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TO STUDY THE VITAMIN B12 STATUS IN MORBIDLY OBESE PATIENTS

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ABSTRACT

Vitamin B12 deficiency is often missed out for many reasons in routine investigation. Morbid obesity is associated with some nutritional deficiency. Few data on the concentration of vitamin deficiencies in morbid obese patients are available. To estimate the prevalence of vitamin B12 deficiency in morbidly obese patients. A retrospective randomized study was design to assess the prevalence vitamin B12 level in morbidly obese population. 65 morbidly obese patients (BMI >35) was enrolled for the study. Height, weight, BMI, Vitamin B12 level was assessed as per the protocol. Dietary information was gathered. Average vitamin B12 was 198.9pg/ml, which is below cut off levels. The mean serum Vitamin B12 levels were 169.7 ± 31.7 & 227.2 ± 69.1 and BMI were 46.3 ± 7.9 & 45.8 ± 7.1 in vegetarian and non vegetarian subjects respectively. Total 42 (65%) out of 65 subjects turned out to be B12 deficient, where as 14 (22%) were male and 28 (43%) were female. In the present study 32 (49%) subjects were documented as vegetarian; 33 (51%) were documented as non vegetarian. Out of which 27 (42%) were male & 38 (58%) were female. Vegetarian dietary habits was found to be a substantial risk factor for B12 deficiency ($p < 0.05$). Vitamin B12 deficiency more prevalent among obese population. Vitamin B12 is not a part of our routine health checks. There should be more awareness so that further impairment of organs can be avoided.

Key words: Vitamin B12, Morbid Obesity, vegetarian, non vegetarian, BMI.

INTRODUCTION

Morbid obesity, which is defined as a body mass index (BMI; in kg/m²) >35 with a weight related co morbidity, impairs quality of life, increases the risk of coronary heart disease, and shortens life expectancy. Observational studies in the general population have shown associations between vitamin status and morbidity, beyond the traditional vitamin deficiency disorders.

The low vitamin concentrations observed in the morbidly obese patients could have been caused by several mechanisms. Dietary and lifestyle habits may be the most important contributors. A low intake of fruit and vegetables has been described in severe obesity. Although morbidly obese persons have greater intakes than do non obese persons, morbidly obese persons may have nutritional deficiency.

Vitamin B12 deficiency can have neurologic and hematologic sequelae and can lead to hyperhomocysteinemia. Symptoms of B12 deficiency include fatigue, weakness, anorexia, paresthesias, numbness, and dizziness. Initial presentation is often vague.

Obese individuals have elevated amounts of total body water, and the extracellular compartment is relatively more expanded than the intracellular compartment.

Obesity is associated with chronic low-grade inflammation.

B12 deficiency is often missed for two reasons. First, it's not routinely tested by most physicians. Second, the low end of the laboratory reference range is too low. This is why most studies underestimate true levels of deficiency. Many B12 deficient people have so-called "normal" levels of B12. Few data about other possible vitamin deficiencies in morbidly obese patients are available.

Even though the human body can store vitamin B12 to last for up to five years, its deficiency is not very uncommon.

As a result of these clinical and laboratory findings, we decided to conduct a retrospective randomized study to investigate the serum vitamin B12 level in two groups of non vegetarian and vegetarian subjects suffering from morbid obesity.

METHOD AND MATERIAL

The study was carried out in the tertiary care hospital of the city. On obtaining their consents, morbid obese patient admitted for bariatric surgery had been enrolled for this study. 65 patients were selected by random sampling method. Morbid obese patients whose BMI was >35 kg/m² were included in the study

irrespective of their medical history of DM, HTN and Dyslipidaemia.

We collected all nominal information on a simple data-collection form as age, gender, height, weight, BMI and vitamin B12 level. Height and weight were measured with the subject in light clothes without shoes, and BMI (Kg/m^2) was calculated. We also attempted to determine whether patients were vegetarian or nonvegetarian. The term vegetarian includes vegans, lactovegetarians, and lacto-ovovegetarians. We defined nonvegetarians as anyone who even occasionally consumed meat or fish. Serum vitamin B12 levels (normal range 211- 946 pg/ml) were estimated by centaur fully automated chemiluminescence method. All values were expressed as mean \pm S.D, percentage. Statistical analyses were done in SPSS.

