

Differences Between 25-hydroxyvitamin D Levels in Patients with Pelvic Organ Prolapse and Non-Pelvic Organ Prolapse: A Systematic Review



E. M. Kurniawati



N. A. Rahmawati



A. Widyasari

Eighty Mardiyani Kurniawati, MD, PhD;¹

Nur Anisah Rahmawati, MPH;²

Anis Widyasari, MD³

¹Department of Obstetrics and Gynecology Faculty of Medicine, Universitas Airlangga, Surabaya, East Java, Indonesia

²Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia

³Division of Urogynecology and Reconstructive Surgery, Obstetrics and Gynecology Department, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada, Dr. Sardjito Hospital, Yogyakarta, Indonesia

ABSTRACT

Objectives: Treatment options for cases of pelvic organ prolapse still lead to the use of a pessary rather than a surgical method. Additional therapy is needed to help treat or prevent pelvic organ prolapse. Vitamin D deficiency has consistently been associated with decreased muscle function, so it is assumed that it will affect the pelvic floor muscles. This paper systematically explores the differences between 25-hydroxyvitamin D levels in patients with pelvic organ prolapse and non-pelvic organ prolapse.

Study Design: A systematic review was conducted through the PubMed, Google Scholar, Cochrane Library, and ScienceDirect databases using relevant keywords. Articles published in the last 10 years—from 2012 to 2022—that were written in English, that discuss the status or effect of vitamin D on pelvic organ prolapse, and that focus on 25 OH-vitamin D were included in the review.

Results: In total, 717 articles were filtered but 8 articles met the criteria. A total of 1339 women with prolapse and without prolapse with ages ranging from 20 years to 78 years were included in the study. The studies found did not use the same standard threshold in determining deficiency status. Most studies have found that there are lower levels of vitamin D in women who have had pelvic organ

prolapse. A total of 7 of 8 studies confirmed the comparison of vitamin D-25OH levels in women with pelvic organ prolapse and without pelvic organ prolapse at $P < 0.05$.

Conclusions: There are differences between 25-hydroxyvitamin D levels in patients with pelvic organ prolapse and non-pelvic organ prolapse.

RÉSUMÉ

Objectifs : Les options thérapeutiques pour les cas de prolapsus génital s'orientent encore vers l'utilisation d'un pessaire au lieu du recours à une méthode chirurgicale. Un traitement complémentaire est nécessaire pour traiter et prévenir le prolapsus génital. Comme la carence en vitamine D est systématiquement associée à une diminution de la fonction musculaire, on présume qu'elle aura un effet sur les muscles du plancher pelvien. Cet article explore systématiquement les différences entre le taux de 25 (OH) D (concentration sanguine de 25-hydroxyvitamine D) des patientes avec prolapsus génital et celui des patientes sans prolapsus.

Méthodologie : Une revue systématique a été effectuée dans les bases de données PubMed, Google Scholar, Cochrane Library et ScienceDirect à l'aide de mots clés pertinents. Les articles publiés dans les 10 dernières années (2012–2022), rédigés en anglais, portant sur le statut en vitamine D ou l'effet de la vitamine D sur le prolapsus génital et traitant précisément de la vitamine 25 (OH) D, ont été retenus.

Résultats : Des 717 articles répertoriés, 8 ont été retenus. Au total, 1339 femmes de 20 à 78 ans, avec ou sans prolapsus, ont été incluses. Les études examinées n'utilisaient pas toutes le même seuil de référence pour déterminer un état de carence. La plupart ont relevé un taux inférieur de vitamine D chez les femmes ayant présenté un prolapsus génital. La comparaison entre le taux de 25 (OH) D chez les femmes avec prolapsus génital et celui chez les femmes sans prolapsus a été confirmée dans 7 des 8 études, d'après une valeur $P < 0,05$.

