

# PREVALENCE AND CORRELATES OF VITAMIN B<sub>12</sub> DEFICIENCY AMONG DEPRESSIVE PATIENTS PRESENTING IN THE TERTIARY CARE HOSPITAL OF GANDAKI PROVINCE OF NEPAL

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## ABSTRACT

### Introduction

The prevalence of vitamin B<sub>12</sub> deficiency in depression is not clear and more research is needed.

### Objectives

The objective of this study is to find the prevalence of deficiency of vitamin B<sub>12</sub> level in the depressed patient. The second objective is to find the prevalence of deficiency of vitamin B<sub>12</sub> according to different socio-demographic variables.

### Methodology

The patients diagnosed as depressive episodes according to the International Classification of Disease – 10 Classification of Mental and Behavioural Disorders were selected from the Psychiatric Out-Patient Department of Manipal Teaching Hospital, Pokhara. The proforma was used to collect the socio-demographic profile of the patient. The serum sample of the 50 patients was sent for vitamin B<sub>12</sub> estimation. Serum concentrations less than 239 pg/ml was considered deficient in this study.

### Result

The overall prevalence of vitamin B<sub>12</sub> deficiency was 22% in the depressed patients. The mean age of the total patients were 39.2 years with the standard deviation of 13.75 years. Vitamin B<sub>12</sub> deficiency was more prevalent in the socio-demographic variables like age above 61 years, Brahmin and Chhetri caste, female gender, unmarried groups, and in the patients living in the urban area as compared to other variables.

### Conclusion

The result shows that vitamin B<sub>12</sub> deficiency is common in the patients with depression. Clinicians should be aware of the risk for vitamin B<sub>12</sub> deficiency in depressive patients. As this study was done in limited geographical area and sample size being small, further larger studies are needed before generalizing these results.

## KEY WORDS

Deficiency, depression, Nepal, vitamin B<sub>12</sub>



## INTRODUCTION

Pernicious anaemia is widely recognized to be associated with subacute combined degeneration of the cord but it may also be accompanied by abnormalities of the mental state.<sup>1</sup> Vitamin B<sub>12</sub> deficiency accompanied by abnormalities of the mental state is widely recognized. The surveys which were conducted among the psychiatric populations have detected a large number of patients with low serum B<sub>12</sub> levels.<sup>1</sup> The deficiency of vitamin B<sub>12</sub> can occur from inadequate intake, impaired absorption, vitamin B<sub>12</sub> degradation, increased requirement, or can be multifactorial.<sup>2-4</sup>

The association of affective disorders secondary to vitamin B<sub>12</sub> deficiency has been documented.<sup>1,5,6-8</sup> Affective disorder, schizophrenia, paranoia, episodes of disorientation and delirium, and progressive dementia have been attributed directly to vitamin B<sub>12</sub> deficiency.<sup>5</sup> The psychiatric manifestations due to vitamin B<sub>12</sub> may antedate by many years the first hematologic or neurologic symptoms,<sup>9-13</sup> and this deficiency is completely reversible by etiological treatment.

It is difficult to know whether the low levels of B<sub>12</sub> is the cause or consequence of abnormal mental states, since B<sub>12</sub> deficiency can result from inadequate nutrition. However, daily requirement of B<sub>12</sub> are small and it would normally take many years before simple dietary lack would cause deficiency in this way. Lowering of vitamin B<sub>12</sub> may result from mixed nutritional deficiency in patients with depression who have neglected their diet.<sup>1</sup>

The role of vitamin B<sub>12</sub> in the facilitation of monoamine transmitter release and the mechanism by which low levels may lead to depressed mood have generated renewed interest in the role of vitamin B<sub>12</sub> in the aetiology.<sup>1</sup> Overall the evidence supporting an association between vitamin B<sub>12</sub> deficiency and depression remains quite sparse. Currently, there is no clear guideline for the screening of patients with psychiatric manifestations for vitamin B<sub>12</sub> level.<sup>1</sup> This study was done to fulfill these lacunae. The objective was to study the prevalence of vitamin B<sub>12</sub> deficiency in the patients suffering from depressive episodes attending Psychiatry OPD of Manipal Teaching Hospital, Pokhara. The second objective was to find the prevalence of deficiency of vitamin B<sub>12</sub> in the different socio-demographic variables of the depressive patients.

