PELVIC FLOOR DISORDERS ARE ASSOCIATED WITH VITAMIN D DEFICIENCY

Dr. Mamta Gupta¹*, Dr. Kirti Aggarwal², Dr. Sanjay Jain³, Dr. Vandana Saini⁴, Dr. S.K. Gupta⁵

Abstract

**Background:** A strong relationship between serum vitamin D concentration and muscle function has been documented in various studies. Vitamin D deficiency can lead to impairment of pelvic floor muscle strength and hence pelvic floor disorders (PFD) i.e. urinary incontinence, faecal incontinence and prolapse symptoms.

**Objectives:** 1) To determine serum vitamin D levels in women with PFD symptoms and healthy controls. 2) To correlate serum vitamin D levels with severity of PFD symptoms, pelvic floor muscle strength and quality of life in patients with PFD.

**Materials and Methods:** This was a hospital based case control study conducted on women attending gynaecology OPD. Eighty women were enrolled in our study and comprised of two groups - Group A of 40 patients with PFD symptoms and Group B of 40 healthy subjects. Serum vitamin D estimation, history, clinical examination, and pelvic floor muscle strength by Oxford scale was recorded in all the subjects on a predesigned proforma. Patients in group A were further divided on the basis of vitamin D status as vitamin D sufficient and vitamin D insufficient groups. PFD symptoms severity and its impact on quality of life were recorded on 'Pelvic Floor Distress Inventory-Short form 20' (PFDI-SF 20) and 'Pelvic Floor Impact Questionnaire-7' (PFIQ-7) questionnaire respectively in group A.

**Results:** In group A, 90% of patients were vitamin D deficient compared to 57.5% in group B \((p = 0.002)\). Vitamin D level had positive correlation with pelvic floor muscle strength in both group A \((p = 0.034, r value=0.336)\) and group B \((p = 0.004, r value = 0.448)\). Mean PFDI-SF 20 summary score was significantly more in vitamin D insufficient group compared to vitamin D sufficient group. A negative correlation with PFIQ-7 scoring \((p = 0.017, r value = -0.392)\) and vitamin D was observed, suggesting poor quality of life in vitamin D deficient women.

**Conclusion:** Vitamin D deficiency is associated with pelvic floor disorders, poor pelvic floor muscle strength and quality of life.

**Keywords:** Vitamin D, Pelvic Floor Disorders, Pelvic Floor Muscle, Quality of Life, Pelvic Organ Prolapse.

Introduction

Female pelvic floor disorders are a wide variety of clinical conditions, including urinary incontinence, faecal incontinence, pelvic organ prolapse, sensory and emptying abnormalities of the lower urinary tract, and defecatory dysfunction. Various studies have shown a strong relationship between serum vitamin D concentration and muscle function. Vitamin D influences muscle cell calcium uptake, phosphate transport across the muscle cell membrane, phospholipid metabolism and mediate cell proliferation and subsequently differentiation into mature muscle fibres. Vitamin D receptors (VDR) are present in several tissues throughout the body including brain, bone and also muscle tissue. Muscle biopsy studies in humans suggest a potentially selective effect of vitamin D on type II muscle fibers. Hence vitamin D deficiency has role in impaired muscle strength, leading to postural instability and increased risk of fall. Pelvic floor is composed of levator ani and coccygeus muscles. There are studies which show role of vitamin D in pelvic floor muscle strength. Hence, vitamin D deficiency can lead to impairment of pelvic floor muscle strength and lead to pelvic floor disorders. The symptoms of ‘pelvic floor disorders’ and its association with vitamin D therefore needs to be assessed. The ‘quality of life’ of such a woman having pelvic floor disorder symptoms is also adversely affected and needs evaluation. Extrapolation of this can be used for supplementing vitamin D in women with pelvic floor disorders to improve pelvic floor muscle strength, pelvic floor disorder symptoms and also improving quality of life (QOL) in these women.

There are very few studies in this regard which are either retrospective or based on self filled up questionnaires by patients having pelvic floor disorder symptoms. Therefore in this study, we have evaluated the association of vitamin D deficiency with pelvic floor disorders. Also we have assessed pelvic floor muscle strength and their clinical profile.

