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Original Article

RELATIONSHIP BETWEEN VITAMIN B12 LEVELS AND ADVERSE LIPID PROFILES IN APPARENTLY HEALTHY INDIVIDUALS VISITING WELLNESS ASSESSMENT CENTER: A PROSPECTIVE STUDY

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ABSTRACT

Objective: For metabolic disorders, an abnormal lipid profile stands alone as a risk factor. Since most research has been done on unhealthy populations, a relationship in vitamin B12 deficiency and lipid profile is unclear.

Methods: We conducted a cross-sectional research with 201 apparently healthy vitamin B12 deficient people, aged 25 to 60, in order to evaluate a relationship in serum vitamin B12 levels and lipid profiles.

Results: Sociodemographic, anthropometric, and biochemical data has been collected. Serum vitamin B12 deficiency has defined as serum B12 level of<159 pmol/l.25% of the subjects had raised cholesterol, 70% had raised LDL, 35% had raised triglycerides, and 71% had low HDL. We observed that only MCV was negatively associated with vitamin B12 levels (P<0.0001). A remaining other variables, including lipid profile were not associated with vitamin B12 levels. We also found that presence of comorbidities was not significantly associated with vitamin B12 levels (P=NS).

Conclusion: Therefore, in apparently healthy individuals, low serum vitamin B12 levels are not linked with abnormal lipid profiles.

Keywords: Vitamin B12, Lipid profile, Diabetes, Prediabetes

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INTRODUCTION

Research on micronutrient deficits is crucial for understanding the development of many metabolic chronic illnesses. In addition to its numerous metabolic functions, which include lipid metabolism and endothelial dysfunction, vitamin B12 is a crucial micronutrient that is involved in DNA methylation [1]. Research indicates that low vitamin B12 levels are linked to macrovascular conditions such coronary artery disease (CAD) and myocardial infarction, as well as cerebral ischemia [2-4].

Indians possess additionally high homocysteine levels have been mostly linked to low B12 levels.[5] It has believed that a significant B12 deficiency prevalence in this group is due to vegetarianism.

The frequency of vitamin (Vit.) B12 deficiency varies from 2.5% to 40% worldwide [6, 7]. In South India, the prevalence has been reported to be 16% [8]. While another study from Pune reported prevalence to be 67% [9].

There is a negative correlation between vitamin B12 consumption and metabolic diseases, such as insulin resistance [11, 12], type 2 diabetes mellitus (T2DM) [13], body mass index (BMI), [10] and poor lipid profile [14]. According to research on animals, low B12 levels in mothers may be a direct cause of unfavorable lipid profiles in their offspring [15].

Indians have higher risk of abnormal lipid profile due to lifestyle modifications. We are aware of no prior research from this area that has evaluated vitamin B12 level in connection to lipid profiles in individuals who appear to be in good health as of yet.

MATERIALS AND METHODS

The individuals aged 25-60 y and attending Wellness center has been included in the research. The subjects were included if they were vitamin B12 deficient. Pregnant women, patients previously diagnosed with gastrointestinal disorders, anemia, malabsorption diseases, on lipid-lowering agents, with hypothyroidism, patients taking OTC pills, patients taking beta–blockers/prednisone/Amiodarone/cyclosporine/anabolic steroids/diuretics and those not willing to participate were excluded.

The demographic variables like age, gender and clinical parameters like BMI, waist circumference, hip circumference, Diet pattern–veg/nonveg, associated co-morbidities were recorded.

Serum glucose, HbA1C, cholesterol, HDL cholesterol, triglycerides, has been evaluated by standard methodologies followed in the respective labs in the study population. LDL cholesterol has been calculated utilizing the Friedewald formula.

Data analysis

The data were exported into SPSS v21.0 (IBM, USA) after being entered into a Microsoft® Excel workbook 2019. Frequency and percentages were used to represent categorical data. Quantitative data has been expressed as mean standard deviation (SD), and compared utilizing one-way ANOVA between multiple groups. Correlation of vitamin B12 levels with other variables was determined utilizing Spearman correlation coefficient. P value<0.05 has been considered statistically significant.

RESULTS

Demographic characteristics

Table 1 presents demographic characteristics of the study participants. A total of 201 participants has been included. The mean patient's age was 40.89±8.52 y. Seventy-four percent of the subjects were males. Mean waist circumference, hip circumference, and BMI were 89.27±9.04 cm, 98.08±7.67 cm, and 26.33±3.24 kg/m^2 respectively. 9.9% of the subjects (n=20) were obese while 55.7% of the subjects (n=112) were overweight. 20% of the subjects were pre-diabetic, 10% were diabetic, 7% were hypertensive while one subject had systemic lupus erythematosus (SLE).

