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Original Research Article

ROLE OF VITAMIN D SUPPLEMENTATION IN LOW BACK PAIN IN YOUNG ADULTS

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Abstract:-

Introduction:- Low back pain (LBP) is a global problem, being the highest contributor of years lived with disability (YLDs) worldwide. The majority of research on LBP has concerned management strategies; however, given the small effect sizes of current interventions, a better understanding of the factors associated with the prevalence and risk of developing LBP is needed to guide future intervention strategies.

Aim and objectives:- The aim of this study was to investigate if vitamin D levels are associated with the prevalence and risk of LBP and if serum levels of vitamin D correlate with pain intensity in patients with LBP.

Material and methods:- This study was done prospectively in the Department of Orthopaedics and Trauma Centre in J. A. Group of Hospitals, Gwalior (M.P.) The cases were selected on random basis from those having low back pain. 100 patients (young adults with back pain) were selected on O.P.D. basis for the study.

Result and conclusion:- The study concluded that vitamin D supplementation could have a role to play in the management of chronic low back pain. This study shows that vitamin-D supplementation has a role in the improvement of pain and disability in patients with LBP in addition to the normalization of serum levels.

KEY WORDS:- Low back pain, vitamin D supplementation, Oswestry disability questionnaire, Visual Analogue Score

1. INTRODUCTION

Low back pain (LBP) is a global problem, being the highest contributor of years lived with disability (YLDs) worldwide (64.9 million) vs diabetes (38.6 million), COPD (30.6 million)[1]. From an economic perspective, the burden of LBP can be seen across many countries. The prevalence in India ranges between 6.2 to 92%, with youth at higher risk and ~5%-10% may develop chronic LBP[2].

The majority of LBP cases presenting to primary care are classified as non-specific (~85%), as there is a poor correlation between symptoms and structural abnormalities identified by medical imaging[3]. A small percentage of individuals may present with LBP that can be attributed to a structural pathology (<5%) such as osteoporosis or vertebral fractures, and can experience significant pain and disability [5]. Numerous intervention strategies have been investigated for non-specific LBP and are recommended in most evidence-based clinical practice guidelines such as structured exercise programs and advice to remain active [6]. In addition, numerous conservative pharmacological and surgical interventions have been

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investigated for the management of LBP resulting from osteoporosis or vertebral fractures.[16] However, despite an abundance of research investigating different types and doses of these interventions , the analgesic effects are modest at best and have failed to reduce the enormous global burden of LBP.[7] With this in mind, it may be time to consider alternative interventions, rather than investigating procedural adjustments of those already established. One of the current and popular alternative treatments for painful conditions including LBP is vitamin D supplementation.[8]

AIMS AND OBJECTIVES:-

To assess the prevalence of vitamin D deficiency in young adults with low back pain. To assess the impact of vitamin D supplementation on pain intensity and functional disability measured by VAS[9] and Oswestry disability questionnaire (ODQ)[10].

2. MATERIAL AND METHODS

This study was done prospectively in the Department of Orthopaedics and Trauma Centre in J. A. Group of Hospitals, Gwalior (M.P.) The cases were selected on random basis from those having low back pain.

A Total number of 100 patients (young adults with back pain) were selected on O.P.D. basis.

Inclusion Criteria are Patients having low plasma 25 – hydroxyvitamin D3 levels (< 30 ng/ml), Age :- 18-45yrs, Patients with non-specific LBP. Exclusion Criteria are Refusal to consent for participating in study, Age group <18 and >45, H/O Significant trauma, Radiculopathy and neuropathy, Infection, GI pathology affecting vit-D Metabolism, Patients consuming drugs altering bone metabolism like corticosteroids or bisphosphonates, Pregnant and lactating mothers.

Methods:-

1. Detailed History was taken.
2. A blood sample was taken. Measurement of Plasma Vitamin-D Levels [25-Hydroxyvitamin D (25(OH) D3)], serum calcium, alkaline phosphatase levels were also measured.
3. Vitamin D Supplementation for 12 weeks to patients having vitamin- D3 levels < 30 ng/ml.
4. Measurement of Plasma Vitamin-D Levels [25-Hydroxyvitamin D (25(OH) D3)] after completion of 12 weeks.
5. Efficacy parameters included pain sensitivity and functional disability measured by Visual Analogue Score (VAS) and Oswestry disability questionnaire (ODQ).

ODI score[10] (%) for Level of disability is 0–4, No disability, 5-14 Mild disability, 15-24 Moderate disability, 25-34 Severe disability, 35-50 Completely disabled.

Definition of Vitamin-D Levels According to the level of 25(OH) D3, Vitamin-D deficiency was defined as a 25(OH) D3 level of ≤ 20 ng/mL, vitamin-D insufficiency as 21 – 29 ng/mL, and normal level as > 30 ng/mL .

Treatment Regimen:-Vitamin-D3 sachets in a dose of 60,000 IU were given every week orally for a period of 12 weeks to the enrolled patients, along with short duration analgesics.

