ORIGINAL RESEARCH

Association of Chronic Low Back Pain with the Vitamin D Level and Bone Mineral Density - A Cross Sectional Study

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ABSTRACT
Background: Background: Chronic LBP was defined as pain in the small of the back for a minimum of 5 days per week for at least 3 months. Those who reported no LBP or who reported experiencing occasional non-persistent LBP that occurred no more than twice per week were classified as having no LBP.
Aim: The aim of the study is to Association of chronic low back pain with the Vitamin D and bone mineral density.
Methods: this was a cross-sectional observational study. A total of 120 patients of chronic low back pain were included in our study. The level of 25(OH) D (vitamin D) in serum was measured by chemiluminescent immunoassay methodology.
Result: Out of 120 enrolled participants 24 (20%) were males and 96 (80%) were females. Mean age was 32.80 ± 8.7 years. The duration of low back pain ranged from 7 to 14 months with a mean of 11.05 ± 4.31 months. Spine BMD on DXA scan ranged from 0.90 to 0.98 g/cm2 with a mean of 0.95 ± 0.02.The mean BMD decreased significantly with increasing age and severity of LBP; 20-30 years vs. 31-40 years (0.94 ± 0.01 vs. 0.93 ± 0.02; p=0.001).There was no significant difference in mean BMD across various durations of low back pain; 7-10 vs. 11-14 months (0.92 ± 0.03 vs. 0.91 ± 0.01; p=0.48). Majority of the chronic low pain patients (40%) associated with the vitamin d deficiency.
Conclusion: The mean BMD at spine was found to be low in patients with CLBP. It was significantly lower in older patients and those with severe low back pain. However, it didn't change significantly with various durations of low back pain or gender.
Keywords: Chronic low back pain, bone mineral density, Vitamin D.

Introduction

Low back pain (LBP) is one of the commonest musculoskeletal disorders disabling people worldwide. The mean overall prevalence of LBP is 31.0% globally1. Chronic low back pain (CLBP), defined as LBP of more than six months duration, has a significant impact on the ability to perform activities of daily living (ADLs) [1].Maximising peak bone mass towards late adolescence and minimising bone loss after this period are important factors in the maintenance of optimal skeletal integrity. Although a large volume of research has been dedicated to minimising bone loss towards later adulthood, particularly in the context of age-related and post-menopausal osteoporosis, maintenance of bone strength at earlier life stages is equally, if not more important, from a life course perspective [2,3]. Therefore, a better understanding of the potentially-modifiable events across the life course which may be associated with sub-maximal bone accretion orinfluence bone loss is important, particularly when considering the immense population burden of bone fragility. Low back pain (LBP) is one of the most common and significant musculoskeletal disorders

experienced across the life course and is most common during middle-age [4].

It represents an enormous public health issue world wide owing to the soaring healthcare costs associated with the condition and the societal and personal burdens imposed [5]. The lifetime prevalence of LBP is around 80% for adults and adolescents and although in the majority of cases the experience of LBP is benign and most people regain functional capacity, pain and disability can persist [6].

Materials & Methods

This is a Cross sectional observational study conducted at collaboration of department of orthopaedics and biochemistry in a tertiary care centre, India. Participants aged 20 to 60 years with self-reported histories of chronic LBP were enrolled in present study. Chronic LBP was defined as pain in the small of the back for a minimum of 5 days per week for at least 3 months. Those who reported no LBP or who reported experiencing occasional non-persistent LBP that occurred no more than twice per week were classified as having no LBP.

The level of 25(OH) D (vitamin D) in serum was measured by chemiluminescent immunoassay methodology. Vitamin D levels were measured for each patient. Patients were classified into three groups based on their serum vitamin D levels: normal (>30ng/ml), vitamin D insufficiency (21-29ng/ml), and vitamin D deficiency (20 ng/ml).

Information necessary to determine the eligibility of potential participants was obtained from a medical history form and by direct questioning. On the basis of self-reported history, participants were assigned to either the chronic LBP or non-LBP group. All aspects of the study protocol were approved by the local institutional review boards of both sites, and all participants signed approved informed consent forms.

Exclusion Criteria:

• Participants who reported LBP 3 or more times per week but who did not meet the chronic LBP criteria was excluded from the study.

• Potential participants were excluded from the study if they had any conditions that would prohibit them from lying prone for 30 minutes or that could potentially alter the lumbar bony anatomy.

• Congenital vertebral anomalies, such as spina bifida; history of lumbar or low thoracic vertebral fractures; or history of surgery. Participants who were pregnant or those who had received spinal manipulation within 8 weeks of the study were also excluded.

Results

Out of 120 enrolled participants 24 (20%) were males and 96 (80%) were females. Mean age was 32.80 ± 8.7 years. The duration of low back pain ranged from 7 to 14 months with a mean of 11.05 ± 4.31 months. Spine BMD on DXA scan ranged from 0.90 to 0.98 g/cm2 with a mean of 0.95 ± 0.02.

Table 1: Summary of age, duration of low back pain, bone mineral density.

