

Association of vitamin D, B-12 and Calcium levels in middle age women presenting with body aches and pains Vitamin D, B-12 and Calcium levels in aches and pains

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ABSTRACT

Objective: To determine the association of vitamin D, B-12 and Calcium levels in middle age women presenting with body aches and pains.

Study Design: Comparative cross-sectional study.

Place and Duration of Study: General medicine department, Pak Emirates Military Hospital Rawalpindi, Jul 2019 to Feb 2020.

Methodology: One fifty middle age women presenting with generalized aches and pains and not fulfilling criteria of any medical or psychiatric illness were included in the study. Equal number of matched controls were included from the community without having any aches and pains. Vitamin D, B-12 and Calcium levels were assessed in all the participants including the cases and controls. Body mass index and the Vitamin D, B-12 and Calcium levels were compared among the cases and controls with chi-square.

Results: Out of 150 patients presenting with aches and pains, 91(60.6%) showed the presence of vitamin D deficiency, 60(40%) showed B12 deficiency and 56(37.3%) showed hypocalcemia. Among the healthy controls 61(40.6%) had deficiency of vitamin D, 45(30%) had B12 deficiency and 32(21.3%) had hypocalcemia. After applying the chi-square test, we found that Vitamin D and calcium levels had significant difference among the cases and controls (p -value<0.05).

Conclusion: Calcium and vitamin D deficiencies emerged as predictors of aches and pains among the middle age women without any medical or psychiatric diagnosis. Incorporation of these investigations while evaluating the women for generalized aches and pains may be useful practice.

Keywords: Body aches; Calcium; Vitamin B-12; Vitamin D.

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INTRODUCTION

Patients in all parts of the world are most concerned and report to the hospital when they are having the pain may it be localized to any part of the body or generalized. Women have been affected more as compared to men due to various reasons.¹ Situation is not different in our part of the world and middle age working women are a common victim of chronic aches and pains.² Any part or more than one part may be affected among these patients with chronic backache but lower back pain have always been the commonest symptom.³ Deficiency of various vitamins including Vitamin D and calcium has been a common finding among the females of developing countries like Pakistan.^{4,5} Presence of chronic aches and pains have a lot of dimensions and multiple factors may interact and prone the individual towards this clinical condition.⁵

Franklin *et al.* in their study published in 2017 concluded that patients with deficient levels defined as 25-hydroxyvitamin D (25-OHD) levels <30 nmol/L are most likely to benefit from supplementation, while individuals with 25-OHD >50 nmol/L probably have little benefit from supplementation.⁶ Raymond CR Liang smelled this correlation long ago and published an interesting paper on it in 1985 and coined the idea that calcium and vitamin D deficiencies are associated with abnormal muscular functions including non-specific pain and weakness.⁷ Buesing *et al.* in 2019 published similar findings regarding vitamin B-12 and concluded that vitamin B12 may prove to be an adjunctive or integrative treatment for pain conditions.⁸ Wolffenbuttel *et al.* last year published a comprehensive account of manifestation of Vitamin b-12 deficiency and aches and pains were the frequently reported symptoms by the patients diagnosed with B-12 deficiency.⁹

Pain killers or blind prescription of mineral and vitamin supplements have been a common practice to

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manage the patients with generalized body aches without any obvious cause. The pain symptoms even without any serious underlying clinical condition may pose a great burden on quality of life of individual and over all society.¹⁰ Women especially middle age women had to fight on various fronts. Most of them have to take care of their children and work together therefore early diagnosis and management of underlying deficiencies linked to their aches and pains is of supreme importance. This study was designed with the rationale to determine the association of vitamin D, B-12 and Calcium levels in middle age women presenting with bod aches and pains.