Mode of Supplementation:- Patients were advised to take the vitamin-D3 sachet containing 60,000 IU orally by mixing in a glass of milk early morning once a week.

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3. RESULTS

Present study mean age of the cases was 31.74±6.75 years, median age 30 years, mode 28 years, minimum age 18 years and maximum age was 45 years. Majority of cases 52(50.5%) were belonging to in 21 – 30 years age groups followed by 29(28.2%) cases was found in 31-40 years age groups, 17(16.5%) cases belonging to 41 – 50 years age groups and 5(4.9%) cases belonging in <20 years age groups. Out of 103 cases 61(59.2%) cases were female and 42(40.8%) cases were male.

Table 1: Oswestry Disability Index (ODI)(51)Before categories

ODI(Before)	**No of patients**	**%**
No disability (0 - 4)	0	0.0%
Mild disability (5 - 14)	59	57.3%
Moderate disability (15 - 24)	44	42.7%
Severe disability (25 - 34)	0	0.0%
Completely disabled (35 - 50)	0	0.0%

ODI before vitamin D supplementation in majority of cases 59(57.3%) had 5 – 14 ODI level (mild disability) & 44(42.7%) cases had 15-24 ODI level(moderate disability). Before treatment majority of cases had 55(53.4%) less than equal to 10 nmol/L 25(OH)D3 level, 43(41.7%) cases had 11 – 20 nmol/L 25(OH)D3 level and 5(4.9%) cases had 21 – 30 nmol/L 25(OH)D3 level. After three months of the treatment majority of cases had 48(46.6%) more than 30 nmol/L 25(OH)D3 level, 32(31.1%) cases had 21-30 nmol/L 25(OH)D3 level and 23(22.3%) cases had 11-20 nmol/L 25(OH)D3 level.

Table 2: Oswestry Disability Index (ODI) categories after three months of the treatment.

ODI(After 3Mo)	**No of patients**	**%**
No disability (0 - 4)	0	0.0%
Mild disability (5 - 14)	81	78.6%
Moderate disability (15 - 24)	22	21.4%
Severe disability (25 - 34)	0	0.0%
Completely disabled (35 - 50)	0	0.0%

After three months of the treatment majority of cases 81(78.6%) had mild disability and 22(21.4%) cases had moderate disability.

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Table 3: Association between gender and different study variables

		sex				Chi-Square	p
		Female		Male			
Age groups	<= 20 years	3	4.90%	2	4.80%	7.44	0.049
	21 - 30 years	31	50.80%	21	50.00%		
	31 - 40 years	13	21.30%	16	38.10%		
	41 - 50 years	14	23.00%	3	7.10%		
ODI(Before)	No disability (0 - 4)	0	0.0%	0	0.0%	0.696	0.404
	Mild disability (5 - 14)	37	60.7%	22	52.4%		
	Moderate disability (15 -24)	24	39.3%	20	47.6%		
	Severe disability (25 - 34)	0	0.0%	0	0.0%		
	Completely disabled (35 -50)	0	0.0%	0	0.0%		
25(OH)D3 (nmol/L) Before treatment	<= 10 nmol/L	38	62.30%	17	40.50%	4.903	0.086
	11 - 20 nmol/L	21	34.40%	22	52.40%		
	21 - 30 nmol/L	2	3.30%	3	7.10%		
25(OH)D3(nmol/L) After treatment	11 - 20 nmol/L	16	26.20%	7	16.70%	1.31	0.518
	21 - 30 nmol/L	18	29.50%	14	33.30%		
	> 30 nmol/L	27	44.30%	21	50.00%		
ODI(After3Mo)	No disability (0 - 4)	0	0.0%	0	0.0%	0.000	0.989
	Mild disability (5 - 14)	48	78.7%	33	78.6%		
	Moderate disability (15 -24)	13	21.3%	9	21.4%		
	Severe disability (25 - 34)	0	0.0%	0	0.0%		
	Completely disabled (35 -50)	0	0.0%	0	0.0%		

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There was no significant association found between gender and different study variables with p>0.05.

Table 4: Comparison of mean VAS scores between before and after treatment

Variables	Mean	N	SD	t	p
VAS (Before treatment)	5.09	103	1.46	11.699	0.000
VAS (After 3 months treatment)	3.92	103	1.05		

VAS score was significantly decrease with mean 3.92±1.05 after treatment as compare to mean 5.09±1.46 before treatment with p<0.05.

Table 5: Comparison of mean ODI between before and aftertreatment.

Variables	Mean	N	SD	t	p
ODI(Before treatment)	15.21	103	4.14	20.240	0.000
ODI(After treatment)	11.10	103	3.57		

ODI level was significantly decrease with mean 11.10±3.57 after treatment as compare to mean 15.21±4.14 before treatment with p<0.05.

