingly contribute to the burden of disease in LMICs. Another potential explanation of the low prevalence of FI in women in LMICs might be that women are less likely to report FI because of social stigma [31].

The variation of prevalence estimates of PFDs in LMICs was investigated in relation to the economic status of countries. There is an established link between life expectancy and socioeconomic status; hence, the proportion of the population ageing and its related consequences are likely to differ across countries with different levels of economic status. Moreover, the economic status of a country is associated with the risk factors of PFDs, including lifestyle and dietary practice, parity, obstetric health care delivery, health-seeking behaviours, educational status and social norms, which might have an impact. Hence, it was expected that there would be a differing PFD prevalence with countries' varying levels of economic status.

The quantitative synthesis in the current review did not confirm a differential prevalence for FI and POP associated with economic status of the countries. However, a significant difference in the prevalence of UI based on the economic level of individual countries was detected. This may be related to statistical power and reflect the greater frequency with which the prevalence of UI was reported in the included studies (the prevalence of UI, FI and POP was reported independently in 78%, 6% and 10% studies, respectively). The reason for the low prevalence of UI in low and lower middle-income

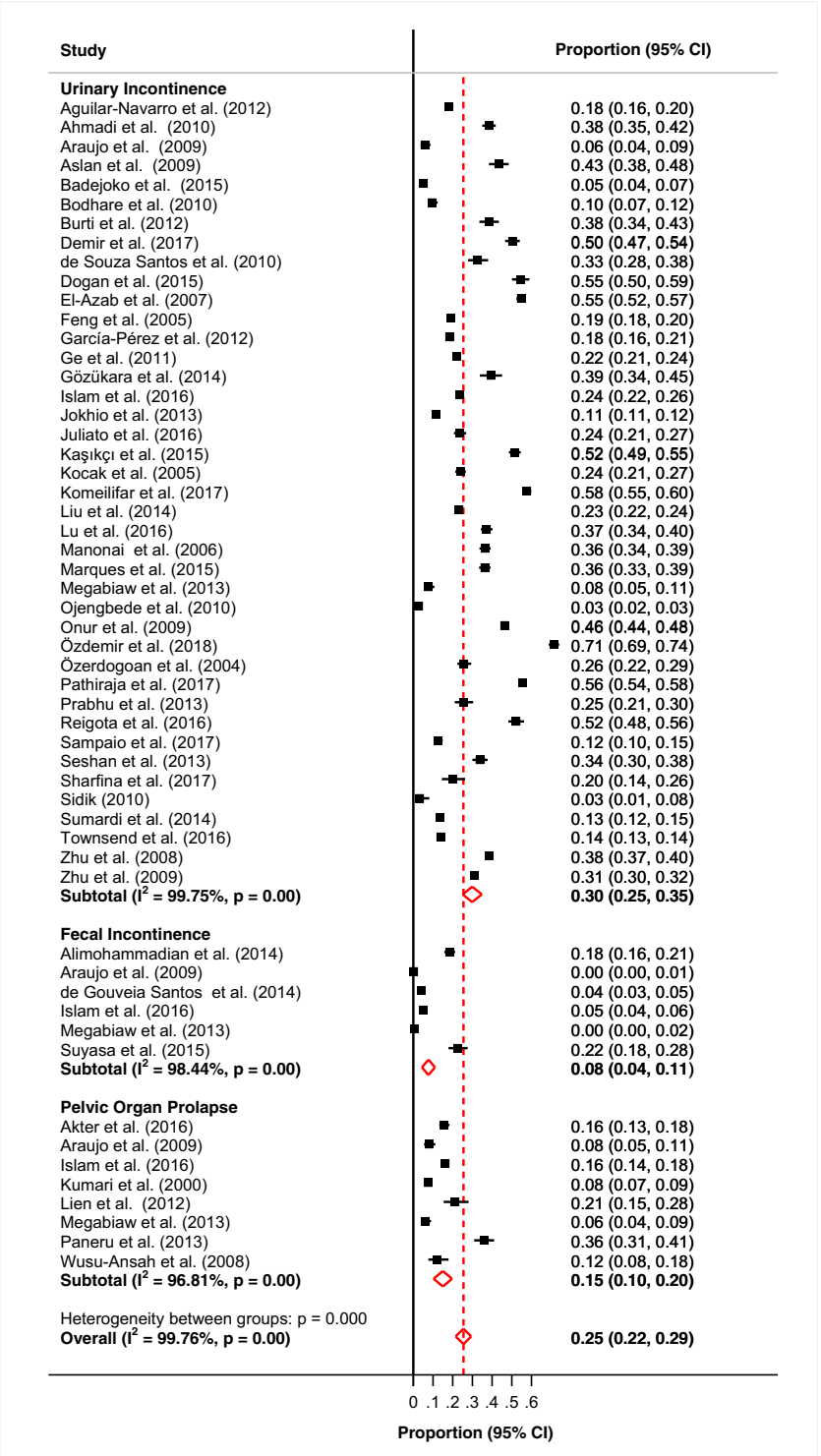

Fig. 2 PFD= Pelvic Floor Disorder; LMICs= Low and Middle-Income Countries; 95%CI= 95% Confidence Interval

countries could be that women in this context are less likely to report UI because of lack of health literacy and embarrassment that needs further investigation.

The findings of non-differential FI and POP prevalences is that the definitions of 'upper middle-income' and 'low and lower middle-income' as categories are probably no longer discriminatory in terms of health conditions of PFDs. Although categorisation by a country's income is common, grouping by more sensitive factors (which are associated with health outcomes) may be warranted. Possible factors include measures of education, public health infrastructure and work of non-government and voluntary organisations. These may have different roles in different countries that might have an impact on prevalence variation. Another explanation could be