## METHODOLOGY

This cross sectional study was conducted in the Psychiatry OPD of Manipal Teaching Hospital. Manipal Teaching Hospital is situated in Pokhara, the capital of the Gandaki Province of Nepal. This hospital provides a teaching base for the Manipal College of Medical Sciences for all types of academic programs and also provides tertiary level of health services to the patients. The ethical clearance of the study was taken from Institutional Review Committee of Manipal College of Medical Sciences, Pokhara before the start of the study. The study was conducted for six months (from January 2019 to June 2019).

The total of 50 patients who had fulfilled the diagnostic criteria of depressive episode (single episode or recurrent episode) according to ICD-10 Classification of Mental and Behaviour Disorder Diagnostic Criteria for Research (ICD-10 DCR)<sup>14</sup> were selected. The ICD-10 Diagnostic Criteria for Research (ICD-10 DCR) was developed by the Division of Mental Health of the World Health Organization. It gives operational criteria for the diagnosis of mental disorders.<sup>14</sup> The Diagnostic Criteria for Research accompanying the ICD-10 are designed for use in research; their content is derived from the Glossary to the chapter on Mental and Behavioural Disorders in the ICD-10. They provide specific criteria for diagnoses contained in the "Clinical Descriptions and Diagnostic Guidelines" that have been produced for general clinical and educational use by psychiatrists and other mental health professionals.<sup>14</sup>

The consent was taken from the patients. The patients who were diagnosed with bipolar affective disorder, comorbid medical/surgical conditions and the patient who had not given the informed consent were excluded from the study. Similarly, the patients who were taking any other drugs/medicine on regular basis and any history of undergone gastrointestinal tract surgery in the past were also excluded from the study.

A self-designed proforma was used to record the socio-demographic data of the patients which includes age, gender, caste, marital status and place of the respondents. The blood samples of all depressive patients were sent for vitamin B<sub>12</sub> estimation. Normal serum vitamin B<sub>12</sub> levels range between 239-931 pg/ml. Serum concentrations less than 239 pg/ml was considered deficient in this study. Data analysis was done in Epi-Info 7 version.

## RESULT

Table 1 showed the vitamin B<sub>12</sub> level of the depressive patients. The overall prevalence of deficiency of vitamin B<sub>12</sub> was 22% in the patients diagnosed as depressive episodes according to ICD-10 DCR.

**Table 1: Vitamin B<sub>12</sub> level of the patients. (n=50)**

Vitamin B <sub>12</sub> level	Number	Percentage (%)
Deficient	11	22
Sufficient	39	78
<b>TOTAL</b>	<b>50</b>	<b>100</b>

Table 2 showed socio-demographic variables and vitamin B<sub>12</sub> level of the patients. The mean age of the patients was 39.2 years with the standard deviation of 13.75 years. The mean vitamin B<sub>12</sub> level was deficient more in the patients aged above 61 years as compared to other age group patients. The Brahmin and Chhetri caste patients had more prevalence of deficiency as compared to other caste. In the gender distribution, the female gender had high prevalence as compared to male gender. The deficiency was also found more in the unmarried patients. The patients living in the urban area were found to have a high prevalence as compared to the patients living in the rural area. The relationship between the different socio-demographic variables and vitamin B<sub>12</sub> level was not statistically significant.



