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Prevalence of Serum Vitamin B_{12} Levels among Patients Presented to Hebron Charitable Medical Center, Palestine

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Abstract: ***Background:*** *Vitamin B_{12} is an essential element for proteins, phospholipids metabolism and neurotransmitters synthesis. It also plays a key role in DNA biosynthesis and cellular energy production. However, vitamin B_{12} deficiency leads to neurologic and psychiatric disturbances including depression, dementia, and a demyelinating myelopathy. Moreover, it's also associated with other diseases such as pernicious anemia and other hematologic manifestation.* ***Methods:*** *After approval from Hebron Charitable Medical Center (HCMC), a retrospective study was carried out among patients at Charitable Medical Center (HCMC) in Hebron, Palestine. It was carried out over a period of one year and half starting from January 2013 till June 2014.* ***Aim:*** *This study was conducted to determine the prevalence of vitamin B_{12} among the patients of HCMC.* ***Results:*** *In general, a total of 305 patients screened for serum vitamin B_{12} levels were enrolled. There were 90 (29.5%) men and 215 (70.5%) women, there were 285 (93.4%) <60 years old and 20 (6.6%) >60 years old .There were 50 patients (16.4%) had vitamin B_{12} deficiency. Mean ± SEM levels of B_{12} in 305 subjects were observed to be 389.73.1±12.93 (range: 60 - 1432 pg/ml). Men had mean value of 423.11±30.17 (range: 60 - 1432 pg/ml) and women had 375.75±13.24 (range: 76 - 1292 pg/ml).* ***Conclusion:*** *This study had highlighted a number of patients that reveals Vitamin B_{12} deficiency according to gender and age. We recommend the necessary implementation of Vitamin B_{12} supplements for all men and women with any age.*

Keywords: ***Vitamin B_{12}, Deficiency, Gender, Age.***

Introduction

Vitamin B_{12} also called cobalamin is an essential element for proteins, phospholipids metabolism and neurotransmitters synthesis. It also plays a key role in DNA biosynthesis and cellular energy production (O'Leary & Samman). Vitamin B_{12} sources are mainly from animal origin, since it's synthesized by certain bacteria in the gastrointestinal tract of animals then absorbed by the host animal, however it's concentrated in animal tissues (Heyssel, Bozian, Darby, & Bell, 1966). So insufficient intake or malabsorption of this vitamin leads to vitamin B_{12} deficiency, which is often seen mainly among vegetarians and people who are suffering from gastrointestinal conditions (Andrès et al., 2004). Hence, this vitamin deficiency leads to neurologic and psychiatric disturbances including depression, dementia, and a demyelinating myelopathy (Bottiglieri, 1996). Moreover, it's also associated with other diseases such as pernicious anemia and other hematologic manifestation (Clementz & Schade, 1990).

Vitamin B_{12} deficiency patients may present different signs and symptoms including fatigue, weakness, numbness, decreased memory, irritability, confusion, although initial symptoms might often be vague(Oh & Brown, 2003) In fact vitamin B_{12} affects all ages (Healton, Savage, Brust, Garrett, & Lindenbaum, 1991) especially older people (Miles, Mills, Clarke, & Dangour, 2015). To get a specific and clear diagnosis of vitamin B_{12} deficiency should be done by measuring the serum homocysteine and methylmalonic acid levels, since they are high in vitamin B_{12} deficiency, and considered as reliable indicators of vitamin B_{12} deficiency than the concentration of B_{12} in blood (Donaldson, 2000).

The prevalence of vitamin B_{12} deficiency in people varies widely depending on the population's heterogeneity and lifestyle.

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Till now establishing a universally normal range for vitamin B_{12}, as well as, prevalence of vitamin B_{12} deficiency in the general population has not been well established (Carmel, 2000). Therefore, it is not always easy to decide whether a patient suffers from vitamin B_{12} deficiency or not. From here, early detection of deficiency is imperative for treatment to be effective, and timely screening and replacement of this vitamin deficiency will help prevent many complications and side effects that may appear in late stages. So treatment can be ensured either by injections or orally doses of vitamin B_{12} (Hvas & Nexo, 2006). It's clinically preferable to take into account preventative measures to avoid deficiencies, which include improving life style and diet control, especially for vegetarian people, and try to eat plenty food-based sources of vitamin B_{12}, such as fish, poultry, and eggs, also vitamin B_{12} commercially available supplements could be used (Watanabe, 2007).

