

**Prevalence of vitamin B12 deficiency in elderly population with dementia****Narender Katakam<sup>1\*</sup>, Sridevi Durgaraju<sup>2</sup>**<sup>1</sup>MD General Medicine, Associate Professor, Maxcare Hospitals, Warangal, Telangana, India<sup>2</sup>MD. DVL., Dermatologist, Katakams Skin Clinic, Kothawada, Warangal, Telangana, India

Received: 18-10-2020 / Revised: 29-11-2020 / Accepted: 22-12-2020

**Abstract**

**Background:** Factors that can interfere with the output of the elderly during the normal ageing phase especially when cognitive impairment is involved. This in turn, may lead to major disabilities and to the deterioration of the quality of life of the elderly. The findings presented herein should therefore provide a thorough explanation of the relationship between vitamin B12 deficiency and its effects on this population. **Aims:** The objective of our study was to establish the prevalence in our local area of major forms of dementia and the prevalence of B12-deficient dementia. **Materials and methods:** A prospective cohort study involving 270 elderly patients with dementia. Subjects were elderly patients above 60 years of age who were recruited, all patients who presented to OPD with complaints of dementia (satisfying the inclusion criteria) were included in the study and evaluated further with detailed history, examination and MMSE. **Results:** Out of 270 patients with dementia 45 cases suffered from B12 deficiency 45 cases with prevalence of 17%. Most of the elderly people suffer from infarct in brain. There is male predominance in B 12 deficiency but there is no significance. > 81 years have significance in prevalence of vitamin B 12 deficiency. In total 45 patients of Vitamin B12 deficiency in which 35 cases (77.8%) have anorexia as presentation followed by paraesthesia 32 case (71%) . Vegetarian diet predisposes a person to developing B12 deficiency. Anaemia and cognitive impairment are features of vitamin B12 deficiency. **Conclusion:** With this marked increase and a high prevalence of B12 deficiency in the elderly population, B12 levels are recommended for all elderly patients with dementia because it is a potentially treatable cause that can substantially enhance the memory and quality of life of a patient.

**Keywords:** Dementia, Vitamin B12 deficiency, Cognitive impairment.

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**Introduction**

Vitamin B12 deficiency is a common cause of neuropsychiatric symptoms in elderly persons. Malabsorption accounts for the majority of cases. Vitamin B12 deficiency has been associated with neurologic, cognitive, psychotic, and mood symptoms, as well as treatment-resistance. It is assessed that up to 40% of more seasoned adults have vitamin B12 (cobalamin) lacks, and most are due to cobalamin malabsorption.[1] Up to 1%–5% of free cobalamin is also absorbed throughout the intestinal mucosa, via passive diffusion.

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This enables the absorption of high doses (at least 1 mg daily) of oral supplemental cobalamin, despite absorption disease processes. High predominance of gastrointestinal (GI) pathology and utilize of medicines that modify cobalamin pharmacokinetics are components that increment the hazard of deficiency among elderly patients.

The infection process ranges from subclinical metabolic changes, to clinical symptoms, to irreversible structural damage, such as periventricular white-matter injuries[1,2].

There are only a few reversible causes of elderly dementia, the most treatable of which is vitamin B12 deficiency. It is well known that deficiency of B12 can cause isolated dementia and that in other irreversible dementias it can be a coexisting factor. This study focuses on studying the prevalence of different forms

of dementia in the elderly population, presenting the incidence of B12 deficiency to a tertiary care hospital and studying the profile of patients with B12 deficiency. The primary aim of the study was to establish the prevalence of major types of dementia and to specifically analyse the prevalence of B12 deficient dementia.

**Materials and methods:** A prospective cohort study involving 270 elderly patients with dementia. Subjects were elderly patients above 60 years of age who were recruited, all patients who presented to OPD with complaints of dementia (satisfying the inclusion criteria) were included in the study and evaluated further with detailed history, examination and MMSE.

Study setting : Maxcare Hospitals, Warangal.

Study period: 2018-2020.

Sample size calculation:

P=47% (according to study of Rajiv singla ,Arpan Garg et al)[3]

q=53

error=6%

sample size is 270

#### Inclusion Criteria

Elderly patients more than 60 years of age, who were literate and had, Dementia as per DSM-IV criteria and MMSE <24.

#### Exclusion Criteria

Patients of Delirium presentation, Recent vitamin B12 injections or chronic vitamin users, recent history of blood transfusions, acute alcohol intoxication/withdrawal, chronic bed bound, malnourished multi-infarct dementias.

