

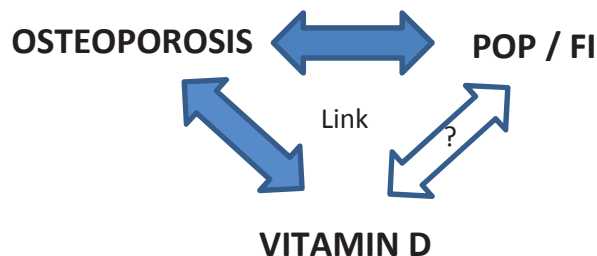
## Clinical Focus Topic: *Vitamin D and Pelvic Floor Symptoms*

### INTRODUCTION

Vitamin D has long been known for its association with bone and connective tissue density. Due to this link, reduced Vitamin D levels are accepted as an important risk factor for osteoporosis. Interestingly, epidemiological studies have also recently demonstrated a link between osteoporosis and pelvic floor disorders such as pelvic organ prolapse and faecal incontinence.

Vitamin D receptors have been found in human muscle tissue. As a result, Vitamin D is thought to influence not only bone and connective tissue density, but also striated muscle strength. Some research has even shown Vitamin D receptors in smooth muscles such as the detrusor and prostatic tissue. Therefore, the question now being asked by researchers is.....

*“In women with both Osteoporosis and Pelvic Floor Disorders, could the common underlying link be a Vitamin D deficiency that is impacting on bone, muscle and fascial density/function?”*



### **LET'S START WITH SOME LITTLE FACTS ABOUT VITAMIN D.....**

#### **PERSONAL DISCLOSURE**

##### **My Limitations on Writing this Review**

I think it is important to acknowledge my limitations in writing the initial part of this review which is simply an overview of Vitamin D itself. I am not a dietician nor a naturopath. Therefore my knowledge on Vitamin D is not extensive. As a result, this initial section will simply consist of a few basic facts about Vitamin D before turning to my main focus which is to summarise the research on Vitamin D and pelvic floor disorders.

*Note; I may ask one of our WHTA Physio members who is also a qualified naturopath to do a talk for us in the future on this!! (hint hint Alyssa ☺)*

## How do we get Vitamin D ?

The first important fact to realise is that there are many forms of "Vitamin D" and its precursors. The form that is ultimately measured in clinical studies is known as 25-hydroxyvitaminD<sub>2</sub>, commonly abbreviated to 25(OH)D.

### PROCESS OF CREATING 25(OH)D<sub>2</sub>

The process is commonly started by either a chemical reaction in the skin or via dietary intake of Vitamin D rich foods. In general though, a person's *primary* source is usually via the chemical reaction in the skin, with only 100-200IU per day usually coming from food sources.

1. The chemical reaction in the skin starts with Ultraviolet B exposure causing the Vitamin D precursor '7-dehydrocholesterol' being converted to Provitamin D<sub>3</sub>.
2. Provitamin D<sub>3</sub> is then transported via blood to either Adipose tissue or the Liver
3. In ADIPOSE TISSUE Provitamin D<sub>3</sub> is stored  
In the LIVER Provitamin D<sub>3</sub> is converted to 25-hydroxyvitamin D<sub>2</sub>, the substance which can then be converted to an active form by the kidney for influence over calcium homeostasis\*\*.

\*\*Calcium then affects bone and connective tissue density, but also affects muscle function via passage through calcium channels and interplay with ATP.

## SUMMARY: SOURCES OF VITAMIN D

### 1. Primary Source is via a stimulated reaction in the skin following Sunlight Exposure

A cholesterol called 7-dehydrocholesterol which is found in skin cell membranes is converted by Ultraviolet B exposure to Provitamin D<sub>3</sub>

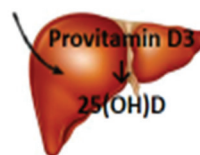
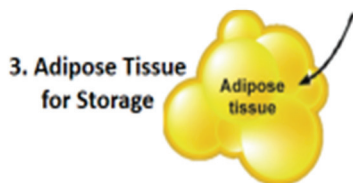


### 1. Secondary Source is via Fortified and Non-Fortified Foods

However, only ~100-200IU of Vit D comes from dietary sources each day



2. Provitamin D<sub>3</sub> is then transported via serum to either



3. Liver for conversion of Provitamin D<sub>3</sub> to 25-hydroxyvitamin D<sub>2</sub>

Note: The level of 25(OH)D is what is measured in most clinical studies to determine Vitamin D status

## How are Vitamin D Levels Measured Clinically?

A person's Vitamin D status is determined by a blood test that measures the serum **25(OH)D levels**.

