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## Signs and Symptoms of Vitamin B12 Deficiency and its Impacts on Student's Academic Performance

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### Abstract

This study carried out to determine the impact of vitamin B12 deficiency signs and symptoms , on the academic achievement of student's in Majmah University. well designed questionnaire by Dr Lisa Watson (Doctor of Naturopathic Medicine) vitamin B12 deficiency signs and symptoms was used and filled out for each student, which included information on demographical factors as: sex, age, work. A convenient sample consisted of (298) students (238, 60) male and female respectively, from (11) faculties were participated in the study. The sample was consisted of (134) students with low averages, while (164) students with high averages. The study revealed that there was a significant correlations between low average (students achievement) and vitamin B12 deficiency signs and symptoms with p value =0.001. No correlations between vitamin B12 deficiency signs and symptoms and gender, (p value=0.832,). Also there was no correlation between age and vitamin B12 deficiency signs and symptoms (p value =0.629), while there was a Significant correlation when we studied age and gender factors combined with vitamin B12 deficiency signs and symptoms with p value = 0.020.

**Keywords:** vitamin B12; cobalamins, Lisa Watson; MU; megaloblastic anemia ;dementia; hallucinations; psychosis; paranoia; depression; violent behavior; personality changes.

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## **1. Introduction**

Deficiencies of nutrients such as vitamin B12, folic acid, iron and vitamin D are frequently associated with impairment of memory, concentration and learning ability [1]. Vitamin B12 is a nutrient which includes a group of cobalt-containing compounds known as cobalamins, which are produced by microorganisms and are only found in foods [2]. Vitamin B12 deficiency produces megaloblastic anemia, altered nucleic acid metabolism and neurologic damage (demyelination) leading to sub acute spinal cord degeneration and memory loss [3]. The clinical importance of vitamin B12 was established over 50 years ago, when ingesting raw animal liver (the primary storage organ for vitamin B12) was found to be an effective treatment for pernicious anemia [4]. Research has shown that the water-soluble vitamin B12 is required for the completion of several biochemical processes [4].

No single symptom, or cluster of symptoms, has been uniquely associated with inadequate levels of vitamin B12. Among older adults, the most frequently reported symptoms of vitamin B12 deficiency are hematologic or neurologic in nature, but gastrointestinal and possibly vascular symptoms are also common. The typically nonspecific manifestations of a vitamin B12 deficiency underscore the importance of encouraging all older adults to consume the synthetic form of the vitamin each day [4]. Recent concerns have also been raised about potential adverse effects on infant growth and development in exclusively breastfed babies of mothers who adhere to a strict vegan diet. Common neurologic complaints include paresthesias (with or without objective signs of neuropathy), weakness, motor disturbances (including gait abnormalities), vision loss, and a wide range of cognitive and behavioural changes (e.g., dementia, hallucinations, psychosis, paranoia, depression, violent behaviour, and personality changes) [5]. Tingling of the hands and feet is perhaps the most common neurologic complaint [4].

Prevention, early detection, and treatment of vitamin B12 deficiency are important public health issues, because they are essential to prevent development of irreversible neurologic damage which can impact quality of life. Although most health care providers already recognize the occasional person who presents with obvious signs and symptoms, they are far less likely to screen and diagnose the majority of patients who have a subclinical or mildly symptomatic vitamin B12 deficiency [4].

## **2. Research Methodology**

### ***2.1 Study design***

This is comparative community based study, designed to identify the relationship between vitamin B12 deficiency and student's achievement. Well questionnaire designed for vitamin B12 deficiency assessment done by Dr: Lisa Watson applied. (Permission had been achieved) .

A convenient sample was chosen from the students with high and low averages, questionnaire was filled up for both groups to see if there is any relation between academic achievement and symptoms of B12 deficiency indicated by the questionnaire in both groups (low and high averages).students with special cases (sickness during exams, absents, diseases that may increase the probability of B12 deficiency, etc) all these cases which

may affect the results were excluded.

**2.2 Study area:**

Majmah University (MU), which sited in Majmah town ,185 km to the north of Ryadah city the capital of Saudia Arabia. MU was established in 2010.

