



ORIGINAL RESEARCH PAPER

Physiology

A COMPARATIVE STUDY OF COGNITIVE IMPROVEMENT IN SUBJECT OF COGNITIVE IMPAIRMENT WITH AND WITHOUT VITAMIN D SUPPLEMENTATION

KEY WORDS: cognitive functions, dementia, vitamin-D

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ABSTRACT

Cognitive impairment may cause functional problems for the older people Cognitive decline in elderly adults is a major public health problem, and there are currently no known preventive treatments. Emerging evidence suggests the low vitamin D concentrations are potentially involved in the pathogenesis of dementia. This is of particular interest when considering the high prevalence of vitamin D deficiency in elderly adults and urgent need to identify modifiable risk factors for dementia

MATERIAL AND METHODS:

Subjects were taken from the psychiatry OPD and Medicine OPD Ajmer, after taking informed consent from patient's guardian. A total of 100 subjects were enrolled which were divided into two groups as Group A[control] and Group B[case] , each group having 50 subjects Interventions [vitamin D and calories supplementation]were done Group B [case].

CONCLUSION: The present study was conducted to see the effect of vitamin D on cognitive performance.

Vitamin D3 supplementation caused improvement in the cognitive performance in senile dementia (Cognitive impairment) patients.

INTRODUCTION

In our society, there are positive and negative views of aging . Some people believe being old is sick and that you just can not teach old dogs new tricks. Other people believe being old is having freedom ,wisdom ,and enjoyment.^{1,2}

Common responses includes following " Being old means you need someone to help"

The prevalence of this population is on rise, not only in world but also in developing countries like INDIA. The aging of the world's population is global phenomenon with extensive economic and social consequences. In view of life long experience and wisdom, elderly person are precious resource not only for families but also for the nation.

Aging is associated with a generalized decrease in efficiency in body's physiological system and natural defense mechanism. In addition to natural these adverse social and environmental factors may lead to increase morbidity.

Psychological wellbeing is an important aspect of health. Like other human being , elderly also have various psychological problems like memory impairment (i.e. Cognitive impairment) ,depression,sleeplessness ,fear ,anxiety ,social adjustment, insecurity etc. These problems may be due to psychological as well as social factors .³ Cognitive impairment may cause functional problems for the older people .Alzheimer's disease is the leading cause of dementia and loss of autonomy and independency in elderly .Alzheimer's disease is characterized by a progressive decline of cognitive performance with deleterious impact on social activities.

Cognitive decline in elderly adults is a major public health problem, and there are currently no known preventive treatments. Emerging evidence suggests the low vitamin D concentrations are potentially involved in the pathogenesis of dementia. This is of particular interest when considering the high prevalence of vitamin D deficiency in elderly adults and urgent need to identify modifiable risk factors for dementia. Several studies suggested that lower vitamin D (25- hydroxy vitamin D) concentration are associated with poorer cognitive function and a higher risk of Alzheimer's disease.⁴

Studies have found the vitamin D is implicated in pro cognitive and neuroprotective function including the reduction of Alzheimer's disease hallmarks such as amyloid beta phosphorylated tau. Cross section studies have consistently found that vitamin D concentrations are significantly lower in individuals with Alzheimer's disease and cognitive impairment compared to healthy controls. Longitudinal studies support an association between low vitamin D concentrations and an increased risk of dementia and cognitive decline.

Five studies have investigated the association between vitamin D and dementia- related outcomes in elderly adults, with four measuring serum 25(OH)D concentration^{5,6} and one measuring vitamin D dietary intake. In the later study , in 498 women with a mean age of 79.8 years, increased vitamin D dietary intake was associated with a reduced risk of Alzheimer's disease but not non- Alzheimer's disease dementias over a 7 year follow-up period.