### Vitamin D cut-offs:

It can be seen from the table below that there is some variation in the literature regarding the accepted cut-offs for diagnosing "Vitamin D Insufficiency" vs "Vitamin D Deficiency". However, >30ng/ml is generally regarded as normal.

	<u>Badalian et al (2010)</u>	<u>Parker-Autry et al (2012)</u>
NORMAL =	>30	>30
Vitamin D <i>Insufficiency</i>	20 – 30	15 - 30
Vitamin D <i>Deficiency</i>	<20	<15

**SERUM LEVEL OF 25(OH)D      units ng/ml**

## SOME FACTS ABOUT VITAMIN D DEFICIENCY

- Prevalence rates vary from 38% to 73%
- Prevalence rates vary based on skin pigmentation, geographic location and BMI / Obesity rates
- Countries at high and low latitude tend to have higher rates of seasonal vitamin D deficiency compared to those closer to the equator due to the reduced daylight hours.
- It affects people of all ages, however the implications for adults and young children are more severe
- Is known to cause osteoporosis, pain and muscle weakness.
- Due to the link with muscle weakness, there has also been found a link between Vit D Deficiency and falls
- It is also thought to have a role in some cancers, cardiovascular disease, diabetes, and pregnancy morbidity.

## Research on the Relationship between Vitamin D Levels and Pelvic Floor Disorders

Review of 4 relevant research papers....

1. Badalin SS and Rosembaum 2010, Vitamin D and pelvic floor disorders in women: results from the National Health and Nutrition Examination Survey, *Obstetrics and Gynecology*, vol 115 (4), pp795-803
2. Parker-Autry, Burgio and Richter 2012, Vitamin D Status in women with pelvic floor disorder symptoms, *International Urogynaecology Journal*, vol 23 (11), p1699-1705
3. Vaughan C, Johnson T, Goode P, Redden D, Burgio K and Markland A (2011), Vitamin D and lower urinary tract symptoms among US men: results from the 2005 – 2006 National Health and Nutrition Examination Survey.
4. Rhodius-Meester H, Otten H and Hamburger H (2010), Urinary Incontinence resolved after adequate vitamin D supplementation: a report of two cases. (2 CASE STUDIES WITH TREATMENT OUTCOME) *Journal of the American Geriatric Society*, vol 58 (12), pp 2438-2439.

**1. Badalin SS and Rosebaum 2010, Vitamin D and pelvic floor disorders in women: results from the National Health and Nutrition Examination Survey, *Obstetrics and Gynecology*, vol 115 (4), pp795-803**

Location: United States of America

Participants: n = 1,881 non-pregnant women. All participants >20 years old

Methods: Screened as part of the National Health and Nutrition Examination Survey, USA

- Pelvic Floor Disorders (PFD)
- Vitamin D Levels via blood test of 25(OH)D

**RESULTS:**

\*Results in black, marked with an asterisk and underlined reached clinical significant p<0.05

	All Women > 20years		Only women > 50 years	
	Normal >30 ng/ml	Insufficiency <30ng/ml	Normal >30 ng/ml	Insufficiency <30ng/ml
Prevalence of <b>Urinary Incontinence</b>	<b><u>6.2%*</u></b>	<b><u>9.8%*</u></b>	<b><u>14.0%*</u></b>	<b><u>25.7%*</u></b>
Prevalence of <b>Pelvic Organ Prolapse</b>	<b>2.8%</b>	<b>3.7%</b>	<b><u>3.3%*</u></b>	<b><u>8.6%*</u></b>
Prevalence of <b>Faecal Incontinence</b>	<b>6.2%</b>	<b>9.8%</b>	<b>12.5%</b>	<b>14.5%</b>
Prevalence of <b>AT LEAST ONE PELVIC FLOOR DISORDER</b>	<b><u>16.7%*</u></b>	<b><u>24.8%*</u></b>	<b><u>27.9%*</u></b>	<b><u>35.5%*</u></b>

**OTHER SIGNIFICANT RESULTS FOR ALL WOMEN >20 years of age**

- Women with a 25(OH)D level >30 had a 25% lower risk of PF disorders compared to women with 25(OH)D<30
- Every 5 point increase in 25(OH)D level resulted in an ~6% decreased risk of pelvic floor disorders
- With specific regard to urinary incontinence rates, a 25(OH)D level >30 resulted in a 30% reduced risk compared to women with a level <30.

