

Association between Musculoskeletal Pain and Vitamin D Deficiency in Female Nurses

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Abstract: Objectives: Most of the problems which affecting the nurses is the complain from musculoskeletal pain. The current work was aimed to study the association between vitamin D insufficiency and the pain in the muscles and bones among the nursing girls work in Sayed Galal University's Hospital in Cairo, Egypt. **Subjects and Methods:** Three hundred of female nurses who agree to be included in the research (cross –sectional study). The serum of female subjects was assayed for estimation of 25-hydroxy vitamin D level [25-OH] and musculoskeletal non-specific pain. In this research we applied the extended Nordic Musculoskeletal Questionnaire [NMQ-E] for detection any pain in nine definite places in the body. Detection of the correlation between the pain in each of the previously determined area and vitamin D level was estimated by using of both Mann– Whitney U and chi-square tests. Results: The average ages of the participating nurses was reached 32.07 years. Whereas, the average level of 25-OH vitamin D in the serum was averaged 16.96 ng/ml. The number of nurses which were deficient in vit D and complain from pain at least in one region (within 1month) was 267, which represent 89%, of which 45.5% (91/267) was categorized as sever vit D deficiency. It was found a relation between deficiency in vit.D and the pains which affecting the upper and lower back, ankles and feet. It is concluded that musculoskeletal pain symptoms was widespread among nurses and was significantly connected with vit. D deficiency.

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1. Introduction

One of the most prevalent problems which affecting the medical healthcare workers is the pain in the muscles and bones. In Netherlands, a study was carried out in medicinal centers, indicated that 57% of healthcare workers suffered from pain in the muscles and skeletal system of which 36% complain from back pain, 30% from cervical and shoulder discomfort and 16% complained from legs pain (1). Whereas, in Brazil another research was conducted, which revealed that 80.7% of nurses had pain in no less than one area in the muscles musculoskeletal system (2). In addition, in a study carried in Greece, 75% of the nurses had bring down back pain, while 22.3% of sick days were because of low back tenderness (3). Generally, musculoskeletal pain can negatively affect the nature of nursing work. Many investigators reported that a deficiency in vitamin D usually was associated with non-specific pain in the musculoskeletal system (4–6).

Historically, identification on vitamin D was in 1923 and is called at that time calciotropic vitamin (6). Vitamin D play an important role in many aspects such as on cell differentiation and proliferation, enhance bone development and avoidance of osteomalacia (7,8). Other reported found that vitamin D deficiency may influence bone uprightness and

incline grown-ups to osteoporosis and inflammation in the bone tissues (9,10).

It additionally unfavorably influences muscle work and can lead to pain in the muscles and subsequently muscle weakness or muscle tear, in spite of the fact that the mode of action on the muscle fatigue isn't up till now evident (11). Many studies demonstrate the role played by vit. D in relieving the symptoms of musculoskeletal tenderness (4,8,12,13,14). On the other hand, some diverse researchers reported that no definite relation was found between vit. D status and unknown cause of pain in the musculoskeletal system (15,16). In a control study performed for 1 year on young women (12-14 years old), treated with a doses of vitamin D in the form of 25-hydroxy (25-OH) vitamin D, In spite of this long period of vit.D supplementation, it couldn't build the mineral accumulation, strength, muscle force or bone geometry (17). Expanding proof proposes vitamin D insufficiency is a common problem (7,8,11,18). Hypovitaminosis D is more common in female subjects (11). In Spain, 64% of postmenopausal women had vitamin D insufficiency (19). Exposure of body skin to the sunlight which contain Beta ultraviolet can supply the human body by 80-90% of its need from vitamin D (5). Vitamin D deficiency can result from insufficient sun exposure

(18). Research demonstrates that females who are not capable to exposed to sunlight for enough time or covered completely their bodies with heavy wears are greatly susceptible to deficiency in vit. (9), specially in Muslim ladies in some courtiers who. This condition is more prevalent among Muslim women who dressed special clothes due to the religious believes (11), in a survey carried on Turkish ladies present in Germany, the study found an increase in rate of vit. D insufficiency among those ladies in contrasted with males of a similar nationality (20). Research in Egypt demonstrated that 66% of Egyptian adolescence young women had vitamin D deficiency (21).