**Objectives**

The objectives of the study were 1) To estimate serum 25-

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hydroxyvitamin D \([25(OH)D]\) levels in women with PFD symptoms and healthy controls.

2) To correlate serum vitamin D levels with the pelvic floor muscle strength, severity of PFD symptoms and quality of life.

**Materials & Methods**

This case control study was conducted in the Department of Obstetrics & Gynaecology of an urban tertiary center, New Delhi from October 2013- March 2014. The study was approved by institutional ethics committee of Hindu Rao hospital and New Delhi Municipal Corporation, Medical College, Delhi. Study subjects included women attending gynaecology OPD who were more than 30 years of age. After taking written consent, 80 subjects were enrolled. These comprised of two groups-

Group A consisted of 40 women having PFD as defined by 'International Urogynaecological Association and the International Continence Society'. \(^9\) Presence of a PFD was defined as having at least one PFD symptom diagnosis i.e. stress urinary incontinence (SUI), urinary urgency incontinence (UUI), faecal incontinence (FI) or pelvic organ prolapse (POP) as their primary diagnosis.

Group B included 40 healthy subjects with no symptoms of PFD, coming for routine gynaecological care or other benign gynecological condition at their initial visit.

**Exclusion criteria:** Pregnant women, women three months after delivery, subjects with known neurological and muscular disorders known to affect urinary or faecal function; multiple sclerosis, degenerative muscular diseases, history of cerebrovascular accident, spinal cord injury etc., women with medical disorders like diabetes, inflammatory bowel disease that could impair vitamin D absorption or metabolism, urinary tract infection/pelvic inflammatory diseases and other infection, trauma including surgical trauma to urogenital area, bowel and bladder pathology, history of gastric bypass surgery, and chronic renal and/or liver disease, patients on medication for urinary urgency/incontinence, patients using diuretics and vitamin D supplements, patients who did not consent for the study.

Subjects in group A and group B were distributed based on the presence of a PFD diagnosis as defined above. Women with PFD (Group A) were further divided on the basis of serum 25 (OH) D levels as vitamin D sufficient and vitamin D insufficient groups.

Serum 25(OH) vitamin D, a metabolite of vitamin D was estimated in all women using CLIA Cobas e 411(Roche) by chemiluminescent assay. It is the most reliable marker of vitamin D status and has a half life of 3 weeks, is biologically inactive with levels approximately 1000 times greater than its other metabolite i.e. 1,25 hydroxy vitamin D. The assay employs a vitamin D binding protein (VDBP) as a capture protein in the assay which binds to 25 (OH) vitamin D. Addition of microparticles and hydroxy vitamin D labeled with biotin, the free sites of VDBP become occupied. The microparticles are magnetically captured on an electrode which induces chemiluminescent emission measured by a photomultiplier.

Vitamin D insufficiency was considered as levels <20 ng/ml in our study.

The demographic characteristics, history, clinical examination, pelvic floor muscle strength (PFMS) by Oxford grading and pelvic organ prolapse (POP-Q) staging if any were recorded in a predesigned proforma. In all the cases, clinical examination/observations were made by one observer only.

Two validated questionnaires were used in our study. First was 'Pelvic Floor Distress Inventory-Short Form 20 (PFDI-SF 20)' to measure PFD symptom severity and the second was 'Impact on Quality of life' (PFIQ-7) to assess quality of life in women with PFD symptoms. \(^10\) They were completed at the initial OPD visit.

**POP-Q staging**

Stage 0 - No prolapse is demonstrated

Stage I - Most distal portion of the prolapse is 1 cm or more above the level of hymen

Stage II - Most distal portion of prolapse is 1 cm or less proximal to or distal to the plane of hymen

Stage III - Most distal portion of prolapse is more than 1 cm below to the plane of hymen

Stage IV - Complete eversion of the total length of lower genital tract is demonstrable.

**Pelvic Floor Muscle Strength Testing (Oxford Grading)**\(^11\)

Examination was carried out after emptying the bladder in the dorsal position, with the knees semi-flexed. Patient was requested to contract the muscles of pelvic floor (like lifting up inside, closing of introitus, and drawing the anus in) and the perineum and labia were observed for any visible contractions, followed by palpation of the vaginal wall with two fingers. A 'best-of-three' assessment of pelvic floor contraction was carried out during examination. A score from 0-5 were given according to validated Oxford Scale.