Data collection was performed in all the elders two meetings. At the first meeting, the elderly were informed about the research goals and signed the Informed Consent Form. Subsequently, a questionnaire was applied to collect the elderly's socioeconomic and

#### Results

In total 270 patients we have analysed following details.

demographic features (date of birth, gender, marital status, education). Then, anthropometric assessment was carried out. The biochemical tests consisted of complete blood counts, 15 mL blood sample was collected from each individual by a technician from the Clinical Analysis Laboratory. All the studied participants were instructed to fast for 12 hours before the blood collection. Vitamin B12 was analysed by CLIA method using Beckman coulter.

According to the World Health Organization, vitamin B12 measurement may be interpreted according to the following concentrations: deficiency (levels below 80 pg/mL), suggesting deficiency (between 80 and 140 pg/mL) indefinite diagnosis (between 140 and 200 pg/mL) and normal (from 200 to 960 pg/mL)[21]. According to this criterion, vitamin B12 deficiency was the analysed dependent variable, and it was defined as plasma levels below 140 pmol/L[21].

Cognitive impairment was assessed through Mini-Mental State Examination (MMSE), which is composed of questions grouped into seven categories. Each one of them evaluated the deficit of specific cognitive functions: time orientation, local orientation, record of three words, attention and calculation, remembering three words, language and visual constructive capacity. MMSE score could range from a minimum of 0 to a total of 30 points. Elderly with scores equal to or lower than 13 were classified as "carriers of some cognitive impairment" and those with scores higher than 13 were classified as "without cognitive impairment". Data entry was done using the Statistical Package for the Social Sciences (SPSS) software package (version 15). Descriptive statistics were calculated using SPSS software. Chi-square test was used for comparison of categorical variables. Confidence intervals (CI) were calculated and a 'p' value less than 0.05 was considered statistically significant. All reported p values are two-sided.

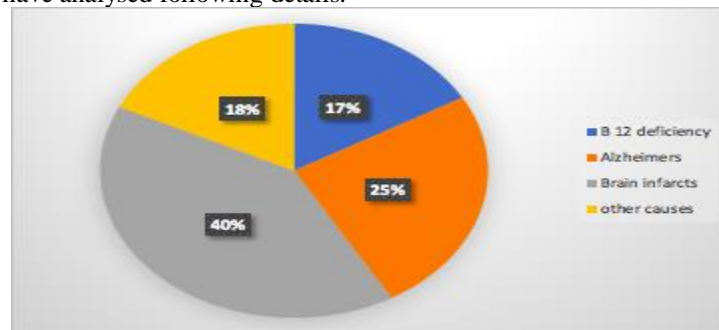


Fig 1: Distribution of dementia cases with various causes

Out of 270 patients with dementia 45 cases suffered from B12 deficiency 45 cases with prevalence of 17%. Most of the elderly people suffer from infarct in brain.

**Table 1: Distribution of study population in demographic variables**

Variables	Number of patients	Patients with B12 deficiency	Prevalence	P-Value
<b>Gender</b>				
Females	177	28	16	
Males	93	17	19	>0.05
<b>Age in years</b>		45		
60-70	179	21	12	
71-80	70	14	20	>0.05
>81	21	5	26	<0.01

There is male predominance in B 12 deficiency but there is no significance. > 81 years have significance in prevalence of vitamin B 12 deficiency.

**Table 2: Clinical presentation of patients with vitamin B12 deficiency**

Sign/symptom	Number of patients	Percentages
Anorexia	35	77.8
Paraesthesia	32	71
Peripheral Neuropathy	23	51
Myelopathy	22	48.9
Glossitis	17	37.8
Pallor	19	42
Hyperpigmentation	15	33.3
Optic neuropathy	14	31
Diarrhoea	8	17.8
Psychiatric symptoms	8	17.8
History of gastrointestinal surgery	6	13.3

In total 45 patients of Vitamin B12 deficiency in which 35 cases (77.8%) have anorexia as presentation followed by paraesthesia 32 case (71%) .

**Table 3: Correlation of vitamin B12 deficiency according to variable noted in study.**

Variables	Number of patients	Patients with B12 deficiency	Prevalence	P-Value
<b>Diet</b>				
Vegetarian	32	10	31	<0.05*
Non vegetarian	238	35	14.7	
<b>Nutritional status</b>				
Normal	31	6	19	>0.05
Underweight	143	21	17	
Overweight	130	18	15.5	
<b>Anaemia</b>				
Yes	49	6	12	<0.05*
No	221	39	17.6	
<b>Comorbidies</b>				
Yes	249	42	16.9	>0.05
No	21	3	14	
<b>History of depression</b>				
Yes	68	11	16	>0.05

No	209	34	16.8	
<b>H/O of cardiovascular disease</b>				
Yes	100	16	16	>0.05
No	200	29	17	
<b>Cognitive impairment</b>				
Yes	103	20	11.9	<0.05*
No	198	25	24.2	
<b>Functional impairment</b>				
Yes	59	16	16	>0.05
No	200	27	15.6	

vegetarian diet predisposes a person to developing B12 deficiency. Anaemia and cognitive impairment are features of vitamin B12 deficiency.