Healthcare workers have to perform the work for extended periods in an indoor situation and in many cases, they dress covering apparel in some Islamic nations, therefore, may be more liable for deficiency in vit.D, where a study in Iran demonstrated that about of 53% of Iranian nurses had extreme vitamin D deficiency (22). In Thailand, some researches found during his study, a high percentage (95.4%) of nurses were suffering from vit.D insufficiency (23).

Aim of the Work

Considering the high prevalence of vitamin D deficiency in medical healthcare workers worldwide, We aimed to verify if un-explained MSK pain associates with vitamin D Deficiency with investigating its possible consequences in female Nurses working in Sayed Galal Hospital which is one of Al-Azhar University's hospital in Cairo, Egypt in August 2016.

2. Materials and Methods

Oversight

This study was approved by ethical research committee of Sayed Galal university's Hospital in Cairo. Every one of the nurses were educated about the study targets and informed consent was obtained from the participants. This cross-sectional study was conducted in August 2016. This hospital is one of main universities hospitals in Cairo. Of the 493 full-time nurses work in this healing facility, 385[78%] are female. Cairo is situated in the focal point of Egypt in the edge of the Incomparable Abandon with bright climate consistently.

Inclusion criteria were female gender; working as a full-time nurture for no less than 1 year in the internal and surgical wards; no history of known chronic conditions, for example, diabetes, ischemic heart diseases, thyroid problems, depression, cancer, or particular musculoskeletal disorders, such as, discopathies; no supplement therapy containing vitamin D in the earlier month; and no history of fractures or musculoskeletal trauma in the previous 6 months.

The sample size was determined using Epinfo with the assumptions that the proportion of nurses with vitamin insufficiency was 85% (22), 95% certainty level, and 5% error. The sample size calculation was 195 subjects; subsequently, 200 female nurses were included then added 100 nurses extra in this study so the total number were included in this study were 300.

The names of the female nurses working in the hospital were listed and every name received a number. Then the nurses were recruited to the study using a random number table. If a nurse did not participate in the study or she did not meet the inclusion criteria, another nurse was invited randomly. The process continued till the 200 nurses completed the study.

Non-fasting blood tests [5– 6ml] were taken. Serums were successively sent to the Laboratory Center The 25-OH vitamin D concentration in the serum is the best indicator of vitamin D nutritional status. The 25-OH vitamin D was dictated by the DIA source 25-OH vitamin D Add up to ELISA which is a competitive enzyme immunoassay for the quantitative determination of 25-OHvitamin D total [D2 + D3] in human serum (24). There is no accord about the ideal 25-OHvitamin D level [25-OHvitamin D], but numerous studies recommend the range of less than 10ng/ml as sever deficiency, 10– 30ng/ml as deficiency, 30– 100ng/ml as normal, and more than 100ng/ml as toxicity (25,26).

The subjects were requested to complete the Extended Nordic Musculoskeletal Questionnaire [NMQ-E]. The NMQ-E was converted into Arabic with cross checking. The NMQ-E demonstrates a body map diagram divided into nine anatomic regions and gets information about the presence of physical inconveniences including ache, pain, and discomfort for the past one and 12 months, and the past 7d in each of the body regions. All answers are as a dichotomous yes/no reaction (27– 29). The NMQ-E is a standard and reliable instrument with observed proportion of agreement of 0.88 to 0.98 (29). The reliability of the questionnaire has been calculated 0.91 in Egypt (30).

The age, work experience, and number of the shifts in the month were also recorded. The nurses got the results of the 25-OH vitamin D with the full insights about the normal levels and suggestions. The normality of the variables was analyzed utilizing the Kolmogorov– Smirnov test. Relationship between the pain in each anatomic area and the level of 25-OH vitamin D were tested using the Mann– Whitney U test. This association likewise was additionally analyzed by the chi-square test after categorization of vitamin D deficiencies.