Grade 0: No discernible contraction

Grade 1: Very weak contraction, a 'flicker'. Slight change in tension only

Grade 2: Weak contraction.

Grade 3: Moderate contraction with some squeeze and lift ability.

Grade 4: Good contraction; squeeze and lift against resistance.

Grade 5: Strong contraction, squeeze and lift against strong resistance.

**The Pelvic Floor Distress Inventory Short-Form 20 (PFDI-SF 20)**\(^12\)

It is a 20 item valid and reliable questionnaire used to assess
the distress, women faced due to pelvic floor disorders (PFD) like lower urinary and gastrointestinal tract dysfunction and pelvic organ prolapse symptoms.

The PFDI-SF 20 questionnaire consists of three subscales:
1. The Urinary Distress Inventory (UDI-6),
2. Pelvic Organ Prolapse Distress Inventory (POPDI-6)
3. Colorectal-Anal Distress Inventory (CRADI-8).

Of the 20 questions in PFDI-SF 20 form, each question response had yes or no as potential answers. 'No' response corresponded to a score of '0'. If the patient answered 'yes', then the response was based on an ordinal range from '1' to '4' in terms of the bother and severity of the symptoms:
1 = not at all,
2 = somewhat,
3 = moderately, and
4 = quite a bit.

Each subscale score was obtained by calculating the mean value of all answered items within the subscale (0-4) and multiplying it by 25 to obtain the scale score (range 0–100). The total PFDI-SF 20 summary score was the sum of all three subscale scores (range 0-300). Higher scores on the summary and subscale scores reflected greater distress from PFD symptoms.

The Pelvic Floor Impact Questionnaire (PFIQ -7)

It reflected the impact of bladder, bowel and vaginal symptoms on activities, relationships and subjective effects of a woman on her daily life to assess 'quality of life'. This questionnaire comprised four life impact domains to include physical activity, travel, emotional health, and social activities. It is based on the past three months' symptoms affecting women.

It has also three subscales:
1. Urinary Impact Questionnaire (UIQ:-7): under column heading 'Bladder'
2. Colorectal-Anal Impact Questionnaire (CRAIQ-7): under column heading 'Bowel'
3. Pelvic Organ Prolapse Impact Questionnaire (POPIQ-7): under column heading 'Prolapse'

Questions responses were assigned values of
0 = for not at all
1= for slightly
2 = for moderately and
3 = for greatly.

Scale Score was obtained by calculating mean values for all of the answered items within the corresponding scale (possible value 0-3) and then multiplying by 100/3 to obtain the scale score (range 0-100). Scores were added from the 3 scales together to obtain the summary score (range 0-300). Higher the score, greater was the impact on quality of life (QOL).

Statistical analysis

Demographics, medical characteristics, and laboratory values are presented as means and standard deviations (SD) for continuous and frequencies for categorical variables. Chi-square and Student’s t test analysis compared the demographic characteristics and laboratory data between women in the control and PFD groups. After the women in the PFD group were dichotomized according to their vitamin D status (sufficient and insufficient with vitamin D levels <20ng/mL), subgroup differences were compared using chi-square and Student’s t test analysis for categorical and continuous variables. For correlation (r value) Spearman rank correlation test was used. Validated questionnaire data were analysed as continuous variables and were compared based on their vitamin D status using the Student’s t test. P value less than 0.05 was considered significant. All statistical calculations were done using SPSS (Statistical package for Social Science) version 16.

Results

The baseline characteristics of the patients in the two groups were similar in respect of age, body mass index (BMI) and menopausal status (Table 1).