Keywords: pelvic organ prolapse; vitamin D; status; effect

Corresponding author: Eighty M. Kurniawati, eighty@fk.unair.ac.id

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Conclusion : On observe des différences quant au taux de 25 (OH) D entre les femmes avec et sans prolapsus génital.

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INTRODUCTION

Pelvic organ prolapse is the most common gynecological problem that occurs in women in both developed and developing countries.¹ Although pelvic organ prolapse is not a life-threatening or emergency condition, the patient experiences an impaired quality of life.² The risk of pelvic organ prolapse will continue to increase with age and parity.³ In the management of pelvic organ prolapse, 1 in 9 women may undergo some type of reconstructive surgery for pelvic organ prolapse during their lifetime and this incidence is expected to increase with increasing life expectancy.⁴ Pelvic organ prolapse also occurs in up to 50% of women who give birth.⁵

The diagnosis of pelvic organ prolapse is made by certain examinations. Patients who experience prolapse will report a visualization or sensation of a bulge in the vaginal area, which is related to vaginal pressure. Other symptoms that appear are increased urgency or frequency of urination, sensation of incomplete bladder emptying, and dyspareunia. The symptoms will appear gradually and may get worse over time as the prolapse progresses.⁶ Although not all women experience these symptoms pelvic organ prolapse often causes pelvic or lower abdominal pain. There are many treatment options for pelvic organ prolapse. Available treatment options include conservative treatment such as using a pessary, pelvic floor physical therapy, or surgical treatment.² Although there are many options, the treatment of pelvic organ prolapse is not completely satisfactory. Patient preferences, comorbidities, and treatment success rates should be considered when making decisions about their treatment.⁵

The pelvic floor is a unique body part whose function depends on the interrelationships between muscles, nerves, connective tissue, and bones. Pelvic floor disorders can occur when this relationship is disturbed. Vitamin D is an important micronutrient in calcium homeostasis and musculoskeletal health. Vitamin D deficiency can have clinical signs of rickets and osteomalacia. The clinical

symptoms of vitamin D deficiency are being explored in several medical conditions.⁷

Vitamin D deficiency is consistently associated with decreased muscle function and performance. In contrast, vitamin D supplementation has been shown to increase muscle strength, especially in elderly patients.⁸ A meta-analysis of randomized controlled trials found a reduced risk of falls in older people treated with vitamin D supplementation. This reduced risk of falls was associated with improved neuromuscular function in vitamin D-deficient subjects.⁹ Furthermore, evidence suggests that vitamin D may play an important role during muscle damage and regeneration. There is an increasing trend of vitamin D deficiency after menopause. This deficiency is likely to occur together with the incidence of pelvic organ prolapse which can occur at any age.^{10,11} The major circulating form of vitamin D is 25-hydroxyvitamin D (25 [OH] vitamin D). The total serum of 25(OH) vitamin D is the best indicator of vitamin D supply to the body from skin synthesis and nutrient intake. Based on this background, this study systematically explores the differences between 25(OH) vitamin D levels in patients with pelvic organ prolapse and non-pelvic organ prolapse.

METHODS

Study Design and Search Strategy

The systematic review was registered on the PROSPERO website with identification 409532. A systematic review was conducted to explore the status of 25(OH) vitamin D levels in patients with pelvic organ prolapse and non-pelvic organ prolapse. The preparation of the report followed the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA) guidelines.¹² A search was conducted through several databases involving PubMed, Science Direct, and Cochrane Library databases. The search is performed using relevant keywords with a combination of Medical Subject Heading terms namely “pelvic organ prolapse,” “vitamin D,” “status,” and “effect” and keywords with similar meanings. This manuscript was not subject to meta-analysis and was assessed for quality in AMSTAR2.¹³

Study Selection

Study selection was done by considering the inclusion criteria and exclusion criteria. Articles published in the last 10 years—from 2012 to 2022—that were written in English, that discuss the status or effect of vitamin D on pelvic organ prolapse, and that focus on 25(OH) vitamin D were included in the review. The exclusion criteria for this study were animal studies, case reports or case series,

