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Micronutrients and Immunity Among Elderly Living in Nursing Homes in Alexandria City, Egypt

Soheir F. Nour, Samir M. Ahmed and Aya M. Hassan[1]

ABSTRACT

The number of older people (above 60 years old) is expected to increase in the world. It is projected to reach 20.8% in 2050, in Egypt. Elderly nursing homes have increased in Egypt over the past 20 years due to rapid demographic change. Most older people over the age of 60–65 years experience some immune dysregulation that makes them less able to respond to immune challenges. Eating healthy food and sufficient nutrients may keep the immune system strong. Therefore, the aim of this study was to identify the impact of some micronutrients on the immune function among people living in nursing homes in Alexandria, Egypt. The research sample consisted of twenty-one elderly men, and twenty elderly women selected from nursing homes in Alexandria (2021) to evaluate the level CRP, IgA, IgG, IgM as indicators for the immunity status as well as of some vitamins and minerals in blood to find the impact of micronutrients status on the immunity.

most of the studied elderly suffered from high levels of serum CRP. About of men had a normal range of IgA compared to women(38.10% and 30%), respectively. Males had higher normal levels of IgG than females but the deference was not significant. The majority of elderly males (90.48%) and only 35% of elderly females had normal levels of IgM.

The low percentage of IgA and IgG among most of the participants confirms the weakness of their immune system

Keywords:Micronutrients; Immunity;Elderly; Nursing Homes

INTRODUCTION

There were 703 million people aged 65 years or older in the world in 2019. The number of older people is expected to increase to 1.5 billion in 2050 (World Population Ageing , 2019). In Egypt, through the past few years' decades, there was a gradual increase in the numbers of elderly population. The percentage was 6.9% in 2015 and it is projected to reach 20.8% in 2050(Sweed & Maemon, 2014).

Elderly nursing homes have increased in Egypt over the past 20 years; there are currently around 145 homes and 200 elderly care organizations. Over half of the 145 homes are located in Cairo. They vary from small apartment to palatial conditions (Abowd, 2009). Rapid demographic change is altering the position of the elderly population from a generation of little statistical significance to one with growing social and economic influence (Abowd, 2009).

As the body ages, so does the immune system (Fulop et al., 2014) , and most older people over the age of 60–65 years experience some immune dysregulation that makes them less able to respond to immune challenges (Montecino-Rodrigue et al., 2013).

There are certain immune markers which can be tested. Increasing evidence shows that C-reactive protein (CRP) is not only an inflammatory biomarker but also an important risk factor associated with ageing-related diseases including cardiovascular disease, hypertension, diabetes mellitus, and kidney disease (Tang et al., 2017).

Immunoglobulins are known as antibodies produced by plasma cells (white blood cells). They protect the body's immune system by regulating the multiple cell destruction pathways, depending on the type of signals they received or the pathogens they interacted with. Also, they kill off the foreign invaders through three different types of mechanisms: neutralization, opsonization, and complement activation (Schroeder & Cavacini, 2010).

Eating healthy food and sufficient nutrients may keep the immune system strong(Childs et al., 2019). Immune support by micronutrients is historically based on vitamin C deficiency and supplementation in scurvy in early times. It has since been established that the complex, integrated immune system needs multiple specific micronutrients, including vitamins A, D, C, E, B6, and B12, folate, zinc, iron, copper, and selenium,

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[1] Food and Human Nutrition, Home Economics Department, Faculty of Agriculture, Alexandria University (Egypt)

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which play vital, often synergistic roles at every stage of the immune response (Gombart et al., 2020).

Micronutrients with the strongest evidence for immune support are vitamins C and D, and zinc. The role of the other micronutrients are required to substate the benefits of them specially for older people.

Therefore, the aim of this study was to identify the impact of some micronutrients on the immune function among people living in nursing homes in Alexandria, Egypt.

The results could help in initiating nutritional interventions for enhancing the immunity among elderly.

SUBJECTS AND METHODS

Studied Population:

The studied population included all elderly people who are residing in nursing homes in Alexandria (2021). The numbers of nursing homes in Alexandria were twenty-one according to Social Affairs Directorate – Alexandria (2021).

The research sample consisted of twenty-one elderly men, and twenty elderly women. This sample was randomly selected from a total sample of 164 elderly people, to evaluate the level of some biomarkers as indicators for the immunity status as well as of some vitamins and minerals in blood to find the impact of micronutrients status on the immunity.