Table 1. Baseline data of subjects in the two groups

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Parameter</th>
<th>Group A (n=40)</th>
<th>Group B (n=40)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Age</td>
<td>50.8±12.5 years</td>
<td>46.6±10.2 years</td>
<td>0.187</td>
</tr>
<tr>
<td>2.</td>
<td>BMI</td>
<td>22.8±4.16kg/m²</td>
<td>23.5±4.31kg/m²</td>
<td>0.446</td>
</tr>
<tr>
<td>3.</td>
<td>Parity</td>
<td>4.18±2.34</td>
<td>2.45±1.25</td>
<td>0.001</td>
</tr>
<tr>
<td>4.</td>
<td>Post Menopause</td>
<td>22(55%)</td>
<td>20 (50%)</td>
<td>0.654</td>
</tr>
</tbody>
</table>

Vitamin D levels

The mean vitamin D levels was significantly lower (p=0.003) in patients having pelvic floor disorder symptoms. In group A, 90% patient were vitamin D insufficient compared to 57.5% in group B which was statistically significant (Table 2).

Table 2. Vitamin D levels in two groups

<table>
<thead>
<tr>
<th>Vitamin D ng/ml</th>
<th>Group A</th>
<th>Group B</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n)</td>
<td>(%)</td>
<td>(n)</td>
<td>(%)</td>
</tr>
<tr>
<td>0-19.9 (insufficient)*</td>
<td>36</td>
<td>90%</td>
<td>23</td>
</tr>
<tr>
<td>20-32 (sufficient)</td>
<td>4</td>
<td>10%</td>
<td>17</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>12.81 ± 7.67</td>
<td>21.6 ± 16.21</td>
<td>0.003</td>
</tr>
</tbody>
</table>

*Vitamin D insufficiency was considered as levels < 20 ng/ml in our study
**Pelvic muscle strength**

Poor pelvic muscle strength with Oxford grading 1-2 was seen in 19 women of group A compared to 2 women of group B (p = 0.0001). Good pelvic muscle strength in group B (n=25) with Oxford grading 4-5 compared to group A patients (n=6). In both the groups, a positive correlation of vitamin D with muscle strength was seen (Table 3).

<table>
<thead>
<tr>
<th>Oxford grading</th>
<th>GROUP A (cases)</th>
<th>GROUP B (controls)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n)</td>
<td>Mean ± SD vitamin D (ng/ml)</td>
<td>Mean ± SD vitamin D (ng/ml)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>3 ± 0</td>
</tr>
<tr>
<td>2</td>
<td>18</td>
<td>11.06 ± 5.63</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>12.97 ± 7.63</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>19.34 ± 1.034</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>r value</td>
<td>0.336</td>
<td>0.448</td>
</tr>
</tbody>
</table>

**Clinical profile**

In patients having pelvic floor disorder symptoms, clinical profile was evaluated and it was found that all the patients had some degree of prolapse. Majority of them (n=28) were associated with cystocele (Table 4). The difference in clinical profile, in vitamin D sufficient and insufficient group was found to be statistically significant.

**Table 4. Clinical profile in PFD women**

<table>
<thead>
<tr>
<th>S.No</th>
<th>Clinical profile</th>
<th>Total patients</th>
<th>Vit D insufficient group ng/mL</th>
<th>Vit D sufficient group ng/mL</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>n</td>
<td>Mean vit D</td>
<td>n</td>
<td>Mean vit D</td>
</tr>
<tr>
<td>1</td>
<td>UUI</td>
<td>9</td>
<td>8</td>
<td>10.22±4.14</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>SUI</td>
<td>19</td>
<td>17</td>
<td>10.60±5.73</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Cystocele</td>
<td>28</td>
<td>26</td>
<td>10.82±5.42</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Rectocele</td>
<td>13</td>
<td>13</td>
<td>11.73±5.67</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Enterocoele</td>
<td>8</td>
<td>8</td>
<td>13.13±4.61</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Cx descent pop.</td>
<td>3</td>
<td>3</td>
<td>14.81±7.67</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Stage 1</td>
<td>4</td>
<td>3</td>
<td>14.81±7.67</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Stage 2</td>
<td>7</td>
<td>6</td>
<td>10.97±5.98</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Stage 3</td>
<td>12</td>
<td>11</td>
<td>9.88±5.07</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Stage 4</td>
<td>17</td>
<td>16</td>
<td>11.36±8.88</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>117*</td>
<td>109*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Many patients had more than one clinical finding hence there is disparity in total number of patients and the clinical profile.