**OTHER SIGNIFICANT RESULTS SPECIFICALLY FOR WOMEN >50 years of age**

- Women with a 25(OH)D level >30 had a 21% lower risk of PF disorders compared to women with 25(OH)D<30
- Every 5 point increase in 25(OH)D level resulted in an ~8% decreased risk of pelvic floor disorders
- With specific regard to urinary incontinence rates, a 25(OH)D level >30 resulted in a 45% reduced risk compared to women with a level <30.

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## 2. Vaughan C, Johnson T, Goode P, Redden D, Burgio K and Markland A (2011), Vitamin D and lower urinary tract symptoms among US men: results from the 2005 – 2006 National Health and Nutrition Examination Survey.

BACKGROUND From p. 1292:

*“Vitamin D receptors are known to exist in prostate and bladder tissue, and agonists for the vitamin D receptor may have anti-inflammatory and anti-proliferative properties. .... Vitamin D deficiency could influence the development of benign prostatic hyperplasia (BPH) because the active form of Vitamin D is a regulator of prostatic cell growth through anti-proliferative effects.”*

### METHODS:

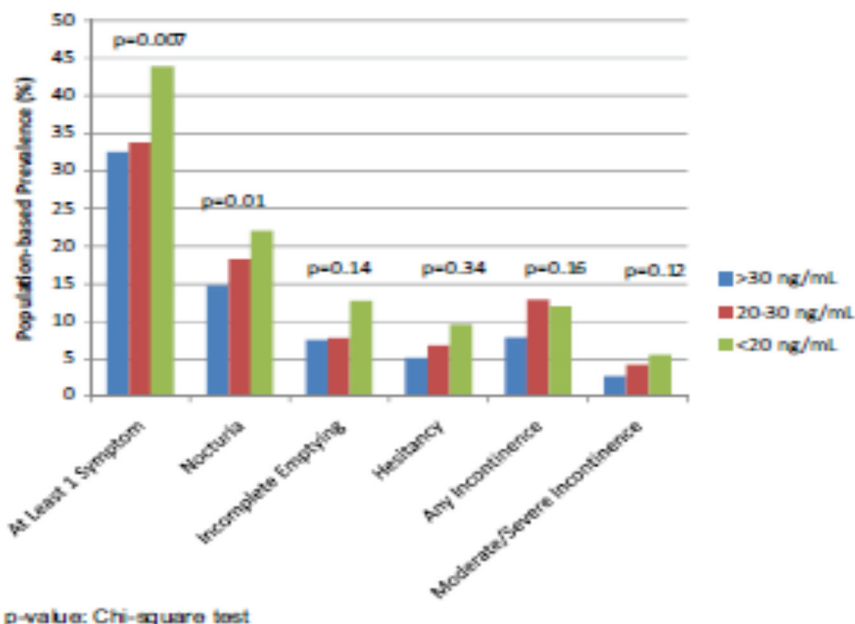
Participants were interviewed in their homes regarding LUTS. Physical examination including height, weight, abdominal girth, also occurred. Venepuncture to determine levels of 25(OH)D was carried out.

Vitamin D Status was classified as:

- >30 = Normal,
- 20-30 = Insufficient,
- <20 = Deficient

### RESULTS:

Progressively lower levels of 25(OH)D were associated with increased prevalence of all urinary symptoms including nocturia, incomplete emptying, hesitancy, and urinary incontinence (any incontinence or mod/severe incontinence).



Whilst the difference between normal and “insufficiency” (20-30) did not always reach significance, there was a significant difference between those with Normal Vitamin D and those with Deficiency (<20ng/mL)

**Figure 1.** Prevalence of individual LUTS and urinary incontinence according to vitamin D levels among US men.

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### 3. Parker-Autry, Burgio and Richter 2012, Vitamin D Status in women with pelvic floor disorder symptoms, *International Urogynaecology Journal*, vol 23 (11), p1699-1705

#### METHODS:

Reviewed 394 women who presented to a gynaecology clinic over a 2 year period.