Lipid profile

Our study reported that 25% of the subjects had raised cholesterol, 70% had raised LDL, 35% had raised triglycerides, and 71% had low HDL (table 2).

Table 1: Demographic characteristics of the study population (n=201)

Variables	Data value
Age (Years)	40.89±8.52
Sex	
Male: Female	149:52
Vegetarian	65
Waist circumference (cm)	89.27±9.04
Hip circumference (cm)	98.08±7.67
BMI (Kg/m²)	26.33±3.24
Co-morbidities	
Pre-diabetes	40
Diabetes	20
Hypertension	14
SLE	1

Data were presented as frequency or mean±SD

Table 2: Abnormal lipid profile

Lipid parameters	Frequency (%)
Raised cholesterol (>200 mg/dl)	50 (25%)
Raised LDL (>100 mg/dl)	140 (70%)
Raised triglycerides (>150 mg/dl)	71 (35%)
Low HDL (<40 mg/dl)	143 (71%)

Data were presented as frequency (%), Relation between vitamin B12 and lipid profile and other parameters, Our study observed that only MCV was negatively linked with vitamin B12 levels (P<0.0001). A remaining other variables including lipid profile (fig. 1) were not associated with vitamin B12 levels (table 3).

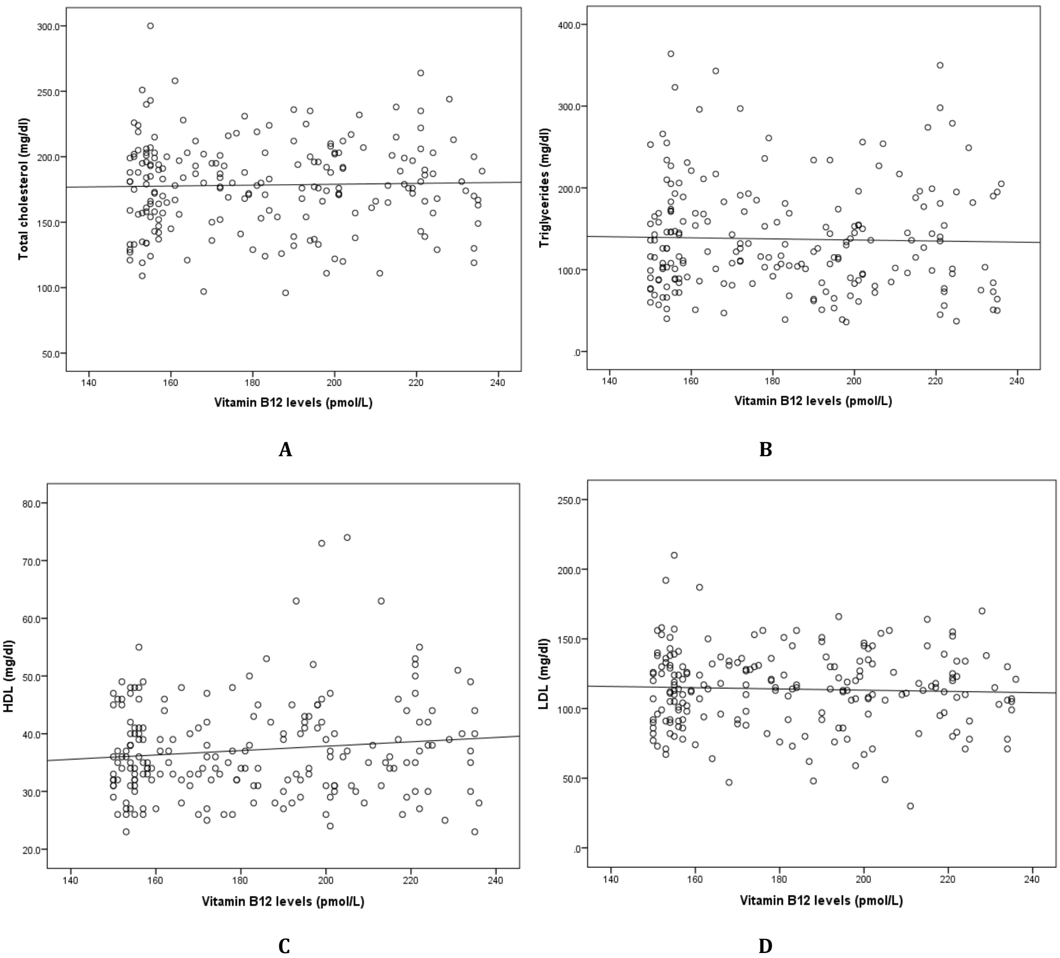

Fig. 1: Scatter plot showing correlation of vitamin B12 levels with A) cholesterol, B) triglycerides, C) HDL, and D) LDL levels, association of co-morbidities with vitamin B12 levels We found that presence of comorbidities has not significantly linked with vitamin B12 levels (P=NS) (table 4)