**PFDI-SF 20**

Mean PFDI-SF 20 summary score was significantly more in vitamin D insufficient group signifying the association of vitamin D insufficiency and severity of PFD symptoms; however, no significant difference was found in the scores of its subscales related to prolapse and bladder symptoms (Table 5). No patient in vitamin D sufficient group had bowel symptoms.

**Table 5. PFDI-SF 20 scoring in vitamin D sufficiency and insufficiency groups**

<table>
<thead>
<tr>
<th>Scale score</th>
<th>n</th>
<th>Scale Score in vitamin D insufficient group (0-19.9 ng/ml)</th>
<th>Scale Score in vitamin D sufficient group (20-32 ng/ml)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFDI-SF 20</td>
<td>40</td>
<td>140.5 ± 43.95 (n=36)</td>
<td>85.37 ± 32.03 (n=4)</td>
<td>0.020</td>
</tr>
<tr>
<td>POPDI-6 (0-100)</td>
<td>37</td>
<td>61.56 ± 11.95 (n=34)</td>
<td>58.33 ± 7.21 (n=3)</td>
<td>0.650</td>
</tr>
<tr>
<td>CRADI-8 (0-100)</td>
<td>19</td>
<td>59.89 ± 13.53 (n=19)</td>
<td>0 (0)</td>
<td>-</td>
</tr>
<tr>
<td>UDI-6 (0-100)</td>
<td>33</td>
<td>59.27 ± 11.60 (n=30)</td>
<td>55.5 ± 9.52 (n=3)</td>
<td>0.591</td>
</tr>
</tbody>
</table>

**PFIQ-7**

Mean PFIQ-7 summary score was significantly high in vitamin D insufficient group, signifying the association of vitamin D insufficiency and quality of life; however, no significant difference was found in the scores of its three subscales (Table 6). A negative correlation with PFIQ-7 scoring (p=0.028, r value = -0.392) and vitamin D was observed, suggesting poor quality of life in vitamin D deficient women.

**Table 6. PFIQ-7 scoring in vitamin D sufficiency and insufficiency groups**

<table>
<thead>
<tr>
<th>Scale score</th>
<th>N</th>
<th>Scale Score in vitamin D insufficient group (0-19.9 ng/ml)</th>
<th>Scale Score in vitamin D sufficient group (20-32 ng/ml)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFIQ-7</td>
<td>40</td>
<td>116.10 ± 39.48 (n=36)</td>
<td>62.76 ± 15.44 (n=4)</td>
<td>0.028</td>
</tr>
<tr>
<td>Bladder (UIQ-7) (0-100)</td>
<td>26</td>
<td>54.31 ± 19.83 (n=24)</td>
<td>32.50 ± 32.52 (n=2)</td>
<td>0.162</td>
</tr>
<tr>
<td>Bowel (CRAIQ-7) (0-100)</td>
<td>3</td>
<td>23.77 ± 12.58 (n=3)</td>
<td>0 (0)</td>
<td>-</td>
</tr>
<tr>
<td>Prolapse (POPIQ-7) (0-100)</td>
<td>35</td>
<td>77.98 ± 20.77 (n=33)</td>
<td>61.64 ± 13.23 (n=2)</td>
<td>0.284</td>
</tr>
</tbody>
</table>
Discussion

This study was aimed to estimate serum vitamin D levels in women with pelvic floor disorders (PFD) and healthy controls and to correlate serum vitamin D levels with pelvic floor strength, severity of PFD symptoms, and quality of life.

The demographic distributions of patients in our study i.e. mean age group, BMI, and menopausal status of patients in both the groups was comparable (Table 1).

Mean vitamin D levels were significantly less \( (p = 0.003) \) in the PFD group \( (12.81\pm7.67) \) compared to control group \( (21.6\pm16.21) \). Similar results were observed by Candace et al\(^8\), and Navneethan et al\(^9\). More number of patients in group A were vitamin D deficient compared to group B \( (90\% \text{ vs } 10\%, p = 0.002) \) signifying patients with pelvic floor disorders were associated with lower levels of vitamin D levels.