**Table 2: Socio-demographic profile and vitamin B<sub>12</sub> level of the patients. (n=50)**

Socio demographic variables		Deficient Level (n=11) (%)	Sufficient Level (n=39) (%)	Total (n=50) (%)	Odds Ratio	95% Confidence Interval	p value
Age Groups	21-40	7 (23.3)	23 (76.7)	30 (60)	1.21	0.30; 4.85	1.00
	41-60	2 (13.3)	13 (86.7)	15 (30)	0.44	0.08; 2.36	0.55
	>61	2 (40.0)	3 (60.0)	5 (10)	2.66	0.38; 18.41	0.64
Caste	Brahmin/Chhetri	7 (25.9)	20 (74.1)	27 (54)	1.66	0.41; 6.60	0.70
	Mongoloids	3 (21.4)	11 (78.6)	14 (28)	0.95	0.21; 4.27	1.00
	Newar	0 (0.0)	3 (100)	3 (6)	*	*	0.81
	Others	1 (16.7)	5 (83.3)	6 (12)	0.68	0.07; 6.51	1.00
Gender	Female	8 (25.0)	24 (75.0)	32 (64)	1.66	0.38; 7.28	0.74
	Male	3 (16.7)	15 (83.3)	18 (36)	0.60	0.13; 2.62	0.74
Marital Status	Married	6 (16.7)	30 (83.3)	36 (72)	0.36	0.08; 1.46	0.28
	Unmarried	3 (60.0)	2 (40.0)	5 (10)	6.93	0.99; 48.54	0.11
	Separated	1 (25.0)	3 (75.0)	4 (8)	1.20	0.11; 12.82	1.00
	Widow	1 (20.0)	4 (80.0)	5 (10)	0.87	0.08; 8.73	1.00
Residence	Urban	8 (28.6)	20 (71.4)	28 (56)	2.53	0.58; 10.99	0.35
	Rural	3 (13.6)	19 (86.4)	22 (44)	0.39	0.09; 1.71	0.35
TOTAL		11	39	50 (100)			

Mean age  $\pm$  SD = 39.2  $\pm$  13.75 years

\* Odds ratio cannot be calculated

## DISCUSSION

Deficiencies of vitamin B<sub>12</sub> are associated with a variety of neuropsychiatric manifestations. The vitamin B<sub>12</sub> plays a very important role in the mood and other brain functions. The low levels of vitamin B<sub>12</sub> may be highly prevalent and is linked to depression.

The overall prevalence of vitamin B<sub>12</sub> deficiency in this sample of the population was 22%. The prevalence of the deficiency in other study in Nepal was 53.6% by using cut off level of vitamin B<sub>12</sub> of 211 pg/ml.<sup>15</sup> One Indian study found prevalence of 38% and 70% by using cut off level of 211 pg/ml and 350 pg/ml respectively.<sup>16</sup> In other study, the prevalence of deficiency of Bhutanese refugees migrated to USA previously living as refugee in Nepal were 64%, 27% and 32% in three different settings.<sup>17</sup> Epidemiological studies found that up to 31% of depressed patients have low serum vitamin B<sub>12</sub> levels.<sup>18</sup> Two other studies had also found vitamin B<sub>12</sub> deficiency in depressed patients.<sup>19,20</sup> One comparative cross-sectional study showed that the patients who had a vitamin B<sub>12</sub> deficiency had higher Beck Depression Inventory scores than those who did not and vitamin B<sub>12</sub> deficiency can be correlated with depressive complaints.<sup>21</sup> It is found that the higher vitamin B<sub>12</sub> levels are thought to be associated with a more favorable outcome in depression.<sup>22</sup>

The mean age of the patients in the current sample was 39.2 years with standard deviation of 13.75 years. The other study done in Nepal found mean age of 46.81 years with standard deviation of 11.26 years.<sup>15</sup> In our study, the deficient level of vitamin B<sub>12</sub> was seen in the age group of above 61 years, although the relationship is not significant. The other study conducted in Nepal also found that 55% of deficiency was seen in the age above 60 years.<sup>15</sup> The Indian study also found 50% deficiency in the age above 50 years.<sup>16</sup> Previous study noted that up to 40% of older adults have vitamin B<sub>12</sub> deficiencies and most of them are due to cobalamin malabsorption.<sup>23</sup> Other studies found deficiencies ranges from 3% to 40% in elderly peoples, where lower rates and higher rates of prevalence were seen in the community and institutional settings respectively.<sup>23-27</sup> The other different studies have showed a gradual rise in the incidence of vitamin B<sub>12</sub> deficiency with age.<sup>15,28-30</sup>

