Journal of Cardiovascular Disease Research
ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 04, 2024

Correlation of serum Vitamin D levels in male alcoholic individuals of tertiary healthcare centre in northern India

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ABSTRACT

Objective: To observe the correlation of serum Vitamin D levels in male alcoholic individuals.

Materials and methods: A total of 54 male individuals, aged between 21 to 70 years with history of alcohol consumption were included.. Analysis of serum vitamin D by Vitros autoanalyser was done.

Result: It was observed that maximum number of individuals consumed 15- 16 drinks per week.Very few individuals consumed 20 – 21 drinks per week. Vitamin D levels were in sufficient range in participants who consumed 15 – 16 drinks per week. Whereas levels were lowered as the number of drinks consumed were increased. Moderate negative correlation between number of drinks consumed per week and Vitamin D levels which was statistically significant was observed.

Conclusion: Our results clearly show that individuals who consume more than 15 drinks per week have insufficient serum Vitamin D levels compared to the normal reference range. This was statistically proven using Karl Pearson's correlation formula, establishing a moderate negative correlation. Therefore, we can conclude that as the number of drinks per week increases, serum Vitamin D values decrease. It is necessary to develop national monitoring systems to track alcohol consumption and its consequences, raising awareness among the public and policymakers.

Key words: Vitamin D, 25-hydroxyvitamin D, Alcoholics.

INTRODUCTION

Alcohol dependence is a major public health problem worldwide. Rates of individual alcohol consumption have soared over the years across various countries[1]. Alcohol use disorders are very common mental disorders worldwide[2,3].

Vitamin D has been regarded as one of the essential nutrients by scientific and medical communities, the food industries, regulatory agencies, and people, in general over the past fifteen years[4]. There are widespread cases of Vitamin D insufficiency and deficiency in almost half the healthy population of developed countries[2]. Vitamin D helps to build and maintain bone mineral density, and its deficiency is a global concern[5]. It is a secosteroid prohormone synthesized in response to ultraviolet B-irradiation with pleiotropic effects reaching beyond its direct myoskeletal action[6]. Vitamin D3 is naturally found in animals and animal derived products and derived through skin synthesis. Vitamin D2 is mainly obtained from yeast, mushrooms and chemical synthesis[7].

Vitamin D receptors (VDRs) which are present in the central nervous system along with neurons synthesize the active form of vitamin D i.e. 1,25-dihydroxyvitamin D. Various studies have been conducted to find the link between mental disorders (schizophrenia, Alzheimer's disease, obsessive compulsive disorders, autism, psychosis, conditions causing cognitive deficits, alcohol dependence) and Vitamin D levels. But due to the inconsistency in findings, further research is needed[8]. The most important disease conditions in this group are alcohol use disorders (AUDs), which include alcohol dependence and harmful use or alcohol abuse[9]. Nearly 5.1% of the global burden of disease is attributable to alcohol consumption, and it causes nearly 3.3 million deaths every year[10]. Alcohol use disorders or alcohol dependence can lead to behavioural and mental changes like inappropriate conduct, unstable moods, slurred speech, thin attention spans, poor memory and loss of coordination[8,11].

Vitamin D is essential for growth and development of bones and teeth by regulating the absorption of calcium and phosphorus and facilitating normal immune system functioning[12].

It has long been known that excessive alcohol consumption has a negative impact on vitamin D status. Chronic alcoholism results in disturbed vitamin D metabolism and they usually lower the levels of serum 25-hydroxyvitamin D [25(OH)D]. Even in the absence of chronic liver disease, alcoholism can cause moderate to severe deficiency in alcoholics[13]. According to the factsheet of National Institute on Alcohol Abuse and Alcoholism (NIAAA),

the medical diagnosis of "alcohol use disorder" (AUD) is given for drinking habit that becomes severe[14].