RESULTS

TABLE I: CLINICAL STATUS OF MORBIDLY OBESE PATIENTS

In the present study average age of the subjects was 38 yrs., and BMI was $46\text{kg}/\text{m}^2$. Mean vitamin B12 was 198.9pg/ml, which is below cut off levels.

Table I: Clinical status of morbidly obese patients

Clinical status	MEAN \pm SD
Age	38.2 \pm 12.2
Height	158.5 \pm 9
Weight	115.5 \pm 26.6
BMI	46 \pm 7.48
Vitamin B12	198.9 \pm 60.9

TABLE II: CLINICAL STATUS OF MORBIDLY OBESE PATIENTS ACCORDING TO DIET

The mean serum Vitamin B12 levels were 169.7 \pm 31.7 & 227.2 \pm 69.1 and BMI were 46.3 \pm 7.9 & 45.8 \pm 7.1 in vegetarian and non vegetarian subjects respectively, which has been shown in.

Table II: Clinical status of morbidly obese patients according to diet

Clinical Status	VEG	NON VEG
Age	39 \pm 12	37.4 \pm 12.5
Height	157.7 \pm 9.1	159.3 \pm 9.01
Weight	114 \pm 27.8	117 \pm 25.8
BMI	46.3 \pm 7.9	45.8 \pm 7.1
Vitamin B12	169.7 \pm 31.7	227.2 \pm 69.1

TABLE III & FIGURE I: SERUM VITAMIN B12 DISTRIBUTION ACCORDING TO GENDER

Out of 65 patients there were 26 (40%) male and 39 (60%) female. Table 3 depicts serum B12 levels and percentage of male and female studied. As 211pg/ml was taken as cut off for deficiency state, total 42 (65%) out of 65 subjects turned out to be B12 deficient. In this group 14 (22%) were male and 28 (43%) were female.

Table III: Serum Vitamin B12 distribution according to gender

GENDER	<211 N (%)	>211 N (%)	TOTAL
Male	14 (22)	12 (18)	26 (40)
Female	28 (43)	11 (17)	39 (60)
Total	42 (65)	23 (35)	65 (100)

Figure I: Percentage prevalence of vitamin B12 in male and female

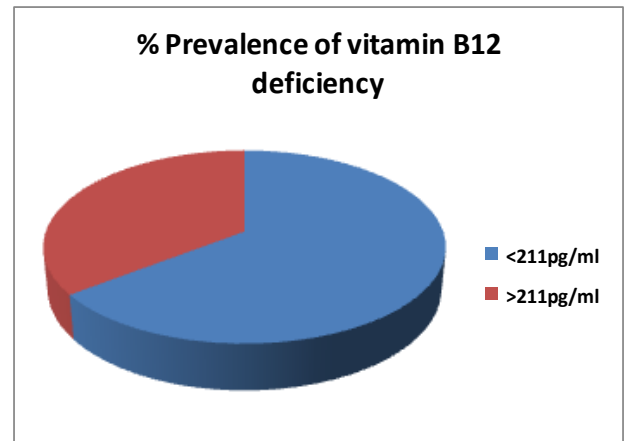


Figure I state the total 42 (65%) out of 65 subjects turned out to be B12 deficient and 23 (35%) has normal Vitamin B12 level, as 211pg/ml was taken as cut off for deficiency state

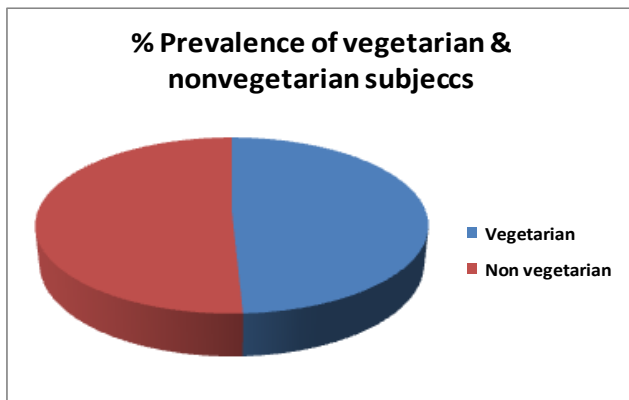
TABLE IV & FIGURE II: SERUM VITAMIN B12 DISTRIBUTION ACCORDING TO GENDER AND DIET