Various studies have shown to increase skeletal muscle efficiency in vitamin D sufficient women.\(^1,2\) In our study, higher levels of vitamin D in both the groups was seen in higher muscle strength of oxford grading of 3 and above compared to lower oxford grading of 0 to 2 in both the groups. Thus, a positive correlation was seen between vitamin D levels and pelvic floor muscle strength \( (r \text{ value } = 0.336 \text{ and } r \text{ value } = 0.448 \text{ in group A and B respectively}) \). We could not find any other study in literature where pelvic floor muscle strength was assessed and associated with vitamin D levels though many studies have found an association of skeletal muscle strength and vitamin D levels. Hence, this is a novel finding of our study. This finding of our study can be extrapolated that vitamin D supplementation may be beneficial as an adjunct with pelvic floor muscle training (PFMT), the first line of treatment in women having SUI, UUI, overactive bladder; thus optimizing results of PFMT.

Clinical profile of patients of PFD group has shown that none of the patients in vitamin D sufficient group \( (n=4) \), had UUI, rectocele or enterocoele; only 2 patients had SUI and cystocele and 4 had prolapse. In the vitamin D insufficient group \( (n=36) \), there were 9 patients having UUI, 19 patients had SUI, cystocele was present in 28 patients, rectocele in 13, enterocoele in 8 and some degree of prolapse uterus was found in all the patients. Thus, a strong positive association was seen between the clinical profile and vitamin D insufficiency. We could not find any other study in literature where clinical examination and assessment of pelvic floor disorders in relation to vitamin D has been evaluated. Study by Candace et al\(^8\) is a retrospective study and study by Badalian et al\(^1\) was based on a self-answered questionnaire.

Vitamin D receptor (VDR) has been identified in human skeletal muscle nuclei\(^3\), hence, it can be hypothesized that vitamin D is important in skeletal muscle efficiency, detrusor muscle and urothelial function, explaining our observation that vitamin D insufficient women are more affected by urinary incontinence compared to vitamin D sufficient group. The hypothesis may explain our observation that in vitamin D insufficient women, pelvic floor muscle weakness may prevent efficient closing of the urethra during increased intra-abdominal pressure resulting in SUI (stress urinary incontinence). Vitamin D insufficiency may also affect the detrusor wall contributing symptoms of overactive bladder and urgency (UUI). Gau JT\(^10\) reported two case studies of resolution of urinary incontinence symptoms with vitamin D supplementation. Dalonso et al\(^11\) has reported that higher intake of vitamin D in diet decreased the risk of overactive bladder symptom onset.

Our study revealed that in patients with insufficient vitamin D levels the PFD severity score \( \text{(PFDI-SF 20: } 140.5\pm43.95) \) was significantly high \( (p \text{ value } 0.020) \) compared to vitamin D sufficient group \( \text{(PFDI-SF 20: } 85.37\pm32.03) \), though the subscale scoring related to symptoms of bladder and prolapse did not show a significant difference. Nineteen women had bowel symptoms in the vitamin D insufficient group; whereas no women in vitamin D sufficient group had colorectal anal distress (Table 5). This observation is corroborated by Alkhatib et al\(^12\) who have reported a small series of 10 patients having faecal incontinence in which all patients were found to have hypovitaminosis D. A higher prevalence of vitamin D insufficiency has been found by Parker Autry et al in women having faecal incontinence.\(^13\)

A significantly higher PFIQ-7 summary score was seen in vitamin D insufficient patients compared to vitamin D sufficient patients \( (116.10 \pm 39.48 \text{ vs } 62.76 \pm 15.44, p = 0.028) \) in our study (Table 6). Thus a poor quality of life is associated with vitamin D deficiency.\(^14\) The results of this study gives an insight into possible reduction of pelvic floor disorders including urinary incontinence, improved pelvic floor muscle strength and a better quality of life by supplementing vitamin D. Vitamin D supplementation may be used as an adjunct to PFMT to optimize its outcome hence quality of life.

Conclusions

A significantly lower vitamin D levels was seen in women with PFD symptoms compared to women without PFD symptoms. Also lower vitamin D levels were associated with increased severity of PFD symptoms, and poor pelvic floor muscle strength and quality of life.

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Conflict of interest: The authors have no conflict of interest.

References

on the terminology for female pelvic floor dysfunction. *Int Urogynecol J* 2010; 21(1):5-26.