METHODOLOGY

This comparative cross-sectional study was conducted at the general medicine department of Pak Emirates Military Hospital Rawalpindi Pakistan, between July 2019 and February 2020. WHO sample size calculator was used to calculate the sample size for this study by using population prevalence proportion of chronic aches and pains as 19%.³ Non probability consecutive sampling was done to collect the cases and controls were recruited from the community after that by matching the age of the cases. All the women between the age of 45 and 60 years presenting with generalized body aches without any underlying diagnosable medical or psychiatric illness were included in the study. Exclusion criteria were the patients more than 60 years of age or those who did not consent to or those with a past or current history of any chronic physical or psychiatric illness or current history of substance use. Patients who were pregnant or breast feeding, had any biochemical abnormality in base line blood or radiological examination (Full blood counts, renal function tests, liver function tests, fasting blood sugars and chest X-ray) or had pain localized to one part of the body were excluded from the study. Patients who were diagnosed with or had suspicion of any neoplastic or immunological illness were also excluded from the study. For Vitamin D, Normal levels were $>30\text{ng/ml}$ and Deficiency levels were $<20\text{ng/dl}$.¹¹ For Calcium

Albumin corrected Ca (total Ca) $2.15\text{-}2.57\text{mmol/l}$ and for Vitamin B-12 reference range used was $200\text{-}300\text{pg/ml}$.¹³

All ethical aspects were catered for the study including the formal ethical approval (IREB letter number: A/28/EC/285/2021) and formal consent from the patients and controls after providing them all the information regarding the study and mentioning

them their right to withdraw at any time from the study if they did not feel comfortable being the part of study. Subjects with confounding variables like presence of acute or chronic inflammatory condition or physical or psychiatric illness were identified by detailed history taking and excluded from the study. Controls were age matched middle age women living in the community without having any aches and pains in last two years. The concentration of vitamin D3 in serum was measured by electrochemiluminescence immunoassay on a Roche Elecsys (Roche Diagnosis, Penzberg, Germany) while calcium was measured on Roche Cobas6000 501 and vit B12 on Roche Cobas6000 601. All these investigations were carried in the laboratory of our own hospital. WHO classification of body mass index was used to group the patients according to their weight and height ratio. Researchers before the start of study designed the proforma for the study variables and all the data was entered into the proforma before being put into the required software.

Descriptive statistics were used in the study to describe the relevant data. Presence and absence of vitamin D deficiency, hypocalcemia and vitamin B-12 deficiency was mentioned by using the percentage and frequency. Chi-square was the statistical test applied initially to establish any association between the variables among the cases and controls. SPSS-23.0 was the software used to process all the data and perform the analysis. Differences between groups were considered significant if p -values were less than or equal to 0.05.

RESULTS

A total three hundred study participants were included in the final analysis. Half of these were the cases which comprised of middle age women presenting with aches and pains and half were the matched controls. Mean age of the cases was 47.4 ± 4.215 years and of the controls was 47.3 ± 4.321 years. Out of 150 patients presenting with aches and pains, 91(60.6%) showed the presence of vitamin D deficiency, 60(40%) showed B12 deficiency and 56(37.3%) showed hypocalcemia. Table-I showed the general characteristics of study participants. Among the healthy controls 61(40.6%) had deficiency of vitamin D, 45(30%) had B12 deficiency and 32(21.3%) had hypocalcemia. Chi-square test revealed (Table-II) that Vitamin D and calcium levels had significant difference among the cases and controls (p -value <0.05) while BMI and vitamin B-12 had no statistically

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significant difference among the cases and the controls (p -value >0.05).

Table I. Characteristics of study participants

Parameters	n(%)
Age of Cases (years)	
Mean \pm SD	47.4 \pm 4.215
Range (min-max)	45 - 60 years
Age of Controls (days)	
Mean \pm SD	47.3 \pm 4.321 years
Range (min-max)	45 years - 60 years
Vitamin D levels	
Within range	148(49.3%)
Deficiency/insufficiency	152(50.7%)
Calcium levels	
Within range	212(70.7%)
Hypocalcemia	88(29.3%)
Vitamin B12 levels	
Within range	195(65%)
Deficient	105(35%)

presenting with bod aches and pains at family outpatient department of our tertiary care teaching hospital.