Table 3: Relation between vitamin B12 and lipid profile and other parameters

Parameters	Correlation coefficient (r)	P value
Cholesterol (mg/dl)	0.035	0.625
LDL (mg/dl)	-0.017	0.807
Triglycerides (mg/dl)	-0.022	0.756
HDL (mg/dl)	0.086	0.226
HbA1c (%)	0.109	0.123
Fasting blood glucose (mg/dl)	0.114	0.106
Hb (g/dl)	-0.137	0.053
MCV (fl)	-0.285	<0.0001
BMI (kg/m^2)	0.092	0.194
Waist circumference (cm)	-0.028	0.690
Hip circumference (cm)	0.004	0.959
Age (years)	0.111	0.115

Table 4: Comparison of vitamin B12 levels with co-morbidities

Comorbidities	Vitamin B12 levels	P value
No comorbidity	181.11±26.61	NS
Prediabetes	185.83±27.78	
Diabetes	187.94±24.01	
Hypertension	180.45±29.05	
SLE	155	

DISCUSSION

The lipid profile (TC, LDL-C, and TG levels) and serum (Sr.) vitamin B12 levels has not observed to be significantly associated in this investigation. To the best of our knowledge, no prior research has examined the relationship in a lipid profile and a vitamin B12 deficiency in a population that appears to be healthy.

Our results don't line up with those of other research. Adaikalakoteswari *et al.* discovered that the TC/HDL ratio and levels of TGs were independently and inversely associated with serum vitamin B12 levels in a comparative investigation of T2DM patients residing in the UK and India [15]. Similar results were obtained from a second cross-sectional study including 300 CAD patients. Positive correlations were seen between a serum vitamin B12 level and HDL-C levels, whereas negative correlations were detected with TG and VLDL levels, but not with TC or LDL-C [16].

Few research has looked into a relationship in serum Vit. B12 levels and lipid profile in people who appear to be in good health. Vit. B12 levels have not been linked to dyslipidemia or any atherosclerotic events in a prospective cohort of 421 healthy Korean subjects followed up for 12 y. That being said, compared to other previously analyzed population samples, Korean persons had a mean Sr. vitamin B12 level that was greater [17]. Our findings are in concordance with the above-mentioned study.

Vitamin B12 deficiency may be associated to abnormal lipid profiles by a mechanism that involves higher plasma tHcy concentrations and alters phospholipid metabolism, which in turn promotes high VLDL secretion [18].

The following are the strengths of the current study. Firstly, it concerns a population of people who appear to be in good health, a group that hasn't been studied before. Second, our study's comprehensive data collection on sociodemographic, nutritional, medical history, and physical activity might be useful in identifying additional significant mediating or confounding variables in the relationship in lipid profiles and B12 levels.

Our study does, however, have a number of shortcomings. First, no causal inferences can be drawn because research used a cross-sectional design. Second, to determine the B12 status, the only parameter utilised was the serum vitamin B12 level. The markers of a tissue-level B12 deficiency, methylmalonic acid and tHcy levels, were left out. Third, we only included vitamin B12 deficient subjects.

CONCLUSION

In conclusion, although the population's adequate B12 intake is encouraging, the danger may not be eliminated given our result that there is no association in B12 and a poor lipid profile. Larger sample size research is necessary in the future. The primary objective of these studies should be to comprehend the processes behind the association in serum vitamin B12 levels and adverse lipid profiles.