The positive connection between vitamin B<sub>12</sub> deficiency and depression points to the possibility that vitamin B<sub>12</sub> deficiency is a significant risk factor of geriatric depression.<sup>31,32</sup> The high proportion of deficiency in the elderly populations is mainly explained by the food-B<sub>12</sub> malabsorption seen in this group of population.<sup>33,34</sup>

The prevalence of deficiency of vitamin B<sub>12</sub> was 25% in the female and 16.7% in the male in this study. There is no statistical significance relationship between gender and vitamin B<sub>12</sub> level in the present study. Some other studies also reported more prevalence of deficiency in the female gender.<sup>16,30</sup> whereas, another study in Nepal reported more prevalence of deficiency in the male, but the association was not significant.<sup>15</sup>

In our study, the prevalence of vitamin B<sub>12</sub> deficiency was higher in patients of urban area and in unmarried samples but in the insignificant way. Similar to our study, other study in India also found high prevalence of deficiency in the patients living in the urban areas.<sup>35</sup> The relatively low level of vitamin B<sub>12</sub> in this sample of the populations might be attributed to vegetarianism.<sup>36</sup>

The high proportion in the Brahmin and Chhetri caste in the present study might be explained by their dietary habits. The study conducted in India discussed that vegetarianism in India is multigenerational, lifelong and are based on religious and cultural belief.<sup>35,37</sup> The socio-cultural similarity between India and Nepal might explain this high prevalence. These are just a possible explanation as our study had not taken into account the dietary habits of the patients. Further study is required to confirm this hypothesis in future.

The difference in the prevalence rates in the above studies might be due to difference in the nutritional status of the respondents. The different result of the different studies might be because these studies failed to consider other potential confounding factors such as depressive patients had decreased appetite which might leads to low vitamin B<sub>12</sub> level. The study design, different cut-off values and confounding factors in various studies could lead to the different findings. The difference in the prevalence rates in the different studies is also explained by the low intake of B<sub>12</sub> rich foods of animal origin and possibly due to gastrointestinal infections and host-microbiota interactions.<sup>35</sup>

## CONCLUSION

The vitamin B<sub>12</sub> deficiency was noted in the 22% of the depressed patients. The deficiency was greater in the age above 61 years, Brahmin and Chhetri caste, female gender, unmarried samples and in the urban resident as compared to other variables. The identification of risk factor found in this study would be helpful in the prevention and management of depressive patients. The psychiatrist should keep high degree of index of suspicion in dealing with depressive patients for vitamin B<sub>12</sub> deficiency.

## RECOMMENDATION

Screening for vitamin B<sub>12</sub> level should be the regular part of the holistic management in every depressive patient. The risk factors found in this study like the patient age above 61



years, Brahmin and Chhetri caste, female gender, unmarried samples and in the resident living in the urban areas should be given special attention while searching for vitamin B<sub>12</sub> deficiency. This study highlights the importance aspects of screening vitamin B<sub>12</sub> deficiency in the patients suffering from depressive episodes.

### LIMITATIONS OF THE STUDY

The cross-sectional nature of this study is obvious limitation of this study. Therefore, the cause and effect relationship could not be estimated. Hence, it is not known whether low vitamin B<sub>12</sub> leads to depression or vice versa. But from the mental health perspective, the prevalence of vitamin

deficiency was a matter of high concern. The second limitation was assessing dietary habit of the depressive patients was not done in this study which might provide insight into the dietary factors associated with low serum vitamin B<sub>12</sub> level. Another limitation is that this study was done in limited geographical area and in small sample size. So, further larger scale studies are needed before generalizing these results.

### CONFLICT OF INTEREST

None

### FINANCIAL DISCLOSURE

None

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