Biochemical measurements

The Serum C-reactive protein, Immunoglobulin- A, Immunoglobulin- G, Immunoglobulin- M were analyzed in the Laboratory of Mabaret El-Asafra, Alexandria, Egypt using kits produced by Cobas, Rochie (Manheim, Germany).

Also, Devert Lab Company Cairo, Egypt performed vitamins and minerals tests by Quantum Resonance Magnetic Analyzer. QRMA 4th Generation model. (QRMA is the magnetic analyzer that offers a selection of indications for assessing the grade of specific component of a test).

The tests included vitamin A, vitamin B1, vitamin B2, vitamin B3, vitamin B6, vitamin B12, vitamin C, vitamin D, vitamin E, vitamin K, calcium, iron, zinc, selenium, phosphorus, potassium, magnesium, copper and manganese

Statistical analysis

The data was tabulated and statistically analyzed using the descriptive analysis, percentage, frequencies, Chi-squared test as well as correlation between variables using SPSS version (Program)16.0.

RESULTS AND DISCUSSIONS

C-reactive protein level

C-reactive protein (CRP) is a protein produced by the liver in response to inflammation.

As observed from Table (1) None of the studied male or female elderly had a normal range of C-reactive protein level while 33.3% and 45% of males and females, respectively had a low risk level of C-reactive protein. Compared to 42.9% of males and 20% of females had a high and very high level of C-reactive protein. High levels may be sign of serious infection or other disorders. Therefore, males are more suffering from high risk levels of CRP than females. This result was in agreement with Lee et al. (2009) as they found CRP was higher in males than females. These may be due to men are usually cigarette smoker than women.

Immunoglobulins

Immunoglobulins act as critical part of the immune response. IgA, IgG, and IgM are the major antibody classes that have been identified.

Immunoglobulin- A level

IgA response 10-15% of the total immunoglobulins. It plays a pivotal role in mucosal homeostasis in the gastrointestinal, respiratory, and genitourinary tracts, functioning as the dominant antibody of immunity in this role.

Table 1. C-reactive protein level in serum blood in elderly

C-reactive protein level of the elderly (mg/l)	Males		Females		Total	
	n	%	n	%	n	%
High risk (More than 10)	9	42.9	4	20	13	31.71
Moderate risk (from 6 to 10)	5	23.8	7	35	12	29.27
Low risk (from 3 to 5.9)	7	33.3	9	45	16	39.02
Normal (less than 3.)	0	0.0	0	0	0	0.00
Total	21	100	20	100.0	41	100.0

X^2= 2.483 there is no significant difference

Table 2. Immunoglobulin- A level in serum blood in elderly

Immunoglobulin- A level of the elderly (mg/dl.)	Males		Females		Total	
	n	%	n	%	n	%
High level (more than 600)	4	19.05	7	35	11	26.83
Marginal (from 401 to 600)	9	42.86	7	35	16	39.02
Normal (70 – 400)	8	38.10	6	30	14	34.15
Total	21	100	20	100.0	41	100.0

X^2= 1.33 there is no significant difference

The percentage of the two gender of the studied elderly according to Immunoglobulin- A level did not show any significant differences. Table (2) depicts that more than one third of elderly males (42.86%) and females (35%) had marginal level (from 401 to 600 mg/dl). Nearly two fifth of males (38.10) had a normal range compared to 30% of females. On the other hand, 19.05% and 26.83% of males and females, respectively had a high immunoglobulin-A level. High levels of IgA can be a sign of some diseases such as rheumatoid or chronic inflammation (Rollenske et al., 2018). This result is in disagreement with Khan et al. (2021) who found men had higher IgA than women and they added that older compared to younger individuals had higher IgA. Lee et al. (2009) reported positive associations between alcoholism, hypertension, and acute psychological stress with IgA.

Immunoglobulin- G level

IgG is the most common and abundant antibodies present in the body. Blood plasma consists of 75-80% of IgG. The function of IgG is to enhance the phagocytes of pathogens, neutralize, bacterial or viral.