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AUTHORS CONTRIBUTIONS

All authors have contributed equally

CONFLICT OF INTERESTS

Declared none

REFERENCES

1. McNulty H, Pentieva K, Hoey L, Ward M. Homocysteine, B-vitamins and CVD. Proc Nutr Soc. 2008;67(2):232-7. doi: 10.1017/S0029665108007076, PMID 18412997.
2. Ng KC, Yong QW, Chan SP, Cheng A. Homocysteine, folate and vitamin B12 as risk factors for acute myocardial infarction in a Southeast Asian population. Ann Acad Med Singap. 2002;31(5):636-40. PMID 12395652.
3. Weikert C, Dierkes J, Hoffmann K, Berger K, Drogan D, Klipstein Grobusch K. B vitamin plasma levels and the risk of ischemic stroke and transient ischemic attack in a German cohort. Stroke. 2007;38(11):2912-8. doi: 10.1161/STROKEAHA.107.486068, PMID 17885260.
4. Mahalle N, Kulkarni MV, Garg MK, Naik SS. Vitamin B12 deficiency and hyperhomocysteinemia as correlates of cardiovascular risk factors in Indian subjects with coronary artery disease. J Cardiol. 2013;61(4):289-94. doi: 10.1016/j.jjcc.2012.11.009, PMID 23473764.
5. Yajnik CS, Deshpande SS, Lubree HG, Naik SS, Bhat DS, Uradey BS. Vitamin B12 deficiency and hyperhomocysteinemia in rural and urban Indians. J Assoc Physicians India. 2006;54(775):775-82. PMID 17214273.
6. Palacios G, Sola R, Barrios L, Pietrzik K, Castillo MJ, Gonzalez Gross M. Algorithm for the early diagnosis of vitamin B12 deficiency in elderly people. Nutr Hosp. 2013;28(5):1447-52. doi: 10.3305/nh.2013.28.5.6821, PMID 24160198.
7. Green R, Allen LH, Bjørke Monsen AL, Brito A, Gueant JL, Miller JW. Vitamin B12 deficiency. Nat Rev Dis Primers. 2017;3(1):1-20. doi: 10.1038/nrdp.2017.40, PMID 28660890.
8. Shobha V, Tarey SD, Singh RG, Shetty P, Unni US, Srinivasan K. Vitamin B_{12} deficiency & levels of metabolites in an apparently normal urban south Indian elderly population. Indian J Med Res. 2011;134(4):432-9. PMID 22089603.

9. Sivaprasad M, Shalini T, Balakrishna N, Sudarshan M, Lopamudra P, Suryanarayana P. Status of vitamin B12 and folate among the urban adult population in South India. Ann Nutr Metab. 2016;68(2):94-102. doi: 10.1159/000442677, PMID 26667891.
10. Sun Y, Sun M, Liu B, Du Y, Rong S, Xu G. Inverse association between serum vitamin B12 concentration and obesity among adults in the United States. Front Endocrinol. 2019;10:414. doi: 10.3389/fendo.2019.00414, PMID 31316466.
11. Knight BA, Shields BM, Brook A, Hill A, Bhat DS, Hattersley AT. Lower circulating B12 is associated with higher obesity and insulin resistance during pregnancy in a non-diabetic white British population. Plos One. 2015;10(8):e0135268. doi: 10.1371/journal.pone.0135268, PMID 26288227.
12. Krishnaveni GV, Hill JC, Veena SR, Bhat DS, Wills AK, Karat CL. Low plasma vitamin B12 in pregnancy is associated with gestational 'diabesity' and later diabetes. Diabetologia. 2009;52(11):2350-8. doi: 10.1007/s00125-009-1499-0, PMID 19707742.
13. Saraswathy KN, Joshi S, Yadav S, Garg PR. Metabolic distress in lipid and one carbon metabolic pathway through low vitamin B-12: a population based study from North India. Lipids Health Dis. 2018;17(1):96. doi: 10.1186/s12944-018-0748-y, PMID 29695256.
14. Boachie J, Adaikalakoteswari A, Samavat J, Saravanan P. Low vitamin B12 and lipid metabolism: evidence from pre-clinical and clinical studies. Nutrients. 2020;12(7):1925. doi: 10.3390/nu12071925, PMID 32610503.
15. Adaikalakoteswari A, Jayashri R, Sukumar N, Venkataraman H, Pradeepa R, Gokulakrishnan K. Vitamin B12 deficiency is associated with adverse lipid profile in Europeans and Indians with type 2 diabetes. Cardiovasc Diabetol. 2014;13(1):129. doi: 10.1186/s12933-014-0129-4, PMID 25283155.
16. Mahalle N, Kulkarni MV, Garg MK, Naik SS. Vitamin B12 deficiency and hyperhomocysteinemia as correlates of cardiovascular risk factors in Indian subjects with coronary artery disease. J Cardiol. 2013;61(4):289-94. doi: 10.1016/j.jjcc.2012.11.009, PMID 23473764.
17. Kim H, Eun Y, Song S. Serum folate and vitamin B12 levels are not associated with the incidence risk of atherosclerotic events over 12 y the korean genome and epidemiology study. Nutr Res. 2019;63:34-41. doi: 10.1016/j.nutres.2018.12.009.
18. Obeid R, Herrmann W. Homocysteine and lipids: s-adenosyl methionine as a key intermediate. FEBS Lett. 2009;583(8):1215-25. doi: 10.1016/j.febslet.2009.03.038, PMID 19324042.