**2.3 Study population:**

Two groups of Students from different faculties (one with low and the other with high average) in academic performance included in this study. Average less than 3.0 was considered as low while more than 3.0 was considered as high average.

**2.4 Sample size**

According to comparative studies conducted in 2003 by Malouf R: Areosa Sastre and another study about the impact of B12 deficiency on school performance of elementary school children in Kuwait in 2008. Convening sample size of 200 students for each group is sufficient to give clear view for such studies.

**2.5 Data collection**

Data collected from academic records for the last final exam, and questionnaires were filled by students.

**2.6 Data analysis**

Data collected from academic records and questionnaire analyzed by special computer program (SPSS programme –v .17.)

**3. Results**

Table 2 . Gender and B12 levels correlation

		B12 level assessment		Total			
		positive	negative				
gender	male	72	166	238			
	female	19	41	60			
Total		91	207	298			
		Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	
Pearson Chi-Square		.045a	1	.832			

Table 1. Marital status and B12 deficiency correlation

		N	Percentage			
marital	single	267	89.6%			
	married	29	9.7%			
	divorced	2	0.7%			
lisa	positive	91	30.5%			
	negative	207	69.5%			
Valid		298	100.0%			
Missing		0				
Total		298				
Model		-2 Log Likelihood	Chi-Square	df	Sig.	
Intercept Only		16.069				
Final		15.606	.463	1	.496	

Table 3. Age and B12 levels correlation

		B12 level assessment		Total
		positive	negative	
age	18-20	32	64	96
	21-30	59	142	201
	31-40	0	1	1
Total		91	207	298
		Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square		.926a	2	.629

Table 4 Average and B12 levels correlation

		B12 level assessment		Total
		positive	negative	
average	low	67	44	111
	high	22	142	164
Total		89	186	275
		Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square		66.648a	1	0.001

Table 5 The effect of booth gender and marital status, on B12 level

B12 level			Marital status			Total
			single	married	divorced	
positive	gender	male	66	4	2	72
		female	14	5	0	19
	Total		80	9	2	91
negative	gender	male	161	5		166
		female	26	15		41
	Total		187	20		207
Total	gender	male	227	9	2	238
		female	40	20	0	60
	Total		267	29	2	298
B12 level			Value	Df	Asymp. Sig. (2-sided)	
Pearson Chi-Square			7.632b	2	.022	

#### 4. Discussion

Although vitamin B12 (cobalamin) deficiency is considered to be very rare in children, several reports have described dietary vitamin B12 deficiency in a young.

This study involved some social factors to examine their effects on B12 deficiency, marital status had no any correlation as single factors on B12 deficiency with p value = 0.496 (Table 1) this result was comparable to results from study conducted in 2006 in the Institute of Clinical Medicine, Family Medicine, University of Turku, Turku, Finland, which revealed that marital status (unmarried, divorced or widowed) had no any relation with b12 deficiency ,with P value =0.54. (Table 2) [6].

Also the study showed that there was no any relation between age and B12 deficiency with P value = 0.629 ,this result was contradicted with the University of Turku, Turku, Finland study which showed significant correlation between age and B12 with P value =0.001.

Our results were also contradicted to results revealed from study published in 2010,done by Johnson MA and others in the University of Georgia, Department of Foods and Nutrition , ,which showed significant correlation between age and B12 deficiency with P value =0.01 [7].

Students of both genders were 18 to 40 years old, 91 students from the sample size (representing 9.3%) had symptoms of B12 deficiency. (Table 3)

Although, B12 deficiency is more common in the elderly (because B12 absorption decreases greatly in the presence of atrophic gastritis, which is common in the elderly) ,but many studies revealed that B12 deficiency

can occur among small ages especially in communities with poor economic and social status, or even because of inadequate dietary intake of vitamin B12 such as results from study conducted in Department of Health Science, Kochi Women's University, Japan-2000(8).also study in Faculty of Health Sciences, Ben-Gurion University, Israel 2008 ,which revealed a high prevalence 25.4%) of symptomatic vitamin B12 deficiency among elementary school children between the ages of nine and eleven years [9].