Vitamin D and calcium are often taken together , because vitamin D increases calcium absorption in the intestine, and vitamin D and calcium are thought to influence neuronal functioning. Vitamin D is thought to protect against neural degeneration through a number of mechanism , including enhancing antioxidant pathways increasing production of neuron growth factors, and decreasing levels of inflammatory biomarkers.

AIM AND OBJECTIVES

A comparative study of cognitive improvement in subjects of cognitive impairment with and without vitamin D supplementation

MATERIAL AND METHODS

The study was conducted In the Department of Physiology , Jawahar Lal Nehru Medical College [JLN MC] Ajmer , in collaboration with Department of Psychiatry, Medicine and Biochemistry ,JLN Medical College ,Ajmer [RAJASTHAN].

Subjects were taken from the psychiatry OPD and Medicine OPD Ajmer, after taking informed consent from patients guardian . A total of 100 subjects were enrolled which were divided into two groups as Group A[control] and Group

B[case], each group having 50 subjects . Interventions [vitamin D supplementation] was done in Group B [case]

INCLUSION CRITERIA

1. Age >60
2. Mini mental state examination score <24
3. Serum 25 [OH] vitamin D level less than or equal to 30ng/ml.
4. Cognitive impairment due to aging

EXCLUSION CRITERIA

1. Age <60 years
2. Uncooperative
3. All non – degenerative dementia
4. Uncontrolled diabetes and hypertension
5. Drug addiction
6. Non availability of informed consent
7. Smokers

METHODS:

Baseline measurement was done in group A and group B

A. CLINICAL EVALUATION OF SUBJECTS:

- a. Identification data of subjects
- b. Present history of medical illness
- c. past history
- d. family history of obesity , medical, surgical illness
- e. socio-economic status
- f. drug history
- g. nutritionl history
- h. occupational history
- i. menstrual history if applicable

B. Vitamin D LEVEL BY ELISA METHOD:

estimation of 25 [oh] vit. D by direct ELISA kit [immuno diagnostic AG stubenwald Allee]

Vitamin D level:

1. Sufficiency [adequately supplied] ->30ng/ml
2. Insufficiency -20-30ng/ml
3. Deficiency -<20ng/ml

C. ASSESSMENT OF COGNITIVE FUNCTION

Mini-Mental State Examination [MMSE] ¹⁰ – can be used to screen for or monitor cognitive function instrument. Mini Mental State Examination questionnaire is used to determine the cognitive status of the subjects.¹¹ The questionnaire evaluates the performance of orientation to time , place, memory , attention , concentration, recognition of objects, language function, comprehensive and expressive speech , motor function and proxies by giving a score of one for each correct reply . The responses are graded as score .Maximum score a person can get is 30.

INTERVENTIONS IN GROUP B:

1. Vitamin D supplementation-100 IU OF VIT. D per day raises serum 25 [oh] vit. D concentration by 0.7ng/ml. 1,20,000 IU of cholvcalciferol was given every month in the form of calcirol granules. 1 gram of calcirol granules contains 60,000 IU of vit. D . In brief the total dose was 7,20,000 per case over the study period of 6 month .The daily dose of 4,000IU in the study was thus expected to raise the serum 25 [oh] D concentration by at least 28ng , with a concentration ultimately reached >30ng/ml. Chosen dose of 4,000 IU per day does not reach toxic dose[i e.10,000 IU per day] and raises vitamin D concentration within non toxic limits[i.e 156ng/ml].

Assessment of cognitive performance was done after every 3 months By MMSE score.

STATISTICAL ANALYSIS

Data were summarized as mean ± SD. Groups were compared by independent student's test. A two –sided (a=2) p<0.05 was considered statistically significant. All analyses were

performed on SPSS (version -17) software.

OBSERVATIONS AND RESULTS

A. Basic characteristics

The present study evaluates the cognitive improvement in subjects of cognitive impairment with and without vitamin D supplementation. A total of 100 cognitive impairment subjects were recruited and randomized equally in two groups to treat either with medication [group A] or medication along with the vitamin D3 supplementation [group B]. The basic characteristic viz. age, gender, weight, height, BMI, residence, education and occupation of two groups were similar. In other words subjects of two groups were demographically matched and comparable.