Evidence regarding the correlation between alcohol dependence and Vitamin D is a controversial subject for scientific and medical societies. Some studies suggest that Vitamin D deficiency in chronic heavy drinkers is due to low sun exposure, lack of proper nutrition, alcohol related liver disease (ARLD) and poor absorption. Still more research is needed to validate the biochemical association[15]. Vitamin D has long been considered responsible for bone metabolism. Emergent researchers have suggested that Vitamin D deficiency can contribute to heart diseases, autoimmune diseases such as rheumatoid arthritis, malignancies and infections[16]. 1,25-dihydroxyvitamin D (1,25(OH)2D) is the active form of Vitamin D which is called calcitriol. It circulates as a hormone in the blood, having a major role in regulating the concentration of calcium and phosphate and promoting the healthy growth and remodelling of bone. Vitamin D deficiency/insufficiency is found worldwide, thereby, poor calcium intake and malabsorption is also common globally[17]. Vitamin D has a significant role in cell proliferation, differentiation and apoptosis. It is a potent immune system modulator, helps in insulin secretion, hormone regulation and performs various other vital functions for the body[3,18]. Vitamin D receptors (VDRs) help to synthesize the active form of Vitamin D. Vitamin D functions have been investigated through the study of pathogenesis and treatment of chronic liver diseases[2].

Chronic alcohol abuse leads to bone disorders since excessive alcohol consumption interferes with the production of Vitamin D that is required for calcium absorption hence, it negatively affects bone health[8]. Surging cases of alcohol use disorders have made it a global health issue[5]. The following study is directed at investigating the possible relationship between alcohol use and serum levels of Vitamin D.

MATERIAL AND METHOD:

Study was conducted at Department of Biochemistry in collaboration with the Faculty of Medicine at Eras Lucknow Medical College & Hospital, Lucknow. 54 male individuals with history of alcohol consumption were included to estimate serum 25-hydroxyvitamin D [25(OH)D]. Detailed history and consent was taken from the study participant. Patients serum 25-hydroxyvitamin D [25(OH)D] was estimated using Vitros 5600 autoanalyser using dry chemistry method. The results were analysed using following reference range as per the manufacturer's manual[19].

The results were then compared with normal reference range of 25-hydroxyvitamin D [25(OH)D] **(30-100 ng/ml).**

LEVEL	RANGE (ng/ml)
Deficient	<20
Insufficient	20-<30
Sufficient	30-100
Potential Toxicity	>100

Accordingly, Vitamin D deficiency is seen when serum [25(OH)D] concentrations are <20 ng/mL, while vitamin D insufficiency is seen when serum [25-(OH) D] concentrations are 20–29 ng/ml and sufficient concentrations of vitamin D levels are seen when [25-(OH) D] is ≥30 ng/ml.

According to CDC(Centers for Disease Control) Criteria, for men, heavy drinking is 15 drinks or more per week[20].

INCLUSION CRITERIA

1. Individuals with present history of alcoholism consuming 15 drinks or more in a week.
2. Male individuals aged between 21 to 70 years.

EXCLUSION CRITERIA

1. Individuals taking Vitamin D supplements.
2. Individuals with known history of bone and renal disorders.

APPROVALS AND PERMISSIONS

The study was approved by the Institutional Ethics Committee, Era's Lucknow Medical College, Lucknow, vide letter no. ECR/717/Inst./U.P./2015/RR-21 dated 09.02.2023.

DATA ANALYSIS

Statistical analysis of the data was performed using the SPSS statistical analysis software (Statistical Package for Social Sciences). Values are represented as Mean and Standard Deviation(SD). Karl Pearson's coefficient of correlation has been applied to measure the level of correlation between linearly related variables.

RESULT

Table 1: Distribution of study participants according to the number of drinks consumed

Alcohol consumption per week (No. of drinks)	No. of individuals
15-16	15
16-17	13
17-18	9
18-19	9
19-20	5
20-21	3
Total	**54**