Table 6: Characteristics of study variables

Statistics	AGE	ODI Before treatment	VAS Before treatment	25(OH)D3 Before treatment	25(OH)D3 After treatment	ODI After treatment	VAS After treatment
Mean	31.74	15.21	5.09	11.624	29.725	11.10	3.92

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Median	30.00	13.00	5.00	10.560	28.701	10.00	4.00
Mode	28[a]	13	4	10.210	19.6700	10	4
Std. Deviation	6.75	4.14	1.463	4.673	8.775	3.571	1.054
Minimum	18	8	2	3.672	15.670	5	2
Maximum	45	23	8	27.350	49.550	20	6

4. DISCUSSION

The present study has focused on the prevalence of vitamin D deficiency in young adults with low back pain and impact of vitamin D supplementation.

The prevalence of vitamin D deficiency was found to be 93.6% among the 110 subjects who participated in this study. This is similar to the prevalence of low back pain reported in various study like Kapil etal., 2017[11] is 93, Gunjaliya etal., 2015[12] is 93.5 and Rattan etal., 2016[13] prevelance is 84.9. The prevalence of low back pain was seen to be greater in women than in men (59.2% versus 40.8%). Previous studies on the prevalence of low back pain have also reported that low back pain was seen more frequently in women than in men.[14-17]

Vitamin-D supplementation increases plasma levels of 25(OH)-D3 potentially correcting the effects of vitamin-D deficiency[18]. Two recent meta-analyses conducted by **Straube et al**[18] have reported contrasting outcomes between the results of randomized clinical trials (RCTs) and non-RCTs. The effectiveness of vitamin-D supplementation in the treatment of chronic pain was observed in 10% and 95% of RCTs and non-RCTs/observational studies, respectively. The major limitation of these analyses was the fact that both meta-analyses were conducted on small and heterogeneous studies[18,19].

Warner and Arnspiger[20] found no significant decrease in pain score of with ergocalciferol 200,000 IU/month administration for 3 months in patients with musculoskeletal pain. In contrast, a study conducted in non-western immigrants in Netherlands by **Schreuder et al**[21] had reported a small positive effect of vitamin-D supplementation in patients with nonspecific musculoskeletal pain. Further, a study conducted in a North Indian population by **Kalra et al**[22] had reported a high prevalence of severe vitamin-D deficiency (< 10 ng/mL) in 55.55% of cases and 10 – 30 ng/mL in 38.46% of patients with back pain.

A recently published placebo controlled trial by **Schreuder F, Bernsen R, van der Wouden JC** [23] has shown remarkable analgesic efficacy of adding 4000 IU of vitamin D in patients with musculoskeletal pain leading to faster decline in consecutive VAS scores and levels of inflammatory and pain-related cytokines[23]. We did not specifically assess leg pain reduction

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in our study. Instead, we have used ODQ to assess functional disability. This disability questionnaire evaluates lower limb activity, particularly in terms of standing, sitting, and walking.

In our study ODI level was significantly decreased with mean 11.10±3.57 after treatment as compare to mean 14.04±4.06 before treatment with $p<0.05$. As per the studies done by **Lotfy et al**., **Gokcek E et al., and Xu HW et al.**, serum 25 (OH) D levels correlate significantly with the pain severity,[24,25,26] while the studies done by **Johansen JV et al. and Ghai B et al**. found no relationship between them.[27,28]

In our study, the VAS score of the vitamin D deficient patients was statistically significantly higher before vitamin D supplementation was given and VAS score was significantly decreased with mean 3.92±1.05 after treatment as compare to mean 5.09±1.46 before treatment. Thus, implicating that a negative correlation exists between the severity of pain and levels of vitamin D, as supported by previous studies also.[29,30,31]

Our findings provide a reasonable explanation and justification for advising dietary supplementation as well as therapeutic medication to achieve normal Vitamin-D levels in patients with musculoskeletal pain[32].

Limitations:-There were several limitations in this study and its research methods. First, there was no placebo group in this study. Second, sample size was small. Third, the participants included hospital-based and community- based participants, which could be a source of statistical and clinical heterogeneity. Fourth, the study allowed the participants to take analgesics for a few days which could have masked the true effect of vitamin D supplementation if the utilization of analgesics was significantly different among different participants. Fifth, we did not have enough data to determine the effect of baseline vitamin D status and different doses of vitamin D supplementation on pain. In addition, we had limited the follow-up time in the inclusion criteria while it may take longer for vitamin D to show a beneficial effect. The publication of further RCTs will offer greater scope in the future for sub-group analyses with greater statistical power which may identify potential causes of the heterogeneity in our results. Researchers interested in continuing to explore this topic should consider the current quality of the evidence and ensure they implement well-designed and adequately powered clinical trials to build on the available evidence in this field.

5. CONCLUSION

The results of this study support the conclusion that vitamin D supplementation reduce pain scores in the patients with low back pain . This suggests that vitamin D supplementation could have a role in the management of chronic pain. The study shows that vitamin-D supplementation can alleviate pain and disability in patients with CLBP in addition to the normalization of its levels.

Altogether, intense research is needed to establish the effect of vitamin D on LBP. RCTs of longer duration, larger sample sizes, and different outcome assessments in various age groups are recommended. Further, well-designed placebo controlled long-term trials should be conducted to confirm these findings.

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