### Discussion

Out of 270 patients with dementia 45 cases suffered from B12 deficiency 45 cases with prevalence of 17%. Most of the elderly people suffer from infarct in brain. Which is similar to study done by Karina Oliveira Martinho et al[4] is 17.4% (95% CI, 13.4% -21.4%) in the elderly showing deficiency of this vitamin. The results showed to be higher than those found by Framingham, who found 12% vitamin B12 deficiency in the elderly[5]. Lower vitamin B12 deficiency prevalence (4.5%, 5.0% and 6.0%) was also found in population studies conducted by MacFarlane et al[6] in the Canadian Health Measures Survey, and in those by Andrés et al. (2008) and Clarke et al. (2003), respectively[6-8]. Despite their results, population studies related to aging and vitamin B12 deficiency are still conflicting, since the literature lists several definitions about the herein presented deficiency, which may range from 2 to 20%, depending on the definition used in the study. In present study there is male predominance in B 12 deficiency but there is no significance. Lli margalit et al[9] showed deficiency prevalence was greater for men (25.5%) in comparison with women (18.9%;  $p < 0.001$ ). Men were strongly associated with severe deficiency (adjusted OR 2.26; 95% CI 1.43-3.56). Age of  $> 81$  years have significance in prevalence (26%) of vitamin B 12 deficiency. In the US study by Ganguli et al[10] found that the prevalence significantly increased with age as follows- 1% for 55-69 years, 3% for 70-79 years, 15.7% for 80-85 years and 25% for  $>85$  years. The latest figures report up to 40% prevalence in those  $>85$  years. In a study done by RajKumar et al in Chennai[11], the prevalence of dementia in  $>60$  years was 3.5% and increased with age. In another study done by Verghese et al[12] in a rural community in Kerala, the prevalence rate of dementia was 3.2%. 58% were vascular dementia and 40% were Alzheimer's. Another study done by the same group in an urban Kerala population showed a prevalence of 3.4% and here the most

common cause was Alzheimer's (54%) followed by vascular dementia (38%). In a similar Urban study done in Mumbai by Pinto et al, the prevalence of dementia in the elderly was 2.44% and that of Alzheimer's was 1.5%.[13] The authors say that shorter follow up, cultural factors and smaller life span could have been contributory factors for lower prevalence in India. Vegetarian diet predisposes a person to developing B12 deficiency. Anaemia and cognitive impairment are features of vitamin B12 deficiency. In Yajnik's study vegetarians had 4.4 times (95% CI 2.1, 9.4) higher risk of low vitamin B12 concentrations and 3.0 times (95% CI 1.4, 6.5) higher risk of hyperhomocysteinemia compared to those who ate nonvegetarian foods frequently[14]. The current study found significance between vitamin B12 deficiency and the occurrence of anemia. The same result was obtained in the Leiden 85-Plus study conducted by den Elzen et al., who made adjustments using confounding variables without changing the results. This study goes against the literature, which reports information on the isolated measurement of vitamin B12. This data is not sufficient to result in the elderly anemic condition. Studies, such as that conducted by den Elzen et al. , also refer to different tests and cutoff points to measure vitamin B12 and hemoglobin concentrations using biochemical information, such as homocysteine and folic acid concentrations, to complement the studied associations[15]. The cognitive impairment showed to be a factor independently associated with vitamin B12 deficiency among the studied elderly. Different studies show that low concentrations of this vitamin are related to cognitive decline, due to neurological degeneration and the presence of spinal cord demyelination and damage to the cerebral white matter. Cross-sectional studies conducted by Balk et al[7] and Vogel et al.[16] showed positive associations between low vitamin B12 levels and lower scores on cognitive tests performed by elderly individuals. This profile is consistent to that

observed in the current study. On the other hand, the cohort study conducted by Clarke et al[8] found no association between cognitive decline (checked by MMSE scores) and decreased vitamin B12 levels. These authors found high concentrations of homocysteine, which was linked to slow cognition decrease. Castro-Costa et al.[6] conducted population studies on the elderly's socio-demographic features and associated low education with cognitive impairment and with the presence of functional incapacity in performing the activities of daily living.

### Conclusion

The prevalence of vitamin B12 deficiency in our local region was found to be 17 percent. This outcome was higher than that observed in other population studies under review. A major vitamin B12 deficiency-related variable was cognitive impairment, which explained the correlation between levels of vitamin B12 and measures of state of health among the elderly. This reality reinforces the need for steps to ensure that appropriate nutritional status among the elderly .

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**Conflict of Interest: Nil**

**Source of support:Nil**