Table 2 Comparison of pooled prevalence of each pelvic floor disorder by economic level of the country, sample size, sampling technique used, questionnaire and type of questionnaire used, and publication year

Comparison	No. of studies (no. of women)	Difference in pooled prevalences (95% CI)	*p* values
Urinary incontinence			
Upper middle income vs. low and lower middle income	29 (72,743) vs. 12 (20,730)	11.3% (1.6.0–21.0%)	0.022
Large vs. small sample size	35 (91,787) vs. 6 (1686)	7.8% (−5.2–20.8%)	0.242
Random vs. non-random sampling	29 (68,240) vs. 12 (25,233)	3.4% (−7.9–14.9%)	0.555
Validated vs. non-validated questionnaire	24 (58,006) vs. 15 (28,683)	4.1% (−5.8–13.9%)	0.418
The International Consultation on Incontinence Questionnaire vs. others	11 (21,015) vs. 13 (36,991)	2.9% (−9.1–14.9%)	0.632
2010 to recent years vs. years before 2010	31 (57,085) vs. 10 (36,388)	3.4% (−7.1%–13.8%)	0.529
Faecal incontinence			
Upper middle income vs. low and lower middle income	3 (2380) vs. 3 (2298)	1.3% (−7.4–10.1%)	0.770
Large vs. small sample size	4 (3998) vs. 2 (680)	3.5% (−5.9–12.9%)	0.466
Random vs. non-random sampling	5 (4301) vs. 1 (377)	9.3% (−1.9–20.6%)	0.105
Validated vs. non-validated questionnaire	5 (3878) vs. 1 (800)	13.2% (6.3–20.2%)	0.001
2010 to recent years vs. years before 2010	5 (4301) vs. 1 (377)	9.3% (−1.9–20.6%)	0.105
Pelvic organ prolapse			
Upper middle income vs. low and lower middle income	1 (377) vs. 7 (6480)	8.1% (−6.9–23.1%)	0.289
Large vs. small sample size	4 (5772) vs. 4 (1085)	7.6% (−2.0–17.2%)	0.122
Random vs. non-random sampling	4 (3142) vs. 4 (3715)	6.2% (−3.4–15.8%)	0.205
Validated vs. non-validated questionnaire	5 (2720) vs. 3 (4137)	6.7% (−5.1–18.4%)	0.266
2010 to recent years vs. years before 2010	5 (3519) vs. 3 (3338)	2.8% (−8.3–13.8%)	0.624

that a majority of the studies are from four 'upper middle-income' countries, Brazil, Turkey, Mexico and Iran, which might dilute the effect of the economic level of the countries on the prevalence variation. This underlines the need for more research examining FI and POP to determine true differences in these conditions in countries of different economic status, particularly in countries undergoing rapid socioeconomic transition.