Also our result regarding prevalence of low B12 level among small ages was identical to result from study conducted in Jordan University of science & Technology, Irbid, Jordan, 2011, where the age averages among sample size were 18 to 30 years .3.6% showed B12 levels lower than the normal range (<200 pg/ml) [10].

The study revealed significant correlation between low B12 level and students achievement with P value =0.001. (Table 4). This result was comparable to study conducted in Faculty of Health Sciences, Ben- Georgia , Israel 2008(9). Also its comparable with result of study done by Tor A Strand ,et.al, in the urban community of Dakshinpuri in New Delhi ,published in American Journal of Clinical Nutrition 2013, showed B12 status was associated with cognitive performance P = 0.021. And thus cognitive performance affects the student's academic achievement when other circumstantial factors are excluded [11].

Our result was contradicted with result from study done by: Vaughan Bell , et.al (2005) studied Cognitive performance in vitamin B12 deficient , showed that Supplementation with long term vitamin B12 deficiency, did not improve cognitive performance [12].

Although results showed no relation between neither gender nor marital status ,with B12 level (table 1 and table 2 respectively ) as individual variables ,but the correlation was very significant when they studied combined with B12 level P value = 0.022 (Table 5). This result has statistical value .but needs more details to determine its mechanism.

## **5. Conclusion and recommendation**

The information accumulated from the current study highlighted the need for more studies in this field. B12 status showed a statistically significant association with cognitive performance. Given the high prevalence of deficiencies in this nutrient, supplementation trials are required to measure any beneficial effect on , not only cognition as general but specifically on the students performance in all education levels .

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**Appendix:**

**1- B12-Deficiency-Quiz designed by Dr: Lisa Watsone questionnaire**

	Yes	No
1. Do you suffer from fatigue or weakness?	<input type="checkbox"/>	<input type="checkbox"/>
2. Do you have a swollen or sore tongue?	<input type="checkbox"/>	<input type="checkbox"/>
3. Do you experience tingling or numbness, similar to "pins and needles" sensations in your hands or feet?	<input type="checkbox"/>	<input type="checkbox"/>
4. Do you have difficulty concentrating or a poor memory?	<input type="checkbox"/>	<input type="checkbox"/>
5. Do you suffer from low mood or depression?	<input type="checkbox"/>	<input type="checkbox"/>
6. Is your skin unusually pale?	<input type="checkbox"/>	<input type="checkbox"/>
7. Is the skin inside your mouth pale?	<input type="checkbox"/>	<input type="checkbox"/>
8. Do you experience dizziness or lightheadedness?	<input type="checkbox"/>	<input type="checkbox"/>
9. Do you have brittle nails?	<input type="checkbox"/>	<input type="checkbox"/>
10. Do you have indigestion, gas, bloating, diarrhea or constipation?	<input type="checkbox"/>	<input type="checkbox"/>
11. Have you experienced unexplained weight loss?	<input type="checkbox"/>	<input type="checkbox"/>
12. Do you have cold hands or feet?	<input type="checkbox"/>	<input type="checkbox"/>
13. Do you experience difficulty sleeping or have unrestorative sleep (wake from sleep feeling unrested)?	<input type="checkbox"/>	<input type="checkbox"/>
14. Do you suffer from a shortness of breath with minimal physical exertion?	<input type="checkbox"/>	<input type="checkbox"/>
15. Do you experience difficulty walking?	<input type="checkbox"/>	<input type="checkbox"/>
16. Do you regularly drink alcohol?	<input type="checkbox"/>	<input type="checkbox"/>
17. Are you a strict vegetarian or vegan?	<input type="checkbox"/>	<input type="checkbox"/>
18. Do you experience frequent or daily headaches?	<input type="checkbox"/>	<input type="checkbox"/>
19. Do you suffer from celiac disease, Crohn's disease, inflammatory bowel disease, or have you ever had gastric bypass or other stomach or intestinal surgery?	<input type="checkbox"/>	<input type="checkbox"/>