Table 1. Quality assessment using MMAT

Study design and studies		Assessment criteria			
Quantitative non-randomized	Are the participants representative of the target population?	Are measurements appropriate regarding both the outcome and intervention (or exposure)?	Are there complete outcome data?	Are the confounders accounted for in the design and analysis?	During the study period, is the intervention administered (or exposure occurred) as intended?
Parker-Autry et al., 2012 ⁷	Y	Y	Y	Y	N
Barat et al., 2019 ¹⁵	Y	Y	Y	N	Y
Navaneethan et al., 2015 ¹¹	Y	Y	Y	Y	N
Legan et al., 2021 ¹⁶	Y	Y	Y	N	Y
Sasotya et al., 2020 ¹⁷	Y	Y	Y	Y/N	N
Ahn et al, 2018 ¹⁸	Y	Y	Y	N	Y
Al-Mehaisen, 2022 ¹⁹	Y	Y	Y	N	Y
Quantitative randomized	Is randomization appropriately performed?	Are the groups comparable at baseline?	Are there complete outcome data?	Are outcome assessors blinded to the intervention provided?	Did the participants adhere to the assigned intervention?
Kaur et al., 2017 ¹⁰	Y	Y	Y	Y/N	Y/N

MMAT: Mixed Methods Appraisal Tool; N: no; Y: yes.

letters to editors, review studies, abstracts without full text, and articles written in other languages.

Data Extraction and Methodological Quality Appraisal

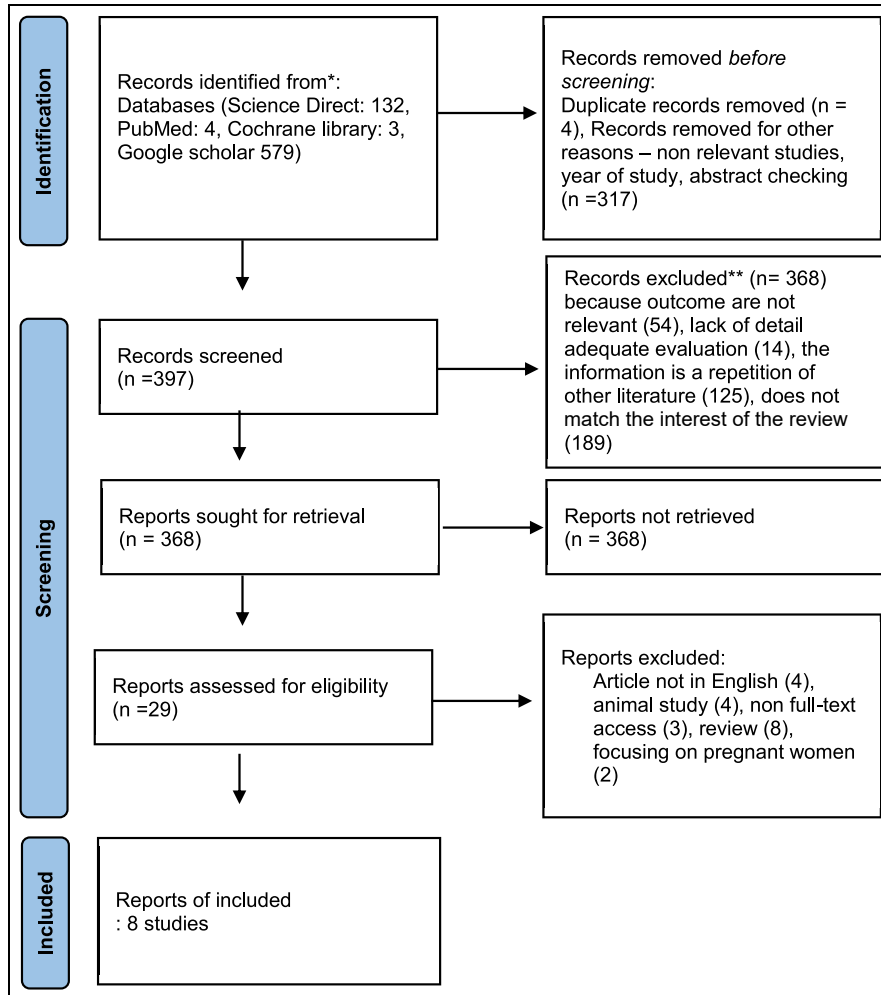
Two authors (E.M.K. and N.A.R.) performed title and/or abstract screening independently of the included articles using standard Microsoft Excel forms. In assessing the agreement of incoming articles, the researcher used Cohen's Kappa Consistency Test. In addition, the consensus is also carried out with the assistance of a third person if no agreement is found. Researchers conducted a risk-of-bias assessment study with the help of critical appraisal tools. The research quality in this review was analyzed using critical appraisal tools, namely the Mixed Methods Appraisal Tool (MMAT) version 2018. The MMAT is a critical appraisal tool that is designed for the appraisal stage of systematic mixed studies reviews, that is, reviews that include qualitative, quantitative, and mixed methods studies. The criteria for assessing non-randomized quantitative research are as follows: (1) the indicators represent the representativeness of the sample to the target population, (2) the measurements carried out correspond to both the outcome and the intervention (or exposure), (3) the outcome data is complete, (4) confounders are taken into account in the design and analysis,