Table (3) illustrates that abnormal Immunoglobulin-G level was found among 70.74% of the elderly sample. About 28.57%, 28.57% and 42.86% of the males had a normal, marginal and high level of serum Immunoglobulin- G level, respectively, compared to 30%, 45% and 25% of the females, respectively. Therefore, males had higher normal levels of Immunoglobulin- G than females. This result was in agreement with Harkness et al. (2020) , as they found females had lower IgG compared with males. Gudelj et al. (2018) demonstrated that changes in IgG glycosylation patterns have been observed in aging and in various diseases.

Immunoglobulin- M level

IgM is the first antibody that interact the bacteria that inter the body.

Table 3. Immunoglobulin-G level in serum blood in elderly

Immunoglobulin- G level of the elderly(mg/l)	Males		Females		Total	
	n	%	n	%	n	%
High level (more than 2000)	9	42.86	5	25	14	34.15
Marginal (from 1601 to 2000)	6	28.57	9	45	15	36.59
Normal (700 – 1600).	6	28.57	6	30	12	29.27
Total	21	100	20	100.0	41	100.0

X^2= 1.719 there is no significant difference

Table 4. Immunoglobulin- M level in elderly sample blood

Immunoglobulin- M level of the elderly (mg/dl)	Males		Females		Total	
	n	%	n	%	n	%
High level (more than 300)	0	0	0	0	0	0
Marginal (from 230 to 300)	1	4.76	8	40	9	21.95
Normal (40 – 230)	19	90.48	7	35	26	63.41
less than 40	1	4.76	5	25	6	14.63
Total	21	100	20	100	41	100

X^2=11.29** there is significant at 0.01

As indicated from the data in Table (4) the majority of elderly males 90.48% and only 35% of elderly females had normal levels of Immunoglobulin- M , although only 4.76% of males and 40% of elderly women suffered from marginal Immunoglobulin- M level. Fortunately, it was observed that there wasn't any elderly suffer from high level Immunoglobulin- M level. The difference between the two sexes was significant. These results were in agreement with Crisp and Quinn(2009) as they observed that IgM was higher in women when compared with men. The results of Khan et al. (2021) found males had lower IgM levels than females. Excess and deficiency of Immunoglobulin- M affect human health.

Vitamins in blood

Vitamins help our bodies grow and develop normally. The best way to get enough vitamins is to eat a balanced diet with a variety of foods. Knowing about different vitamins and what they do can help you to make sure you get enough of the vitamins that you need.

As illustrated from Table(5) more than quarter of the males (28.57%) had a normal level vitamin A compared to 35% of females. Vitamin A is known as anti-inflammation vitamin, and it is involved in the development of the immune system and plays regulatory roles in cellular immune responses and humoral immune process (Huang et al., 2018). Penkert et al. (2021) found that Vitamin A deficiency dysregulated the immune response.

Concerning to vitamins B , the percentage of the males who had normal levels of vitamin B1, vitamin B2, vitamin B3, vitamin B6 and vitamin B12 were 66.67% , 61.90% 85.71%, 76.19%, and 66.67%, respectively compared to 60%, 40%, 40%, 50% and 65 % in female's group, respectively. Arazo-Rusindo et al. (2022) found that females had higher serum levels of vitamin B_{12} rather than males . Porter et al. (2016) discovered that older adults were at high risk of vitamin B_{12} malabsorption due to the lack of production of intrinsic factor.

Regarding vitamin C, more than half of the males had a moderately abnormal level of this vitamin compared to 5% of females who had severity abnormal and 45% had a moderately abnormal level. Only 28.57% and 25% for males and females had normal levels, respectively. This result was in disagreement with Travica et al. (2020) as they found that males had less vitamin C levels than females. Galimberti & Mesinkovska (2016) had mentioned that the most common risk factors for vitamin C deficiency are poor diet, alcoholism, anorexia, severe mental illness, smoking and dialysis.

More than two fifth of males (42.86%) had a normal range of vitamin D and the rest had a deficiency either mild or moderate , while 55% of females had normal levels. This result is in disagreement with Alanazi et al. (2022) as they found that the mean level of vitamin D among they study participants males was higher than females but this was disagreement with Düğeroğlu & Yasemin (2022) as they found vitamin D deficiency and insufficiency among 88.3% of the patients. In addition, serum vitamin D levels of female patients were lower than male patients.