Material and Methods

A retrospective study was carried out among patients at Charitable Medical Center (HCMC), it was carried out over a period of one year and half starting from January 2013 till June 2014. Patients were recruited from the laboratory records using convenience sampling. All of the medical records belonging to the patients of interest whose vitamin B_{12} was assayed were screened to collect data about their vitamin B_{12} levels, ages, and genders. The targeted patients were from the district of Hebron of the Palestinian territories; therefore, they are from the same culture and religious background.

Based on our laboratory's protocol, patients were asked for overnight fasting, and then blood samples were drawn by a professional phlebotomist for vitamin B_{12} level test. Serum vitamin B_{12} level test was performed using commercially available kits (Access 2 vitamin B_{12} Beckman Coulter). According to our laboratory normal range standards, individuals whose serum vitamin B_{12} levels were <200 pg/ml are considered as vitamin B_{12} deficient people, while the vitamin B_{12} concentrations at 370 pg/ml were roughly considered as borderline deficiency. Moreover, individuals whose vitamin B_{12} levels were noticed to be between 200 pg/ml and 900 pg/ml were taken as normal individuals, more than 900 pg/ml were taken up normal level. The sample included 305 men and women who were tested the serum vitamins B_{12} levels.

Statistical Analysis

After data collection, the data were reviewed, organized, tabulated and statistically analyzed using SPSS version 23 (Statistical Package for Scientific Studies). Descriptive statistics (e.g. Frequencies & descriptive) were used to analyze the data. Inferential statistics were used to given a mean score of Vitamins B_{12} and also using T-test (one way Anova) to determine if there is a significance difference between groups. All tests were conducted at level of significance $\alpha = 0.05$, results with p-values <0.05 will be considered statistically significant.

Ethical Considerations

We have stressed the anonymity and confidentiality of any collected information, and that only generic outcome data might be disseminated in scientific settings.

Results

A total of 305 patients screened for serum vitamin B_{12} levels were enrolled. Out of the total 305 patients, there were 90 men (29.5%) and 215 women (70.5%), there were 285 (93.4%) whose are under 60 years and 20 (6.6%) whose are above 60 years old. Out of the total 305 patients. Moreover, there were 50 (16.4%) patients had vitamin B_{12} deficiency.

Table 1 depicts serum vitamin B_{12} levels and percentage of male and female studied. Mean±SEM levels of B_{12} in 305 subjects were observed to be 389.73.1±12.93 (range: 60 - 1432 pg/ml).

Men had mean value of 423.11±30.17 (range: 60 - 1432 pg/ml) and women had 375.75±13.24 (range: 76 – 1292 pg/ml).

Table 1: Vitamin B12 level mean of subjects according to gender.

	Mean	Std. Error of Mean	Std. Deviation	Min	Max
Total results of all participants (n=305)					
n= 305 (ALL)	389.73	12.93	225.8827	60.0	1432.0
Total results of Men participants (n=90)					
n= 90 (Men)	423.11	30.17	286.2859	60.0	1432.0
Total results of Women participants (n=215)					
n= 215 (Women)	375.75	13.24	194.2433	76.0	1292.0

Table 2. If 200 pg/ml was taken as cut off for deficiency state, total 50 (16.4%) out of 305 subjects turned out to be B_{12} deficient. In this group, 16 (17.8%) were men with mean levels of 133.9±11.6 pg/ml and 34 (15.8%) were women with mean of 146.6±5.0 pg/ml. However, it was observed that 246/305 (80.7%) subjects had B_{12} Normal levels. There were 67 males (74.4%) with Mean level 413.2±20.3 and 179 females (83.3%) with mean level 410.8±12.3.

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Table 2: vitamin B12 percentage out of total study subject.

	Deficiency level n(%) Mean ± SEM		**Normal level** n(%) Mean ± SEM		**Up normal level** n(%) Mean ± SEM		**Total** n(%) Mean ± SEM	
Male	16 (17.8%)	133.9 ± 11.6	67 (74.4%)	413.2 ±20.3	7 (7.8%)	1178.9 ± 48.2	90 (29.5%)	423.1 ± 30.2
Female	34 (15.8%)	146.6 ± 5.0	179 (83.3%)	410.8 ±12.3	2 (0.9%)	1132.5 ± 159.5	215 (70.5%)	375.8 ± 13.2
Total	50 (16.4%)	142.6 ± 5.0	246 (80.7%)	411.5 ±10.5	9 (3.0%)	1168.6 ± 45.9	305 (100%)	389.7 ± 12.9

Table 3. If 200 pg/ml was taken as cut off for deficiency state, total 50 out of 305 subjects (16.4%) turned out to be B_{12} deficient. In this group, 46 (16.1%) were <60 with mean levels of 133.9±11.6 pg/ml and 4(20%) were >60 with mean of 146.6±5.0 pg/ml.