and (5) the intervention administered (or exposure occurred) as intended. The criteria for assessing randomized quantitative research are as follows: (1) randomization was performed appropriately, (2) the groups were comparable at baseline, (3) outcome data were complete, (4) outcome assessors were unaware of the intervention given, and (5) participants adhered to the assigned intervention. In the use of the MMAT, quality is determined by providing a more detailed ranking presentation of each criterion to better inform the quality of the included studies. This can lead to performing a sensitivity analysis (i.e., to consider the quality of studies by comparing results).¹⁴ The results of the analysis are presented in [Table 1](#).^{7,10,11,15-19} The bias assessment was carried out using the risks of bias assessment (Cochrane of New Castle-Ottawa assessment). The application used was RevMan 5.4.

Data Abstraction and Synthesis

As suggested in a systematic review of the literature, the analysis is based on the results and conclusions of each study. As a first step, relevant results are extracted, sequenced, and examined to identify subthemes and themes. The results of the synthesis were carried out by all authors. Data are presented in a tabular form containing data from authors, year, country, study type, target

Figure 1. Prisma flow chart. Flowchart study selection.



population, intervention/control, type of vitamin D examined or given, findings, and adverse effects. Data were analyzed qualitatively. Meta-analysis could not be done because of the different characteristics of the research and respondents.

RESULTS

Study Selection

Figure 1 shows the flow diagram of the study selection. After the assessment of eligibility of full-text articles, 8

Figure 2. Risk of bias graph.