Table 5. Vitamins levels in blood in elderly sample blood

Gender	Minerals level of	vitamin A		vitamin B1		vitamin B2		vitamin B3		vitamin B6		vitamin B12		vitamin C		vitamin D		vitamin E		K	
	the elderly	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
males	moderately abnormal	2	9.52	6	28.57	1	4.76	1	4.76	1	4.76	4	19.05	11	52.38	1	4.76	6	28.57	7	33.33
	mildly abnormal	1	4.76	7	33.33	2	9.52	4	19.05	3	14.29	4	19.05	11	52.38	1	4.76	3	14.29	4	16
	normal	6	28.57	14	66.67	13	61.90	18	85.71	16	76.19	14	66.67	6	28.57	9	42.86	14	66.67	11	52.38
	total	21	100	21	100	21	100	21	100	21	100	21	100	21	100	21	100	21	100	21	100
females	severity abnormal	0	0	0	0	0	0	3	15	3	15	0	0	1	5	0	0	1	5	0	0
	moderately abnormal	5	25	6	30	3	15	4	20	4	20	1	5	9	45	3	15	5	25	2	10
	mildly abnormal	8	40	2	10	9	45	5	25	3	15	6	30	5	25	6	30	7	35	1	5
	normal	7	35	12	60	8	40	8	40	10	50	13	65	5	25	11	55	7	35	17	85
	total	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100

Approximately two-thirds (66.67%) of males had a normal range of vitamin E compared to females as only 35% for females. This result is in disagreement with Ma *et al*. (2021) as they found elderly females had higher levels of vitamin E than males. On the other hand, 52% of males had a normal range of vitamin k compare to 83% of females.

Minerals in the Blood

Minerals are important for the body to stay healthy. The body uses minerals for many different jobs, including keeping your bones, muscles, heart, and brain working properly. Minerals are also important for making enzymes and hormones.

The data in Table (6) highlights that elderly females suffering from calcium deficiency more than elderly males . this result was in agreement with Bures et al. (2020) as they also found calcium levels were lower in female than in male. But disagreement with Koek et al. (2021) as they found that women had higher serum calcium levels compared to men in subjects of 45 years and older. In Mohamed et al. (2022) study they found that calcium are associated with cognitive improvement in elderly.

According to iron, Table (6) illustrated that there is iron deficiency prevalent in elderly either in males or in females as only 28.57% in males and 35% in females had a normal range. Confirmed that Fairweather-Tait et al. (2014) the prevalent of iron deficiency in older age may due to Serum ferritin concentrations decline, and it is likely that elevated levels of circulating hepcidin are responsible for changes in iron metabolism that result in systemic iron depletion. Other contributory factors are poor diet and some medications, such as aspirin. and genetic factors are likely to play a role.

Approximately less than half of the males 42.86 %their levels of zinc are normal compared to around the third of females 35%. This result was in disagreement with Alqabbani & AlBadr (2020) as they found that Zinc deficiency was more in women than men. Grădinaru et al. (2021) mentioned that zinc deficiencies have been reported in numerous pathologies, such as diabetes mellitus, but also in the physiological process of ageing.

Regarding the level of selenium, less than half of the males (42.86%) had a normal range and 33.33% had a mildly abnormal range compared to 80% and 5% of females, respectively. Ayling (2014) observed that Plasma selenium concentration is an indicator of recent selenium intake, rather than body stores. Ruocco et al. (2018) added that the mean selenium plasma concentration was significantly lower in critically ill patients with greater severity.

As illustrated from Table (6)52.38% of males had a normal range of phosphorus compared to 55% of females. This result was in agreement with Onufrak et al. (2009) as they found phosphorus levels were higher in women.

According to potassium as indicated from Table (6) 42.86% of males and only 25% of females had a normal range . Low serum potassium concentrations is a common electrolyte disturbance (Kardalas et al., 2018). Hypokalemia can be caused either by decreased intake of potassium or by excessive losses of potassium in the urine or through the GI tract. Excessive excretion of potassium in the urine may result from the use of diuretic drugs, endocrine diseases such as primary hyperaldosteronism, kidney disorders and genetic syndromes affecting the renal function (Palmer et al., 2014). Gastrointestinal losses of potassium usually are due to prolonged diarrhea or vomiting, chronic laxative abuse, intestinal obstruction or infections. An intracellular shift of the potassium can also lead to severe hypokalemia. Insulin administration, stimulation of the sympathetic nervous system, thyreotoxicosis and familiar periodic paralysis are some of the reasons for this phenomenon (Patel et al., 2018).