The correlation between the total number of painful regions and 25-OH vitamin D and different

variables, for example, age, number of shifts in the month, and work experience were analyzed by Spearman coefficient connection. The multiple regression analysis was used to determine the association between total number of painful regions and other variables. All analyses were conducted with SPSS version 16 (SPSS Inc., Chicago, Illinois).

3. Results

As shown in table (1) the data of the participating nurses are tabulated in the table. The ages of nurses was ranged from 22-48 years with an averaged

32.07years. The duration of work experience was ranged between 1-25 years (average 8.15 years). Whereas, assay of 25-OH vitamin D level in the serum recorded 16.96ng/ml. Generally, the percentage of nurses exhibiting vit.D deficiency was 89% (267 nurses), of which 136nurses (45.5%) were severely deficient in vit.D. (10ng/ml),43.5% (131 nurse) their levels of vit.D was low (10-30ng/ml), and29nurses [9.5%] had normal level of vitamin D [30– 100 ng/dl], whereas, 5Nurses [1.55%] carry a higher level or marginally toxic level of vitamin D [100ng/ml].

Table 1. Age, working conditions, vitamin D and total painful regions among nurses

Variables	Mean±SD	Minimum	Maximum
Age (years)	32.7±5.22	22	48
Work Experience	8.15± 4.88	1	25
The working shifts in the month	31.5±3.37	20	45
25- OH vitamin D (ng/ml)	16.96±21.12	3.5	176.1
Total painful regions in previous month	3.33±2.47	0	9

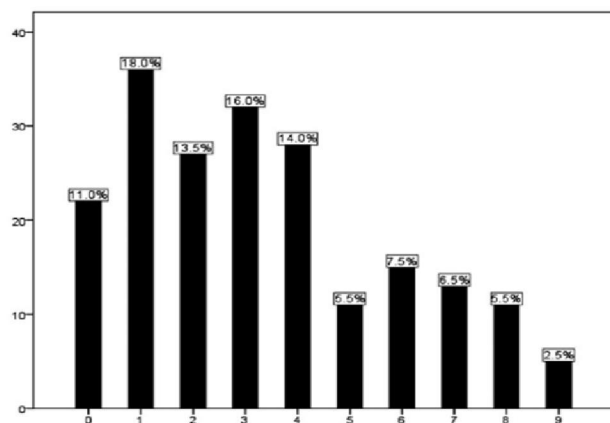


Figure 1. The percentage of total painful regions in previous month among

All things considered, the nurses which feel with an average of 3.33 areas from nine points with pains in the musculoskeletal system within the past month. The number of nurses which feel with pain in more than

one area reached 267/300 nurses (89%), 33/300 nurses (11%) not complain from any pain in the body, whereas, 54/300 (18%) nurses felt with pain in a single area and 8/300 (2.5%) nurses complained from pain in all determined 9 points (Fig. 1).

The total of 222 (74%) nurses complained from low pain in the back which considered mainly the common painful regions. The other tenderness regions were knees 146 (48.5%) nurses, upper back123 (41%) nurses, ankles/feet 123 (41%) nurses, neck, 96 (32%) nurses, hip/tights 89 (29.5%) nurses, shoulders 86 (28.5%) nurses, wrist/hand78(26%) nurses and elbows 39 (13%) nurses. It was noticed that both the nurses who announced pains in the upper and lower back and the workers who felt with pains in the ankles and feet was found to be suffering from deficiency in vitamin D. In addition, it was found that nurses who had announced a painful conditions in different areas was non-significantly deficient in vit. D. as seen in table 2.

Table 2. The musculoskeletal pain in the previous month and 25-hydroxy vitamin D levels.