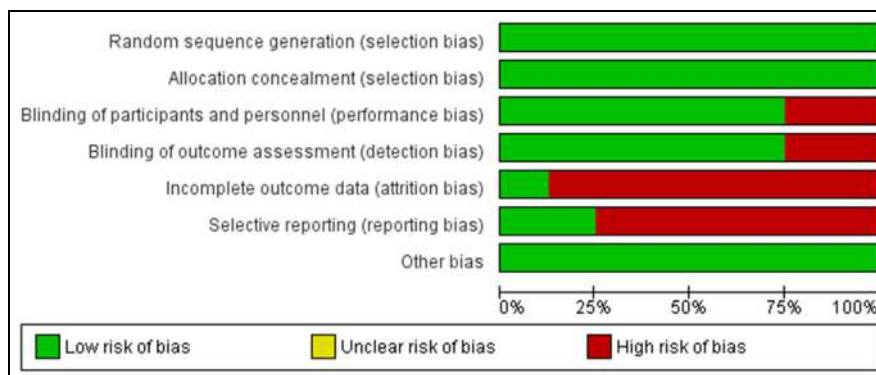


Figure 3. Risk of bias summary.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Al-Mehaisen, 2022	+	+	-	-	-	+	+
Barat et al, 2019	+	+	+	+	-	-	+
Hyung Ahn et al, 2018	+	+	+	+	-	-	+
Kaur et al, 2017	+	+	+	+	+	-	+
Legan et al, 2021	+	+	+	+	-	-	+
Navaneethan et al, 2015	+	+	+	+	-	-	+
Parker-Autry et al, 2012	+	+	+	+	-	-	+
Sasotya et al, 2020	+	+	-	-	-	+	+

studies were included for review. This manuscript consists of 8 articles discussing vitamin D status in women with pelvic organ prolapse. Kappa statistics for agreement between the 2 independent reviewers on title/abstracts and full text were 0.747 (99% agreement), respectively.

Quality Assessment and Study Characteristics

The quality results of the study indicate that all articles were in the moderate to good category. The results of the risk-of-bias assessment are shown in Figures 2 and 3. Most of the bias is caused by attrition bias and reporting bias. Not all studies pay attention to confounding variables in

their design and analysis. In addition, whether the interventions provided are in accordance with their goals is still in doubt. The results of the assessment are in Table 1.^{7,10,11,15-19} Research on vitamin D has been carried out in various countries. The type of research is mostly done in the case-control study. Women with pelvic organ prolapse with no pelvic organ prolapse were compared in different proportions. There are studies with the ratio of mothers with pelvic organ prolapse 2:1, 1:2, 3:1, and 1:1. Not all studies apply the inclusion and exclusion criteria in detail. Study characteristics are presented in Table 2.^{7,10,11,15-19}

Table 2. Study characteristics

Authors, year	Country	Study type	Population target	Prolapse diagnostic	Intervention/control	Age (y)	BMI	Parity	Finding	Statistical test results
Parker-Autry et al., 2012 ⁷	US	A retrospective chart review	PFDs	POPDI-6 (0-100)	268 PFD diagnoses/ 126 non-PFD diagnoses	60.2 ± 12.5 control, 64.3 ± 12.6 case	26.8 ± 7.8 control, 27.8 ± 7.6 case	Not Found	Insufficient vitamin D is associated with increased colorectal symptom distress and urinary incontinence	$P < 0.001$
Barat et al., 2019 ¹⁵	Iran	Case-control study	POP	POP was based on Stroker's description	105 pelvic organ prolapse/ 104 SUI/IUI	20–50	Control 44 (42.7%) case 50 (48.5%)	Control 3.29 ± 1.77, case 3.73 ± 1.97	SUI or UIU had the highest vitamin D level compared to women with POP	$P < 0.001$
Navaneethan et al., 2015 ¹¹	India	Case-control study	POP	POP quantification system	51 pelvic organ prolapse/ 69 without symptoms of PFD.	≥51 y case 38 (74.5), control 43 (62.3)	BMI >25 cases 9 (28.1) control 19 (42.2)	>3 cases 35 (72.9) control 44 (69.8)	A relationship between vitamin D deficiency and POP in postmenopausal women.	$P = 0.034$
Legan et al., 2021 ¹⁶	Slovenia	Case-control study	POP	POP-Q	50 pelvic organ prolapses/ 48 non-pelvic organ prolapses	case 62.6 ± 9.3 control 58.7 ± 7.2	Case 27.6 ± 3.8 control 27.1 ± 5.2	Parity 0/1/2/3/4/5 case 0/5/31/12/0/2 control 1/14/27/5/1/0	Vitamin D deficiency is associated with systemic factors associated with POP.	$P = 0.049$
Sasotya et al., 2020 ¹⁷	Indonesia	Observational analytical cross-sectional study	POP	Not Found	22 patients with POP/22 patients without POP.	Case 59.4 (5.6), control 55.0 (6.5)	Case 26.1 (3.6) control 25.3 (3.2)	Not Found	No significant correlation between vitamin D serum level with levator ani muscle and gastrocnemius soleus muscle strength in patients with POP and without POP in postmenopausal women.	$P > 0.05$
Ahn et al., 2018 ¹⁸	Korea	Case-control study	POP	POP Distress Inventory (POPDI-6)	47 females with PFDs/87 healthy females	Control 61.00 ± 1.12 case 60.93 ± 1.42	Control 23.44 ± 0.41 case 2.24 ± 0.14	Control 2.29 ± 0.10 case 23.96 ± 0.49	The difference in vitamin D levels between women with PFD and healthy females.	$P = 0.048$