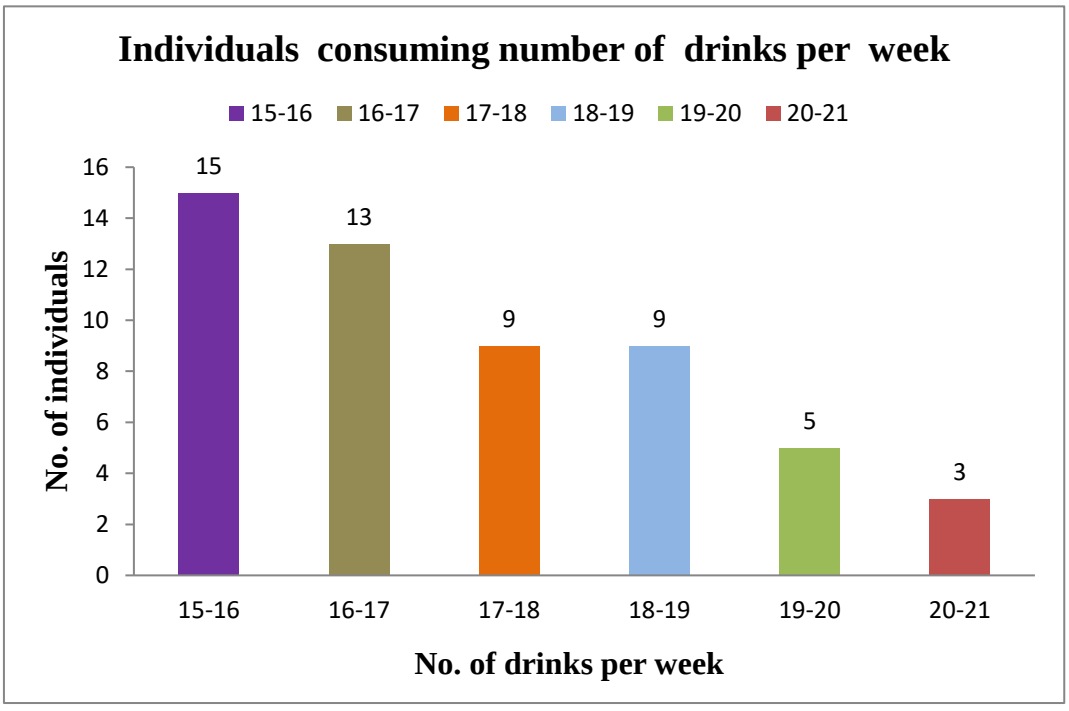

Figure 1: Distribution of study participants according to the number of drinks consumed

Figure 1 shows the number of individuals consuming alcohol (number of drinks) per week. Maximum number of individuals consumed 15- 16 drinks per week. Very few individuals consumed 20 – 21 drinks per week. So there was a decreasing trend seen in number of participants consuming the number of drinks per week.

Table 2: Distribution of study participants according to vitamin D levels

Alcohol consumption per week	No. of individuals	Vitamin D(ng/mL)	
		Mean	SD
15-16	15	26	2.48
16-17	13	24.23	1.34
17-18	9	22.54	0.84
18-19	9	23.84	1.88
19-20	5	22.66	1.64
20-21	3	21.93	0.44
Total	**54**	**24.1**	**2.066**