The existence of pain	N%	Vitamin D Mean±SD	P value	Sever deficiency N%	Deficiency N%	Normal N%	P value
Neck							
Yes	96(32)	14.5±12.1	0.551	50(36.3)	36(27.6)	11(31.8)	0.463
no	204(68)	18.1±24.2		86 (63.7)	95(72.4)	23(68.2)	
Shoulders							
Yes	86(28.5)	13.1±11.5	0.077	48(35.2)	32(24.1)	6(18.2)	0.139
no	214(71.5)	18.5±23.8		88(64.8)	99(75.9)	28(81.8)	
Upper back							
Yes	123(41)	12.9±10.7	0.016*	69(50.5)	45(34.5)	9(27.3)	0.036*
no	177(59)	19.8±25.7		67(49.5)	86(65.5)	25(72.7)	
Elbows							
Yes	39(13)	15.6±12.7	0.939	21(15.4)	13(10.3)	5(13.6)	0.604
no	261(87)	17.2±22.1		115(84.6)	118(89.7)	29(86.4)	
Wrist hands							
Yes	78(26)	14.5±11.5	0.935	36(26.4)	34(26.4)	8(22.7)	0.933
no	222(74)	17.8±23.5		100(73.6)	97(73.6)	26(77.3)	
Low back							
Yes	222(74)	14.6±18.4	0.004*	114(83.5)	93(71.3)	16(45.5)	0.001*
no	78(26)	23.6±26.6		22(16.5)	38(28.7)	18(54.5)	
Hips/tight							
Yes	89(29.5)	14±11	0.824	39(28.6)	45(34.5)	5(13.6)	0.154
no	211(70.5)	18.2±24		97(71.4)	86(65.5)	29(86.4)	
Knees							
Yes	146(48.5)	13.1±9.2	0.325	67(49.5)	69(52.9)	9(27.3)	0.097
no	154(51.5)	20.6±27.6		69(50.5)	62(47.1)	25(72.7)	
Ankles/feet							
Yes	123(41)	14±16.5	0.537	58(42.9)	60(46)	5(13.6)	0.020*
no	177(59)	19±23.6		78(57.1)	71(54)	29(86.4)	
Total painful regions							
0	33(11)	26.5±26.2	0.089	11(7.7)	13(10.3)	9(27.3)	0.076
1-3	143(47.5)	17.8±25.7		61(45.1)	66(50.6)	16(45.5)	
4	124(41.5)	13.4±10.4		64(47.2)	52(39.1)	9(27.3)	

*p value under 0.05 was considered significant, SD, standard deviation.

The results indicated that no significant association between the level of 25-OH vitamin D and whole determined nine areas, but the association was detected between total painful regions, vitamin D and

different variables (Table 3). Also, it was found a significant association between the total painful areas and the amount of shifts within the month.

Table 3. The correlation between 25-OH vitamin D and total painful regions and other variables.

variables	Age		Work experience		The working shifts in the month	
	R	P value	R	P value	R	P value
Vitamin D	A0.079	0.268	A0.044	0.537	A0.01	0.887
Total painful Areas	0.134	0.59	0.109	0.124	A0.178	0.012

By Applying The Analysis Of Multiple Regression Analysis, It Was Demonstrated That The Status Of 25-OH Vitamin D In The Serum And The Age Of Subjects Can Clarify The 6.2% Of Total

Painful Areas. Other Variables Such As Number Of Working Shifts Per Month And Work Practice Were Expelled From The Design (Table 4).

Table 4. The multiple regression of dependent variables of total painful regions and other variables.

variables	Beta	t	P value
25-OH Vitamin D	A0.184	A2.66	0.008
Age	0.157	2.26	0.025
Work experience	A0.147	A0.867	0.387
Number of shifts	A0.132	A1.88	0.061

4. Discussion

The study demonstrated that the musculoskeletal painful conditions and vitamin D were spread widely in nurses. There are a strong correlation between vitamin D deficiency and the pains in the upper and lower back and ankle and feet in the working nurses.

The present work pointed to the phenomena of vitamin D deficiency between working nurses which represent a high rate (89%) which considered a mainobstacles in their works. A higher percentages of vit. D deficiency (95.4) in nurses was recorded in Thailand (23). Also, another survey in Qatar, recorded that 96.5% of human services experts had vitamin D level of under 30ng/ml (31). It is clear that the predominance of vitamin D deficiency among nurses is worldwide phenomena despite the place of work, the etiology may be due to the long time expended in the work on indoor and the working during the night (night shifts), this may be prevent them from exposure to sunlight for enough period.