Characteristic	Minimum	Maximum	Mean	SD
Age (Years)	20	60	32.80	8.7
Duration of LBP (Months)	07	14	11.05	4.31
BMD (g/cm2)	0.90	0.98	0.95	0.02

Table 2: Comparison of bone mineral density across various age groups/pain scores.

Age Groups	Frequency	Pain Scores (Mean ± SD)	BMD (Mean ± SD)	p-value
20-30 Years	34	6.58 ± 1.24	0.94 ± 0.01	0.001
31-40 Years	86	8.20 ± 0.92	0.93 ± 0.02	

The mean BMD decreased significantly with increasing age and severity of LBP; 20-30 years vs. 31-40 years (0.94 ± 0.01 vs. 0.93 ± 0.02; p=0.001).

Table 3: Comparison of bone mineral density across various durations of low back pain

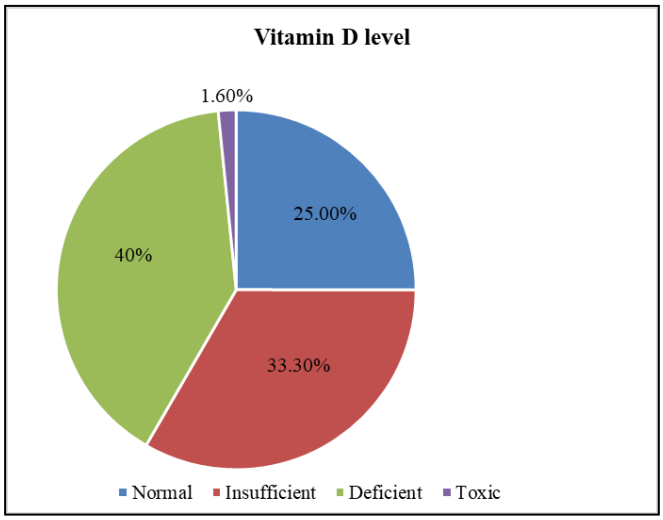
Duration of LBP (Months)	No.	BMD (Mean ± SD)	P value
07-10	59	0.92 ± 0.03	0.48
11-14	61	0.91 ± 0.01	

There was no significant difference in mean BMD across various durations of low back pain; 7-10 vs. 11-14 months (0.92 ±0.03 vs. 0.91 ± 0.01; p=0.48). Most of the chronic low back pain participants (40%) have vitamin D deficiency, majority of them was female. Statistically no significant difference was found in both the gender.

Table 4: Stratification of data for gender and vitamin D levels

Gender	Vitamin D group				P-value
	Normal	Insufficient	Deficient	Toxic	
Male	6	8	9	1	0.759 Not significant at $p < .05$.
Female	24	32	39	1	

Figure 1: Stratification of data for grading of vitamin D levels



Discussion

The vertebral somatic dysfunction burden score was also significantly higher for the chronic LBP group (P=.001). The total somatic dysfunction burden score was not calculated in the pilot study [7]. The chronic LBP group had significantly greater severity of tissue texture abnormality (P=.006), rotational asymmetry (P=.008), motion restriction (P<.001), and tenderness (P=.001) than the non-LBP group, with the vertebral somatic dysfunction severity score also significantly higher in the chronic LBP group (P<.001).12 The total somatic dysfunction severity score was not calculated in the pilot study [8].

In the current study, both the vertebral and the total somatic dysfunction burden scores were higher in the chronic LBP group. Likewise, the vertebral somatic dysfunction severity score and the total somatic dysfunction severity score were significantly higher in the chronic LBP group. Tenderness was more common in the chronic [9].

LBP group, but motion restriction was not found to be more common in this group, as was found in the pilot study [10]. The chronic LBP group had higher severity of tissue texture abnormalities, motion restriction, and tenderness, but not motion restriction. Only the chronic LBP group had moderate/severe tenderness, suggesting that moderate/severe tenderness may have a high predictive value for chronic LBP [11].

The increased presence and severity of tenderness observed in the chronic LBP group in the current study may be a sign of central sensitization. Central sensitization is a hypersensitivity to pain within the central nervous system that develops in response to sustained nociceptive stimuli, such as chronic localized musculoskeletal pain [12].

Bone health as measured by bone mineral density (BMD) is one of the important factors that affect management of patients with LBP/CLBP6.Patients suffering from LBP especially CLBP show evidence of decreased BMD at the lumbar spine, usually as a consequence of disuse associated with the fear of aggravation of back pain associated with strenuous physical activity [13].Severe back pain results in stiffness of trunk musculature making those affected to adopt alternative postures/ movement strategies [14].

Present study found significant association between low back pain and vitamin D deficiency. Patients who suffered from chronic low back pain had inadequate levels of vitamin D3, similar results also reported by K Parikh et al [15] and Heuch I et al [16].

Conclusion

The mean BMD at spine was found to be low in patients with CLBP. It was significantly lower in older patients and those with severe low back pain. Vitamin D deficiency significantly associated with the chronic low back pain. However, it didn't change significantly with various durations of low back pain or gender.

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