Table 3: Vitamin B12 percentage out of total study subject according to age.

	Deficiency level n(%) Mean ± SEM		**Normal level** n(%) Mean ± SEM		**Up normal level** n(%) Mean ± SEM		**Total** n(%) Mean ± SEM	
<60	46 (16.1%)	133.9 ± 11.6	234 (82.1%)	413.2 ± 20.3	5 (1.8%)	1178.9 ± 48.2	285 (93.4%)	423.1 ± 30.2
>60	4 (20.0%)	146.6 ± 5.0	12 (60.0%)	410.8 ± 12.3	4 (20.0%)	1132.5 ± 159.5	20 (6.6%)	375.8 ± 13.2
Total	50 (16.4%)	142.6 ± 5.0	246 (80.7%)	411.5 ± 10.5	9 (3.0%)	1168.6 ± 45.9	305 (100.0%)	389.7 ± 12.9

Table 4. Analysis of serum Vitamin B12 by socio-demographic characteristics of respondents: In comparing the serum Vitamin B_{12} level, there is no significant difference between Male and Female (p = 0.153) and no significant difference between <60 and >60 (p= .143).

Table 4: Differences of vitamin B_{12} levels according to age and gender

Variable	**Group (n)**	**Mean (SD)**	**F statistic (df)**	**P value**
Age	<60(285)	381.44 (211.1)	12.35 (19.89)	.143
	>60(20)	507.80 (366.4)		
Gender	Male(90)	423.11 (286.2)	10.20 (124.68)	.153
	Female(215)	375.75 (194.2)		

Discussion

The prevalence of vitamin B_{12} deficiency was 16.4 % in this representative sample. This is in accordance with the previously reported prevalence rates in other countries (Baik & Russell, 1999; Clarke et al., 2004; Loikas et al., 2006; Wolters, Ströhle, & Hahn, 2004).

Vitamin B_{12} deficiency is prevalent in different countries in the world, because of insufficient intake from different food sources, and/or some troubles in absorbing of vitamin B_{12}. The state of deficiency may present different types of signs and symptoms like neuropsychiatric problems and other associated maladies so Cobalamin occurs in substantial amounts only in foods derived from animals and is essential for one-carbon metabolism and cell division. Low nutritional intake of vitamin B-12 may lead to negative balance, and ultimately, to functional deficiency when tissue stores of vitamin B_{12} are depleted. Early diagnosis of vitamin B-12 deficiency seems to be useful because irreversible neurological damages may be prevented by cobalamin substitution (Herrmann & Geisel, 2002).

In this study, It was found that 20% of older patients have vitamin B_{12} 200 pg/ml or below. There are some studies that support our results, these studies revealed that vitamin B_{12} deficiency increases in the elderly, mainly because atrophic gastritis decreases the production of the acid and digestive enzymes needed to cleave protein-bound vitamin B_{12} from the natural chemical form of vitamin B_{12} found in meat, poultry, fish, and dairy foods and also depending on the biochemical criterion that is used, 5% to more than 20% of older adults have marginal or frank vitamin B_{12} deficiency (Park & Johnson, 2006).

Moreover, there are Sixteen percent of geriatric outpatients had serum Cobalamin levels of 200 pg./mL or below(Yao, Yao, Yao, Yao, & Lou, 1992).

In addition, our study showed that the male have Vitamin B_{12} deficiency 17.6% compared with 15.8% in female.

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These results are supported by some particular studies which appeared that men and women have Vitamin B_{12} deficiency 59% and 23.8% respectively (Carmel, Mallidi, Vinarskiy, Brar, & Frouhar, 2002). Moreover, 34(8%) of men and 28 (4.7%) of women have Vitamin B_{12} deficiency (Loikas et al., 2006).

Conclusion

We conclude that, undiagnosed vitamin B_{12} deficiency is remarkably common in the community of Hebron. This suggests that, in the current clinical practice, only some overt signs and symptoms the individual may have trigger laboratory testing for vitamin B_{12} deficiency. Evidently, routine screening would help to have earlier diagnosis for individuals and reduce the related problems. No specific risk groups among the aged can be defined, but aging itself increases the probability of vitamin B_{12} deficiency, so we recommend the necessary implementation of Vitamin B_{12} supplements for all men and women with any age.

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Conflicts of Interest

There are no conflicts of interests

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