- Assessed symptoms of pelvic floor dysfunction via multiple validated questionnaires
  - o POPDI-6, CRADI – 8; UDI-6; PFDI – 20, MESA-stress; MESA – urge; MESA – total, IIQ-7
- Determined 25(OH)D levels via blood test

#### RESULTS:

- Women with evidence of pelvic floor disorder symptoms had lower 25(OH)D levels than women without pelvic floor symptoms (29.3ng/ml vs 35.0ng/ml)
- The Incontinence Impact Questionnaire (IIQ-7) however, was the only validated questionnaire that demonstrated a significant difference in symptom score between women with vitamin D insufficiency and normal vitamin D (Score = 42.7 vs 28.8)
- Higher IIQ-7 scores were independently associated with Vitamin D insufficiency (p<0.001).

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### 4. CASE STUDIES REPORT

**Rhodium-Meester H, Otten H and Hamburger H (2010), Urinary Incontinence resolved after adequate vitamin D supplementation: a report of two cases.**

*Journal of the American Geriatric Society*, vol 58 (12), pp 2438-2439.

Presented two case studies of women aged >50 years old who had resolution of their urinary incontinence following administration of Vitamin D supplementation.

#### **CASE #1:**

Patient was a 78yo female with a long history of allergic rhinitis, well controlled asthma, and hyperlipidemia. She had been identified as having a Vitamin B deficiency 6months previously and commenced having Cobalin injections since that time. She was fully functioning in her daily life and worked part-time.

She presented with urge urinary incontinence with symptoms of longer than 6months duration that required regular pad use. Past History included hysterectomy 36 years prior and one vaginal delivery.

Laboratory tests included complete blood count, thyroid function and urinalysis which were all normal

Baseline Weight / Height/BMI: 75.8kg, 1.68m, BMI = 26.9

Baseline 25(OH)D level: 10ng/ml

TREATMENT #1: Commenced on 50,000IU of vitamin D2 *twice per month* (ie 100,000IU per month).

Results at 1 year:

25(OH)D Level: 21ng/L

Urinary incontinence: Persisted but patient declined referral to a gynaecologist as she believed her condition was incurable.

TREATMENT #2: Commenced on 50,000IU of vitamin D2 *weekly* (ie 200,000IU per month) for a further 6/12

Results at 18 months:

25(OH)D Levels: 54ng/ml

Incontinence: Patient reported that her urinary incontinence had completely resolved and she had not worn a pad for over a month.

## **CASE #2:**

Patient was a 59yo female with a long history of allergic rhinitis, and complained for chronic multiple joint pains. She presented with a several month history stress urinary incontinence with her main symptoms occurring when she stood up or sneezed. She had no history of hysterectomy or bladder surgery.

Laboratory tests included complete blood count, thyroid function and urinalysis which were all normal. She was referred to a gynaecologist who gave a diagnosis of "loss of external sphincter control". She was suggested to perform pelvic floor muscle exercises, but refused to continue after two weeks as she experienced pelvic and hip pain.

Baseline Weight / Height/BMI: 67kg, 1.60m, BMI = 26.2

Baseline 25(OH)D level: 13ng/ml

TREATMENT #1: Commenced on 50,000IU of vitamin D2 *weekly for 12 weeks*

Results 12 weeks:

25(OH)D Level: 43ng/L

Urinary incontinence: Had completely resolved and her joint pain had significantly improved.

She continued to take Vitamin D2 50,000IU 3 times per month and her most recent blood level was 70ng/ml.

## **DISCUSSION BY AUTHOR – Direct Copy from Journal Article, page 2439.**

*"These two cases suggest that vitamin D deficiency is the underlying condition associated with UI. Significant improvement in UI after "adequate" vitamin D blood levels have been achieved with aggressive treatment supports this."....."Side effects resulting from the use of medications such as corticosteroids or antihistamines that may have contributed to UI are unlikely because there were no changes in these medication uses in either of these cases. There is debate as to what blood levels are considered "adequate" for vitamin D supplementation..... Future studies such as a clinical trial will further illustrate the relationship between vitamin D deficiency and UI.*