B. Biochemical parameters

The mean level of vitamin d3 was 9.34± 4.17 in group A and 8.6 ± 5.1 in group B with P value of .36. From baseline biochemical investigation [vit D3] of both groups was similar and statically not different.

C. Cognitive Assessment

Table 1: Pre and post MMSE scores [Mean±-SD] of two group

Treatment period	Group A	Group B	P Value
Pre MMSE	19.81 ± 270	20.00 ± 1.95	0.9
Post MMSE after 3 Months	21.28 ± 2.65	22.8 ± 2.05	0.02
Post MMSE after 6 Months	22.95 ± 3.06	24.84 ±- 3.16	0.003

After three months of intervention [vitamin D supplementation] there was statically significant diiference [p=0.02] was observed between the control [group A,MMSE-21.28 ± 2.65] and case [group B MMSE-22.8 ± 2.05].Further assessment of MMSE was done at 6 months whereas the statically significant difference was maintained among the two groups [group A 22.95 ± 3.06, group B 24.84 ± 3.16, p=0.003]. the improvement in MMSE was progressive and was later at 6 month of treatment as compared to 3 month of treatment.

The net improvement was significantly better in group B as compared to group A in current study, all persons enrolled showed low level of vitamin D in both groups.

DISCUSSION

Dementia is a common cognitive disorder reflective of a wide spread chronic progressive degenerative disease and may part of normal aging process. It present as as low loss of cognitive function and is characterized by impairment in language ,memory , vishuospatial skills, emotions, personality and cognitions. It is a part of group of illness that causes a progressive decline in a person's mental functions.

In the current study the mean age , gender, weight, height, BMI, residence, education, occupation ere not statically different[p=>0.05]among the two groups. From baseline biochemical investigations (Vit D 3 Level) both groups were similar and statistically not different .

The pre-treatment MMSE was also statistically similar among the two groups (Group A- 19.18 ± 2.7, Group B-20.00 ± 1.95, P= 0.9). Overall both groups were similar in baseline demographic, biomedical and intellectual parameters.

After three month of intervention (Vitamin D supplementation) there was statistically significant difference [p=0.02]was observed between the control (group A, MMSE – 21.28 ± 2.65)

And case (group B, MMSE- 22.8 ± 2.05). further assessment of MMSE was done at 6 months were as statistically significant difference Maintan among two groups (Group A = 22.95 ± 3.06, Group B = 24.84+-3.16, p=0.003) The improvement in MMSE was progressives and was better as 6 months of treatment as compare two three months of treatment.

The net improvement (i.e, change from pretreatment MMSE to post 6 month treatment MMSE) was significantly better in group B (4.84) . Vitamin D is a neurosteroid hormone which crosses the blood brain barrier and bind to the vitamin D receptors present in neurons and glial cells of the central nervous system including hippocampus, the hypothalamus , the cortex and sub cortex 1,25 dihydroxy vitamin D3 [active form of vitamin D] regulates the intraneuronal calcium homeostasis via the regulation of voltage gated calcium channels – thus preventing necrosis and has also exhibited neuroprotective properties against glutamates toxicity through antioxidant effects.

In current study all persons enrolled showed low level of vitamin D in both groups. Hence the present study clearly indicates that vitaminD3 supplementation has an additional effect on the cognitive functions in elderly, who are on medical therapy for dementia. These findings of current study corroborate with other studies where similar results were observed.

In conclusion, the present study is one of the ongoing step in conforming role of vitamin D supplementation in cognitive improvement in elderly population. However to establish a confirmatory result further studies on larger study sample size are needed.

CONCLUSION

The present study was conducted to see the effect of vitamin D on cognitive performance .

Vitamin D3 supplementation caused improvement in the cognitive performance in senile dementia(Cognitive impairment) patients.

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