In the present study 32 (49%) subjects were documented as vegetarian; 33 (51%) were documented as non vegetarian. Out of which 27 (42%) were male & 38 (58%) were female. Vegetarian dietary habits was found to be a substantial risk factor for B12 deficiency ($r=0.39$, $p<0.05$). Figure II states 32 (49%) subjects were documented as vegetarian & 33 (51%) were documented as non vegetarian.

Table IV: Serum Vitamin B12 distribution according to gender and diet

Gender & diet	<211 N (%)	>211 N (%)
Male		
Veg.	10 (16)	1 (2)
Non veg	4 (6)	12 (19)
Female		
Veg	20 (31)	1 (2)
Nonveg	8 (12)	9 (14)
Total	42 (65)	23 (35)

Figure II: Percentage prevalence of vitamin B12 according to diet



DISCUSSION

Deficiency of vitamin B12 is very common because of inadequate dietary intake and/or malabsorption. The deficiency state has a very wide presentation and can cause or exacerbate neuropsychiatric and other vague symptoms. It has been observed that vitamin B12 deficiency is far more prevalent than expected and majority of the cases remain undiagnosed.

Dietary vitamin B12 deficiency is a severe problem in the Indian subcontinent as seen in this study. The mean Vitamin B12 level was observed 198.9 pg/ml which itself was on a lower side of the normal range. Present study of morbid obese population (n=65) depicted that 65% of the total subjects (42 out of 65) had vitamin B12 deficiency (levels < 211pg/ml).

B12 deficiency was observed in 22% male and 43% female in the present study suggesting that the risk of vitamin B12 deficiency is affected by gender. This is in contrast to a study conducted in Finnish elderly population where male gender was observed to increase the probability of vitamin B12 deficiency.

This can be explained by occurrence of higher prevalence of vitamin B12 in Indians probably due to the dietary habits. Inadequate intake of B12 through diet is believed to be a rare cause of B12 deficiency, although people who follow a vegan diet are considered at elevated risk (Braunwald et.al., 2001, Swain 1995, Snow 1999, Carmel 2000 and Herbert 1994). Since the main sources of B12 are eggs and dairy products (Braunwald et.al., 2001, Swain 1995 and Snow 1999) as well as meat and poultry, there has been less concern about B12 deficiency among vegetarians who consume some animal-based products (Braunwald et.al., 2001, Swain 1995, Snow 1999, Carmel 2000 and Herbert 1994). We eat non-vegetarian food loaded with gravy and only a few pieces. Nutrients are lost in overcooking. Milk, milk products and eggs are consumed with less frequency as they are expensive.

One study found that about 38% of people in western India followed a lacto vegetarian diet and that 47% of the study population (60% of vegetarian and 39% of nonvegetarian people) were B12 deficient (Refsum et.al., 2001).

There are few limitations in our study. First, since we have analyzed only the pre bariatric patients vitamin B12 levels of our population, the subjects having sub clinical deficiency (elevated homocysteine and methylmalonic acid with normal B12 levels) might have been missed out. Secondly, since it is a hospital based study, the population visiting the tertiary hospital cannot be considered representative of the central Indians. Thirdly, subjects considered as non vegetarians might be occasional meat consumers. A number of large population based studies are required to validate our study findings in a broader perspective. Despite these limitations, prevalence observed in the present study was found to be highly significant and consistent with several other studies addressing the problem of vitamin B12 deficiency. However large population based studies may provide a better outlook about the magnitude of this problem.

CONCLUSION

Results in our retrospective study are consistent with the few other studies that found B12 deficiency more prevalent among obese population. Vitamin B12 is not a part of our routine health checks. There should be more awareness so that further impairment of organs can be avoided. One possible explanation for this observation is that as obese person have greater intake but the quality of food, cooking method etc. should be consider. We believe that this merits further investigation.

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