There were no significant differences in the prevalence in either the overall PFD or the individual subgroups based on the methodological characteristics of the included studies. This suggests that the overall lack of high external validity of a study, including such features as a representative large sample and random sampling with high-quality recruitment procedures, may contribute to the difference, not merely an individual attribute. However, the difference based on this attribute could not be assessed because of the limited number of studies that had an overall high external validity. It was also noted that no study used a single validated questionnaire to estimate each of the PFDs. Thus, the review emphasises the necessity of further studies, which are large population-based nationally representative surveys using a single validated questionnaire to provide reliable estimates of each PFD prevalence. The only methodological attribute that showed a significant difference across studies was the use of a validated versus non-validated questionnaire in prevalence reporting of FI. However, caution should be used in interpreting this as a limited number of studies were available for this comparison.

It is possible that the variation of prevalence estimates across the population seen in the review might reflect the true prevalence specific to that population. Conversely, population attributes, including heterogeneity in age group, cultural variations, accessibility to health care and health-seeking behaviour, are likely to play important roles in determining the level of comfort and acceptability that individuals feel with their symptoms and their ability to report, which determine the variation of prevalence estimates of PFDs in women in LMICs.

The risk-of-bias tool demonstrated medium to high risk of bias in most studies, especially in the four items associated

Table 3 Review of authors' subjective judgements about the overall risk of bias for each included study

Risk of bias		External validity		
Internal validity		Low	Medium	High
	Low	22	15	3
	Medium	1	3	2
	High	–	–	1

External validity: 1/4 = low; 2/4 = medium; 3–4/4 = high

Internal validity: 1/4 = low; 2–3/4 = medium; 4/4 = high

Two studies had no risk of bias

Numbers inserted in the cells represent the number of articles associated with respective risk of biases

with external validity, lacking good quality studies in LMICs. Although most of the studies demonstrated low risk of bias for internal validity, over 40% of studies did not use a validated instrument to assess PFDs.

Strengths and limitations

The major strengths of the systematic review are the comprehensive database search, inclusion of studies that included community-dwelling women only and studies that reported symptomatic PFDs only. The current review provides the population perspective of the individual's likelihood of having a PFD, which can aid clinicians in determining pre-test probability and efficiently detecting such cases in LMICs. The limited number of studies available for this comparison may be a source of bias, especially for FI and POP. Second, studies published in languages other than English were not included and this may bias the estimates of PFDs found. The quantitative analyses undertaken were not able to identify the structural (health care delivery system), organisational (government and non-government organisations responsible for health care delivery and management) and political factors (good governance) that may affect the actual PFD prevalence variation and its reporting in LMICs. The true prevalence of POP may have been underestimated, as studies that used symptom-based definitions of POP rather than clinical diagnoses were included.

In conclusion, PFDs were found to affect one in four women in LMICs. This has clinical implications for the health system infrastructure and health service delivery in LMICs. There was a substantial heterogeneity apparent in the prevalence estimates of PFDs in LMICs that were unexplained by differences in methodological characteristics of the included studies, except the difference in the reporting of the prevalence of UI between studies conducted in low and lower middle-income and in upper middle-income countries. Thus, this review suggests the need for large population-based nationally representative surveys using a single validated questionnaire to provide reliable estimates of the prevalence of each PFD in LMICs.

Compliance with ethical standards

Ethics approval This review is entirely based on published data. Thus, ethics committee approval or written informed consent is not required.

Conflicts of interest None.

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