

## Association of psychological disorders and Vitamin B<sub>12</sub> deficiency in Sudan

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### Abstract:

*Vitamin B<sub>12</sub> is a water-soluble essential vitamin; it is a member of vitamin B complex. Previous research have shown nutritional deficiencies that correlate with some mental disorders. This study aimed to study the association between low level B<sub>12</sub> and psychological disorders in Sudan. The study included 138 Sudanese subjects: 79 were Sudanese patients who professionally diagnosed as psychotics; and 59 healthy subjects as control group. Psychotic subjects were subdivided to two groups according to the diagnosis, dementia and depression. Vitamin B<sub>12</sub> level was measured using the enzyme linked sorbent immunoassay (ELISA) according to manufacturer instruction (Monobind Inc, California, USA). Low level of vitamin B<sub>12</sub> was found with high frequency in dementia subjects. Our study revealed no significant difference in the frequency of low level of vitamin B<sub>12</sub> between patients and controls; this finding is in agreement with previous reports. Nevertheless, we cannot exclude the possibility that our negative results are a consequence of the cross-sectional design.*

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## **Introduction**

The nomenclature of neuropsychiatric disorders has a contentious history, with periodic attempts to bring cohesion to this diverse and disparate field. The WHO and national surveys report that there is no single consensus on the definition of mental disorder/illness, and that the phrasing used depends on the social, cultural, economic and legal context in different societies (1). The WHO reports that there is intense debate about which conditions should be included under the concept of mental disorder; a broad definition can cover mental illness, mental retardation, personality disorder and substance dependence, but inclusion varies by country and is reported to be a complex and debated issue. (1). Also the World Health Report focuses on a number of common disorders. These include depression, substance use disorders, schizophrenia, epilepsy, Alzheimer's disease, mental retardation and disorders of childhood and adolescence. One in every four people, or 25% of individuals, develops one or more mental or behavioral disorders at some stage in life, both in developed and developing countries. These disorders can now be diagnosed as reliably and accurately as most of the common physical disorders. (2)

Individual with psychotic disorders are distinguished from each other based on the duration, dysfunction, type of delusions and hallucinations, presence of depression and mania, and associated substance use or medical condition (3). Previous research have shown nutritional deficiencies that correlate with some mental disorders (4,5).

Vitamin B<sub>12</sub> is a water-soluble essential vitamin; it is a member of vitamin B complex (6). Vitamin B<sub>12</sub> is also called cobalamin because it contains the metal cobalt. It is synthesized by bacteria and is found mainly in meat, egg, and

dairy products but not found in cereal or vegetables or fruits. B<sub>12</sub> is a co enzyme for two biochemical reactions in the body: first, as methyl B<sub>12</sub>, it is a cofactor for methionine synthase, the enzyme responsible for methylation of homocysteine to methionine tetrahydrofolate (ethyl THF) as methyl donor, and secondly as deoxyadenosyl B<sub>12</sub>, it assists in conversion of methylmalonyl coenzyme A (CoA) to succinyl CoA.(7) so this reveals the importance of vitamin B<sub>12</sub>, folate and homocysteine in carbon transfer metabolism (methylation) required for the production of serotonin, other monoamine neurotransmitters and catecholamine.(8) B<sub>12</sub> one of material involved in formation of healthy DNA of all body cells ,so when it lacks ,there would be a red blood cell problems and neuropathy of terminal sensors and even it can contribute in presence of psychiatric episodes .(6) Causes of vitamin B<sub>12</sub> deficiency can be due to: nutritional deficiency, malabsorption syndromes, increased requirements as in HIV/AIDS patients and in those with rapid red blood cell breakdown, certain medication and come genetic disorders. (9). Reports of psychiatric disorders due to vitamin B<sub>12</sub> deficiency mostly focused on middle aged and elderly patients and pediatric cases are reported to be rare .(8) This study aimed to study the association between low level B<sub>12</sub> and psychological disorders in Sudan.

## **Material and Methods**

One hundred and thirty eight (138) subjects were enrolled in this cross-sectional descriptive study: 79 subjects with established diagnosis of psychosis (diagnosis conducted via professional psychiatrics), who admitted to Eltigani Almahy psychiatric and neurological hospital, Sudan; and 59 healthy subjects as control. None of the patients were receiving vitamin B<sub>12</sub> supplementary therapy at the time of the study. Informed consent was obtained from each co patient and from hospital administration before enrolled in this study. Five ml of venous

blood was collected from each subject at early morning, blood samples allowed to clot, and then centrifuged to collect serum, which kept frozen at -20°C for subsequent vitamin B<sub>12</sub> measurement. Laboratory analysis was performed at the Department of Haematology, faculty of medical laboratory sciences, Alneelain University, Sudan.

Vitamin B<sub>12</sub> level was measured using the enzyme linked sorbent immunoassay (ELISA) according to manufacturer instruction (Monobind Inc, California, USA). The device used was (MAPLAB 2006, Italy). Statistical analysis was performed by means of statistical package or social science (SPSS) software.

## Results

This study involved 138 Sudanese subjects: 79 (57.2%) were Sudanese patients who professionally diagnosed as psychotics, and 59(42.8%) healthy, mentally normal, individual as control group. 88 (63.8%) of them were males and 50 (36.2%) were females. They all enrolled in the assessment of vitamin B<sub>12</sub>. The psychotic patient were subdivides into two groups according to the diagnosis, 8 (10.1%) dementia group, 5(62.5%) of them were males and 4(37.5%) were females, and 71 (89.9%) depression group, 51 (64.6%) were males and 28 (35.4%) were females.

9 (11.4%) patients found with low B<sub>12</sub> level, 5 (55.6%) of them were males and (4) 44.4% were female. Most of them were diagnosed with dementia 6 (66.7%) and 3(33.3%) were diagnosed with depression.

Mean B<sub>12</sub> patients was  $435.44 \pm 171.49$  pg/l, and for control subjects the mean  $460.53 \pm 97.79$  pg/l, the frequency of low level of vitamin B<sub>12</sub> was significant higher in psychotic patients when compared with controls (*p value* .012), most of patients with low vitamin B<sub>12</sub> level were from dementia group (6(75%) subjects of 8 subjects with established diagnosis with dementia).

## Discussion

This study was conducted to determine the level of vitamin B<sub>12</sub> in Sudanese patients with established diagnosis, having psychosis, and it included a79 patients, compared with 59 normal subjects almost matched in sex and age. Psychotic subjects were subdivided to two groups according to the diagnosis, dementia and depression. Low level of vitamin B<sub>12</sub> was found with high frequency in dementia subjects, 75. Our finding, concerning dementia group, is in agreement with previous studies (12,13). Vitamin B<sub>12</sub> deficiency may increase the risk of dementia via elevated levels of homocysteine (HCY). B<sub>12</sub> is necessary for the conversion of HCY to methionine and the accumulation of HCY may lead to neurotoxic effects(14). Our study revealed no significant difference in the frequency of low level of vitamin B<sub>12</sub> between patients and controls, this finding is in agreement with previous reports (15-17).

Nevertheless, we cannot exclude the possibility that our negative results are a consequence of the cross-sectional design.

## Conclusion

In conclusion, our study revealed that low level of vitamin B<sub>12</sub> was found with high frequency in dementia patients than normal subjects.

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