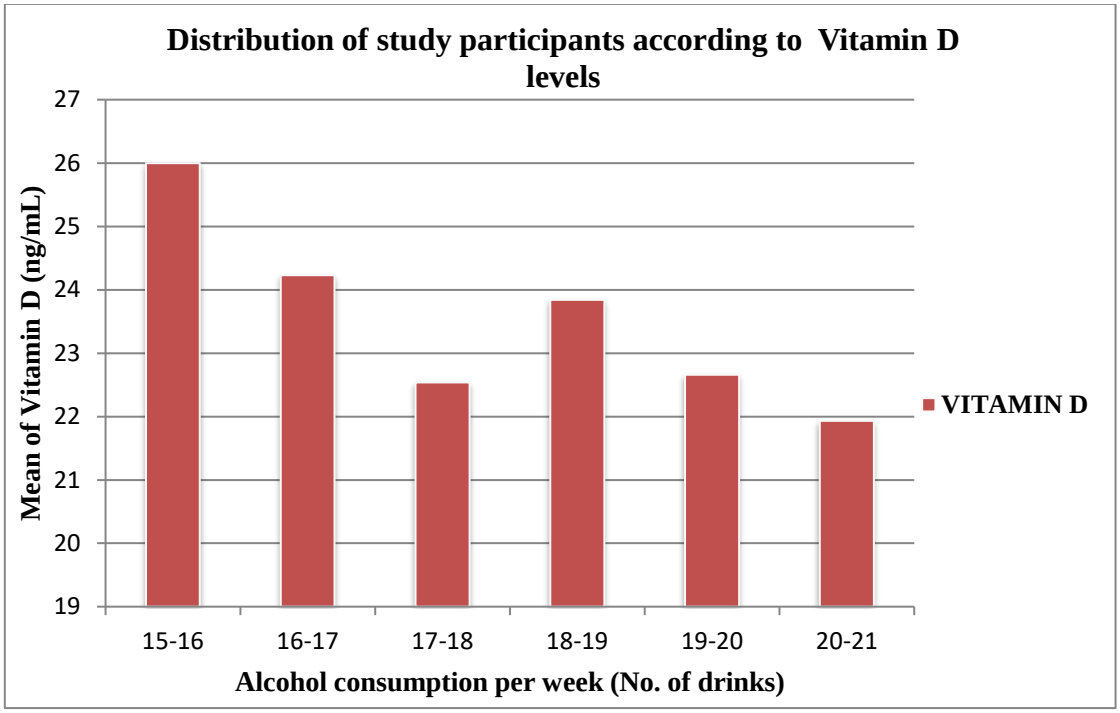

Figure 2: Distribution of study participants according to vitamin D levels

Figure 2 shows the distribution of study participants according to Vitamin D levels. Vitamin D levels were in sufficient range in participants who consumed 15 – 16 drinks per week. Whereas levels were lowered as the number of drinks consumed were increased.

Table 3: Correlation regression analysis showing relationship between number of drinks consumed per week and serum Vitamin D levels

Group	Dependant (Vitamin D)	p-value	r	B

Overall	Constant	0.0001	-0.56107275	-0.76181575

Where, b=SP/SS_x, SP = Sum of products, SS_x = Sum of squares

r= Pearson's correlation

Table – 3 shows the correlation analysis showing relationship between number of drinks per week and Vitamin D levels. There was moderate negative correlation between number of drinks consumed per week and Vitamin D levels which was statistically significant. (r= -0.56107275, p=0.0001).

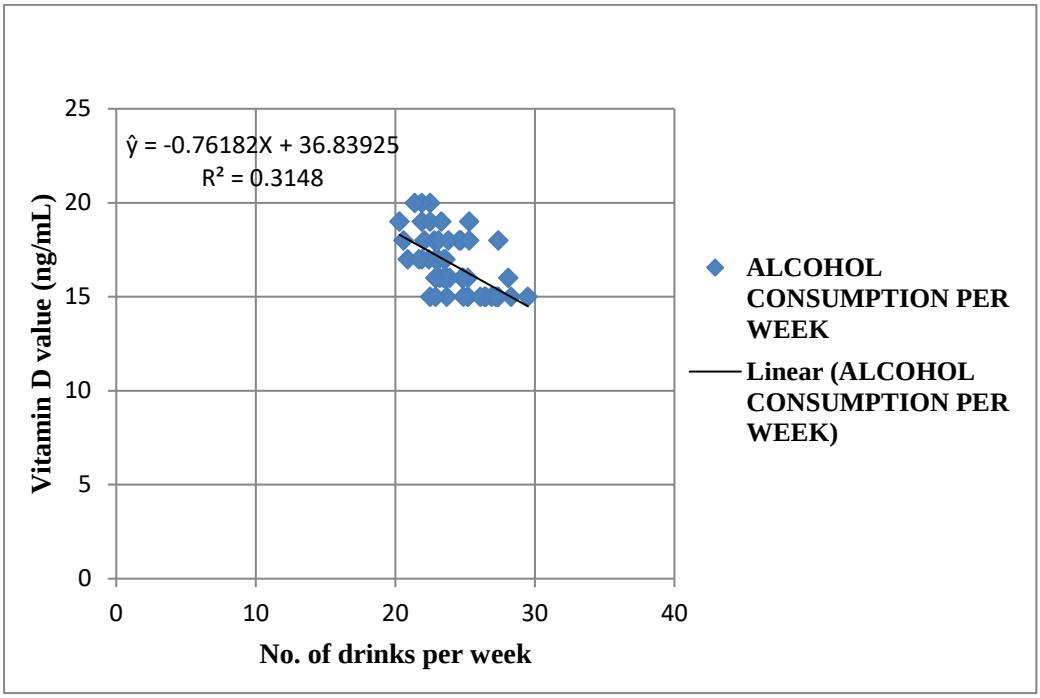

Figure 3: Correlation-regression analysis showing relationship between number of drinks consumed per week and vitamin D levels

On applying, Karl Pearson's coefficient of correlation, correlation coefficient was found to be -0.56107. There was a moderate negative correlation between number of drinks per week and vitamin D value with p-value of 0.0001, which is statistically significant. The results were found to be extremely significant. This was statistically significant that as the number of drinks per week increases, the value of serum vitamin D decreases.