(continued)

Table 2. (Continued)

Authors, year	Country	Study type	Population target	Prolapse diagnostic	Intervention/control	Age (y)	BMI	Parity	Finding	Statistical test results
Al-Mehaisen, 2022 ¹⁹	Jordan	Case-control study	POP	The Baden-Walker halfway system (I) and the POP-Q	104 females with PFDs/36 healthy females	Case 43.4 ± 13.9 control 40.8 12.7	Not Found	Case 6.12 ± 2.31 control 5.34 1.45	Patients with POP showed lower vitamin D levels than those without POP	P = 0.046
Kaur et al., 2017 ¹⁰	India	Randomized Controlled Trials	PFDs (including pelvic organ prolapse, urinary, and fecal incontinence)	Local pelvic examination	200 geriatric female patients	65–78 years of age	Case: 22.32, control: 21.72	Not found	Vitamin D levels were associated with a decreased risk of PFD	P = 0.0462

BMI: body mass indexes; IUI: insensible urinary incontinence; PFD: pelvic floor disorder; POP: pelvic organ prolapse; POPDI 6: Pelvic Organ Prolapse Distress Inventory-6; POP-Q: Pelvic Organ Prolapse Quantification System; SUJ: stress urinary incontinence; UIU: urgency urinary incontinence.

Respondent Characteristics

A total of 1339 women with prolapse and without prolapse were included in the study. In the age assessment, respondents ranged in age from 20 years and over to 78 years. There is 1 study that requires women over 19 years of age to be respondents. Most of the respondents have varying Body mass indexes. Parity is mostly at 3 or greater than 3. Respondent characteristics are presented in Table 2.^{7,10,11,15–19}

Assessment of Vitamin D Deficiency

The research included in this research uses different standard deficiency assessments. Some studies are not categorized. The standard limit for deficiency in ng/mL units was recorded as <15 ng/mL and <20 ng/mL and the standard limit in nmol/l units was recorded at <50 nmol/L (20 ng/mL). There is also 1 study that used the country's average vitamin D standard. Assessment of vitamin D deficiency is presented in Table 3.^{7,10,11,15–19}

Finding: 25(OH) Vitamin D Levels in Patients with Pelvic Organ Prolapse and Non-Pelvic Organ Prolapse

There are differences between 25(OH) vitamin D levels in patients with pelvic organ prolapse and non-pelvic organ prolapse. The study comparing vitamin D status in women with pelvic organ prolapse and without pelvic organ prolapse found that more women with pelvic organ prolapse will have a vitamin D deficiency than the average. Not all women with prolapse will be deficient in vitamin D. Different results were found from the research conducted by Sasotya et al.¹⁷ There was no significant relationship between serum 25(OH) vitamin D3 levels with the levator ani and gastrocnemius soleus muscles.¹⁷