Synthesis of vitamin D in the body require expose the face and hands for sun light for at least 10–15min/daily, for a few times per week by applying this regimen of sunlight exposure no needs for dietary supplementation of vitamin D (11). Some studies indicated that exposure to sunlight for 11 on about 15% of the body surface in reasonable skin individuals for several days could supply the body with about 1000 IU/day of vitamin D3 (32). It appears that nurses in the present work not exposed for sufficient time to the sunlight, therefore it is advised for the nurses to get enough time to expose to the direct sunlight during the shifts and vacations or holidays. Daily supplementation with vit.D for the nurses is recommend urgently as a prophyl active treatment to avoid undesirable effects of vit.D deficiency. (11).

Due to high rate of vit. D insufficiency among nurses in the current study, it is expected to see the increase in the symptoms of musculoskeletal pains among the nurses, inspite of some authors like Engeles *et al.* (1) announced that 43% of 846nurseswhowere examined not complain from musculoskeletal pains. With respect to our work, only 22% of the participating nurses not complained from pain in the muscles and bones. In the present study, lower back pain represent the primary painful disorder (74%), in co-ordinance with the study of Alexopoulos (3) who

recorded 75% of nurses complained from low back pain. Despite the fact that the average ages of the nurses in Alexopoulos study was 37 years, which is higher (5years) than the ages of nurses in our study. To identify on the actual causes of the elevated rates of musculoskeletal pain in Egyptian healthcare workers it require detailed studies with different variables.

Concerning the deficiency in vit.D and its relation with musculoskeletal pains, some authors suppose that the painin the upper part of the body may be conducted principally with vit.D insufficiently. At the same time as on account of osteomalacia, the tenderness is accounted for principally in the legs or lower back (4). The larger part of nurses affecting with osteomalacia introducepain, particularly in the pelvic girdle, rib cage, shoulder and low back (16). Other investigators consider the paindue to vit.D deficiency is widely extensive (4). The present work demonstrated that the deficiency in vit.D was associated mainly with pain in the upper and lower back, ankle and may extend to the feet.

The present study doesn't support the hypothesis that pain related to vitamin D deficiency is mostly occur in the upper parts of the body, where in our investigation the pain was located broadly in different regions not restricted to the upper part. The relation between the age of nurses and vit.D represent only 6.2% of the differences in the total pain regions, which implies the possible modest contributing function of vitamin D deficiency in inducing of musculoskeletal pain. This suggestion require further study.

With respect to the connection between vit.D sufficiently and induction of musculoskeletal pain, as appear from the results in the present work, that its possible to control and mange of non-specific musculoskeletal pain through regular supplementation with vit. D. Other studies additionally propose this intervention, particularly in individuals who are susceptible for deficiency in vit.D, for example, Muslim ladies and the individuals who work in an indoor atmosphere (4).

Conclusion

Our study concluded that the phenomena f vit.D deficiency and musculoskeletal pain are predominant between nurses working in the field of medical care

centers and considered as a high-risk group for vit.D deficiency. In addition some symptoms of musculoskeletal pain in nurses may be conducted with vitamin D insufficiency. Therefore, it is recommended to put a programs to enable nurses to expose to sunlight during work hours, on the other hand vitamin D supplement treatment for nurses in each clinic. More essentially, this common problem must be featured and nurses should be in formed about its preventive action and tools of treatment. We suggest comparable studies in other urban communities and healthcare facilities. This was a cross-sectional study with its limitations. To decide the actual etiology and the relationship between vitamin D and musculoskeletal pain, there is a requirement for interventional or cohort studies on this epidemic issue. However, controlled implemented vitamin D limitation would be an unethical experiment in humans, which limits study design.

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Declaration Of Interest

There is no declaration of interest in this report.

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