DISCUSSION

Alcohol dependence is one of the most prevalent substance use disorders worldwide. According to WHO, 3 million deaths occur globally due to alcohol abuse every year that accounts for 5.3% of all deaths.

Vitamin D is a fat soluble vitamin which is synthesised in the body through sun exposure. Its role is in mineral homeostasis and bone formation. Many research established that Vitamin D provides protection against bone diseases, cancer, hypertension and cardiovascular diseases. Vitamin D deficiency is caused by many factors including skin colour, low sun exposure, breast feeding, ageing, poor fat absorption, and by undergoing certain procedures like gastric bypass[21]. Vitamin D deficiency can have both long term and short term complications ranging from bone pain, muscle weakness to various non-communicable diseases like cancer, depression, autoimmune disorders[22,23].

Alcohol use disorders (AUD) have been associated with Vitamin D deficiency. Alcohol abuse results in disturbed Vitamin D metabolism and alcohol dependent individuals exhibit low levels of serum 25-hydroxyvitamin D [25(OH)D][18].

Considering the possible link between alcohol dependence and vitamin D deficiency, the present study was planned with an aim to assess the correlation of serum Vitamin D levels in alcohol dependent males. A total of 54 alcoholic male participants aged between 21 to 70 years were enrolled in the study and their serum Vitamin D levels were measured. Mean serum Vitamin D level was found to be 24.1 ng/mL, in the study undertaken which is suboptimal according to the reference range.

In the present study, participants were categorised according to the CDC criteria as heavy drinkers and serum Vitamin D levels were found to be insufficient in participants consuming 15-20 drinks per week. The study reported highly significant and a moderate negative correlation of serum vitamin D levels with the quantity of alcohol consumed.

A number of previous studies have also assessed the relationship between serum vitamin D levels in alcoholic individuals and have reported variable spectrum depending upon the study characteristics.

In a study by Jayan et al. the median serum vitamin D level (25-hydroxy cholecalciferol) lied in the insufficient range. There was no significant association of Vitamin D levels with the quantity of alcohol consumed, duration of consumption and with liver enzymes[1]. In yet another study by Neupane et al. in Nepal, most of the respondents exhibited insufficient levels of Vitamin D and reported Vitamin D deficiency[24].

In the present study, all the male respondents consuming more than 15 drinks per week had low Vitamin D levels. The findings are similar to other studies that reported Vitamin D deficiency in alcohol dependent individuals[10,12].

The current cross-sectional study statistically analysed that a moderate negative correlation of Vitamin D levels is there in male alcoholics who consumed more than 15 drinks per week. The results of the present study established that excessive alcohol consumption has a detrimental effect on Vitamin D levels.

Further relevant studies in other populations should be performed to confirm these findings and explain the underlying mechanism.

CONCLUSION

Our results clearly show that individuals who consume more than 15 drinks per week have insufficient serum Vitamin D levels compared to the normal reference range. This was statistically proven and using Karl Pearson's correlation formula, established a moderate negative correlation. Therefore, we can conclude that as the number of drinks per week increases, serum Vitamin D level decreases.

Furthermore, both quantitative and qualitative research is needed to determine the relationship between alcoholism and Vitamin D deficiency. Over time, excessive alcohol use can lead to the development of chronic diseases and other serious problems, including high blood pressure, heart disease, stroke, liver disease, and digestive problems. It is necessary to develop national monitoring systems to track alcohol consumption and its consequences, raising awareness among the public and policymakers. Governments and concerned citizens should encourage debates and formulate effective public health policies that minimize the harm caused by alcohol.

Author's Contribution:

GA- Concept, design, clinical protocol, manuscript preparation, editing, and manuscript revision;**CG-** Literature survey, Prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation;**VS-** Coordination and Manuscript revision

Conflict of interest: Authors declare no conflict of interest.

Source of Funding: no financial support concerning the study was provided.

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