DISCUSSION

This study explores the differences between 25(OH) vitamin D levels in patients with pelvic organ prolapse and non-pelvic organ prolapse. Most studies have found that there are lower levels of vitamin D in women who have had pelvic organ prolapse. Several factors are associated with pelvic organ prolapse such as age, Body mass index, and parity. The pelvic floor is a combination of several muscles with ligamentous attachments that create a dome-shaped diaphragm at the exit of the pelvic bones. Most of the pelvic floor muscles are the levator ani, consisting of the puborectalis, pubococcygeus, and iliococcygeus. Elevation and support of pelvic organs associated with pubococcygeus and iliococcygeus.²⁰ Several risk factors have been associated with pelvic organ prolapse, all contributing to the weakening of the pelvic floor

Table 3. Category of vitamin D deficiency and respondent criteria

Authors, year	Inclusion criteria	Exclusion criteria	Type of vitamin D	Laboratory assessment	Vitamin D Deficiency category
Parker-Autry et al., 2012 ⁷	Women with at least 1 visit to the Urogynaecology Care Clinic who were >19 y of age.	(1) women with medical disorders that could impair absorption or metabolism of vitamin D, (2) women with neurologic or other conditions known to affect UI or FI (3) incomplete/missing clinical data in the EHR (questionnaires, no vitamin D level within 12 mo of visit)	25(OH) vitamin D	liquid chromatography	(1) Deficient status <15 ng/mL. (2) Insufficient status between 15 ng/mL and 29 mg/mL. (3) Sufficient status >30 ng/mL was considered sufficient.
Barat et al., 2019 ¹⁵	Patients aged >20 y, were referred to a hospital for genitourinary tract dysfunction.	Any disorder preventing the absorption of vitamin D and any neurological disease affecting the urinary system or bowel movement, current or chronic infectious and those patients who used estrogen and progesterone or vitamin D supplementation over the past 6 months	25(OH) vitamin D	RIA method (Biosource Europes SA, Belgium).	(1) Deficient status <15 ng/mL. (2) Insufficient status between 15 ng/mL and 29 mg/mL. (3) Sufficient status >30 ng/mL was considered sufficient.
Navaneethan et al., 2015 ¹¹	Postmenopausal women	Women with chronic renal illness, previous vitamin D supplementation, non-ambulant chronically bedridden patients	25(OH) vitamin D	ECLIA by Roche	A vitamin D level of >20 ng/mL is normal.
Legan et al., 2021 ¹⁶	Patients attending the Gynecological Outpatient Department aged 50–74 years	Conditions affecting muscle function, supplementation of more than 400 IU of vitamin D daily in menopausal women	25(OH) vitamin D	Direct competitive CLIA	(1) Deficiency <50 nmol/L, (2) insufficient 50–74 nmol/L (3) normal 75–125 nmol/L
Sasotya et al., 2020 ¹⁷	Postmenopausal women	The medical record was not complete, had unstable vital signs or poor general health condition, and had other comorbidities	25(OH) vitamin D	ECLIA.	Not categorized
Ahn et al., 2018 ¹⁸	Women who utilized the health examination centre and the Obstetrics and Gynecology Clinic	Any medical conditions that impair vitamin D absorption or metabolism or are known to be a major cause of PFD, pregnant women, patients known to be on vitamin D supplementation	25(OH) vitamin D	Serum vitamin D panels were processed using liquid chromatography	(1) deficiency <20 ng/mL. (2) sufficient ≥30 (3) insufficient 20–30 ng/mL
Al-Mehaisen, 2022 ¹⁹	Non-pregnant females who visited the general outpatient clinics of the gynecological department over a 1-year duration	Women who refused to participate, pregnant women, all chronic illnesses or complaints with a particular focus on those that could potentially harm the musculature of the pelvic region, treatment for osteoporosis and taking vitamin D supplements	25(OH) vitamin D	The commercial kit Elecsys vitamin D total II was used on a COBAS Automatic Analyzer.	A previously reported national vitamin D average level for Jordanian females of (31.1 ± 12.0 nmol/L) was used as a cut-off level.
Kaur et al., 2017 ¹⁰	Females aged >65 y attending the outpatient department/indoor of Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar	Participants >65 y of age and those having chronic renal disease, already taking calcium and vitamin D	25(OH) vitamin D	ELISA kits	Deficiency (seriously affected) <12 ng/mL, insufficiency <12 to 30 ng/mL, sufficiency (adequately supplied) >30 ng/mL.