Vitamin D deficiency state has been correlated with use of veil (covering their body including the face), advancing age, widespread pain index and high BMI across various cultures all over the world.^{16,17} Reason whatever may be, this deficiency has been linked with generalized aches and pain in the studies published by Saadat-Ali et al. in 2018 and Matyjaszek-Matuszek et al. in 2010.^{18,19} Our study results strengthened their findings and Vitamin D was significantly deficient among the case as compared to the controls emerging as a predictor for pain symptomatology among the cases.

Calcium and Vitamin D metabolism have been interlinked in number of ways. Therefore, deficiency

Table-II: Difference of study variables among thecases and controls: Chi-square test

	Cases	Controls	p -value
Calcium levels			
Within range	94(62.6%)	118(78.7%)	0.002
Hypocalcemia	56(37.8%)	32(21.3%)	
Vitamin D levels			
Within range	59(39.3%)	89(59.3%)	0.001
Deficiency/insufficiency	91(60.7%)	61(40.7%)	
Vitamin B12 levels			
Within range	90(60%)	105(70%)	0.069
Deficient	60(40%)	45(30%)	
Body Mass Index			
Normal	78(52%)	71(47.3%)	0.419
Overweight or obese	72 (48%)	70(52.7%)	

DISCUSSION

This study is instrumental in understanding the influence of underlying bio-chemical abnormalities on vague symptoms including generalized aches and pains which could not be explained by any disease but still make quality of life of the patient miserable. Primary presentation of patients with aches and pains has not been a new phenomenon and reported worldwide especially to the general practitioners. Studies of Danczak *et al.* and Croft published in 2010 have captured this topic comprehensively and given a way forward for further research.^{14,15} We made an attempt to carry forward the findings of their study and look for underlying bio-chemical abnormalities which may be responsible for these sort of presentations among the middle aged females of a developing country. This study was planned and conducted with the rationale to determine the association of vitamin D, B-12 and Calcium levels in middle age women

of one may lead to the other. Liang in 1985 published a comprehensive review that calcium and Vitamin D supplementation may lead to resolution of symptoms of generalized aches and pains among patients without any other medical illness.⁷ Our results were also not different in this regard and low calcium levels emerged as predictors of generalized body aches among our target population.

Fatigue, lethargy and numbness of the extremities have been symptoms commonly reported by the patients presenting with B-12 deficiency, but our sample population comprised of the middle age female patients with generalized body aches as main symptoms. B-12 deficiency was not found statistically different among the cases and controls (p -value >0.05). Beusing *et al.* and Wolffenbuttel *et al.* in 2019 have reported that pains and aches have been reported by B-12 deficient patients and B-12 supplementation has helped the patients to overcome their pain in a better

way.^{8,9} Difference in our results may be due to strict exclusion criteria as B-12 deficiency usually cause anemia and we excluded all the patients with any kind of anemia at first step of the study and did not include them in the final analysis.

Previous researches have highlighted the inverse relationship of body mass index with vitamin D deficiency and presence of aches and pains.¹⁷ Nikiphorou *et al.* did an interesting analysis which included BMI as independent variable and they came up with the result that it has significant association with the presence of vitamin D deficiency and generalized body aches and pains.¹⁷ Our results were unable to establish any association. BMI, level of physical activity, lifestyle, and nutritional factors have a complex interaction amongst each other. Therefore, more sophisticated study design with control of confounding factors may give accurate results in this regard.

Nutrition status, menstrual problems and using of veil etc. have been some of the confounding factors which were not considered while selecting cases and the control and emerge as a main limitation of this study. Cohort studies and studies incorporating the levels of Vitamin D, calcium and B-12 before the onset of aches and pains may generate better results which could clear the exact association among the study variables.

CONCLUSION

Calcium and vitamin D deficiencies emerged as predictors of aches and pains among the middle age women without any medical or psychiatric diagnosis. Routine incorporation of these investigations while evaluating the women for generalized aches and pains may pick the deficiency early and cater for the symptoms.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MRBK: & KQ: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

AR: & MMK: Data acquisition, data analysis, approval of the final version to be published.

SZ: & IA: Critical review, concept, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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