25(OH) vitamin D: 25-hydroxyvitamin D; CLIA: chemiluminescence immunoassay; ECLIA: electro chemiluminescence immunoassay; ELISA: enzyme linked immunosorbent assay; FI: faecal incontinence; HER: electronic health record; PFD: pelvic floor disorder; RIA: reamer-irrigator-aspirator; UI: urinary incontinence.

connective tissue/collagen, which allows the pelvic organs to prolapse through the vaginal wall.²¹

Vitamin D is a fat-soluble vitamin whose active metabolite (1,25-hydroxyvitamin D 1,25{OH}D₃) plays an important role in calcium homeostasis and is thus essential for the overall health of all individuals. The female pelvic floor is a complex body component whose global function depends on the delicate relationship between the musculoskeletal relationships and the pelvic bones that support the abdominal cavity and pelvic viscera. Pelvic floor muscle weakness is clinically observed in women with symptomatic pelvic floor disorders and thus may be affected by insufficient serum vitamin D. Vitamin D receptors have also been identified in the detrusor wall, so insufficient levels can affect bladder function as well. In vitro skeletal muscle cell, culture studies have shown that vitamin D can affect muscle strength by influencing cell proliferation and differentiation and muscle fibre size. It also protects against muscle degradation by preventing fat degeneration, insulin resistance, and arachidonic acid mobilization.²²

Administration of vitamin D increases the Modified Vaginal Health Index score in cases of pelvic organ prolapse.²³ The Vaginal Health Index Score is a clinical tool that, by evaluating 5 parameters (vaginal elasticity, vaginal secretions, pH, epithelial mucous membrane, vaginal hydration), allows to obtain a final score defining the degree of atrophy in the genitourinary tract by assigning a single score to each parameter. Total score ranges from 5 to 25, with lower scores corresponding to greater urogenital atrophy.²⁴

Although vitamin D has an impact, it can be exacerbated by various situations. The causes of prolapse are multifactorial but are mainly related to pregnancy and vaginal delivery, leading to direct pelvic floor muscle and connective tissue injury. Hysterectomy, pelvic surgery, and conditions associated with sustained episodes of increased intra-abdominal pressure, including obesity, chronic cough, constipation, and repetitive weight-lifting, also contribute to prolapse.^{25,26} This study involved women with ages ranging from 20 years and over to 78 years. There is 1 study that requires women over 19 years of age to be respondents. Different hormonal statuses in young and elderly women can cause bias in drawing conclusions.

This study has limitations, namely not many studies discuss how much vitamin D deficiency causes pelvic organ prolapse. Not all studies use the same standard

to diagnose vitamin D deficiency; therefore, meta-analysis cannot be performed. Recommendations for further research are to study the comparison of vitamin D deficiency severity affecting pelvic floor function. The other limitation is this study does not show causation. Women with pelvic organ prolapse may not be outside as much so their skin is less exposed to sunlight. This fact indicates that vitamin D levels can be lower than normal. This review has not been able to confirm a causal review.

CONCLUSION

There are differences between 25(OH) vitamin D levels in patients with pelvic organ prolapse and non-pelvic organ prolapse. Most studies have found that there are lower levels of vitamin D in women who have had pelvic organ prolapse. This study recommends conducting further research on the comparison of vitamin D deficiency severity affecting pelvic floor function.

PROVENANCE AND PEER REVIEW

Not commissioned, externally peer-reviewed.

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