Only third of males (33.3%) had a normal range of magnesium in comparison to 40% of females. Several changes of magnesium (Mg) metabolism have been reported with aging, including diminished Mg intake, impaired intestinal Mg absorption and renal Mg wasting (Barbagallo et al., 2021).

About four-fifth of males (80.95%) and all females (100%) had a normal range of manganese. This result was in agreement with Oulhote et al. (2014) as they found females had a higher level of manganese than males.

Correlations between Micronutrient and C-reactive protein

Correlations between Micronutrient in the elderly blood and C-reactive protein in serum of them in Table (7).

Table 6. Minerals in the Blood in elderly sample blood

Gender	Minerals level of the elderly	calcium		iron		zinc		selenium		phosphorus		potassium		magnesium		copper		manganese	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Males	moderately abnormal	1	4.76	6	28.57	4	19.05	5	23.81	1	4.76	7	33.33	1	4.76	3	14.29	1	4.76
	mildly abnormal	3	14.29	9	42.86	8	38.10	7	33.33	9	42.86	5	23.81	13	61.90	9	42.86	3	14.29
	normal	17	80.95	6	28.57	9	42.86	9	42.86	11	52.38	9	42.86	7	33.33	9	42.86	17	80.95
	Total	21	100	21	100	21	100	21	100	21	100	21	100	21	100	21	100	21	100
Females	moderately abnormal	2	10	0	0	8	40	3	15	4	20	7	35	4	20	5	25	0	0
	mildly abnormal	2	10	13	65	5	25	1	5	5	25	8	40	8	40	5	25	0	0
	normal	16	80	7	35	7	35	16	80	11	55	5	25	8	40	10	50	20	100
	Total	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100

Table 7. Correlations between Micronutrient in the elderly blood and C-reactive protein in serum of them

Variables	c-reactive protein	
	Male	Female
1. Vitamin A	-0.467*	-0.414*
2. Vitamin B1	-0.408*	-0.273
3. Vitamin B2	-0.411*	-0.312
4. Vitamin B3	-0.375	-0.492
5. Vitamin B6	-0.305	-0.006
6. Vitamin B12	-0.109	-0.428
7. Vitamin C	-0.457*	-0.517*
8. Vitamin D	-0.964**	-0.752*
9. Vitamin E	-0.241	-0.084
10. Vitamin K	-0.977**	-0.95**
11. calcium	-0.435*	-0.269
12. iron	-0.251	-0.126
13. zinc	-0.180	-0.299
14. selenium	-0.207	-0.276
15. phosphorus	-0.494*	-0.477**
16. potassium	-0.492	-0.235
17. magnesium	-0.132	-0.342
18. copper	-0.211	-0.180
19. coblat	-0.322	-0.125
20. manganese	-0.982**	-0.887**
21. iodine	-0.511	-0.150

**Correlation is significant at the 0.01 level
*Correlation is significant at the 0.05 level

Table (7) illustrates that there are negative significant correlations between c-reactive protein and Vitamins A, B_1, B_2, C, D, K, and calcium, phosphorus and manganese, in elderly males. On the other hand, there are negative significant correlations between C-reactive protein and Vitamins A, C, D, K,and phosphorus and manganese in the females group. This result was in agreement with Tao et al. (2015) as they found a negative correlation between CRP and 25(OH)D in serum blood. Also Biniaz et al. (2014) found that CRP reduced significantly after 2 months of intaking vitamin C supplement. Safabakhsh et al. (2020) added that supplementation with vitamin C might have a significant effect on CRP reduction. Also, Crook et al. (2022) confirmed a negative association between plasma vitamin C and clinical biomarkers of acute and chronic inflammation C-reactive protein (CRP). Also, Askar et al. (2019) as they performed a

study in elderly women and found plasma C-reactive protein (CRP), were significantly increased in group with iron deficiency anemia when compared with healthy group. Uddin et al. (2017) reported a negative correlation between zinc and CRP .

Correlations between Micronutrient and Immunoglobulin-A

Correlations between Micronutrient in the elderly blood and Immunoglobulin-A in serum of them in Table (8).

Regarding to Immunoglobulin-A , Table (8) illustrates that there is a positive correlation between Immunoglobulin-A and Vitamins A, B_2, B_{12},C, D, and calcium, zinc, phosphorus and copper, in elderly males. while there is a positive correlation between Immunoglobulin-A and Vitamin B6, Vitamin B12, Vitamin C, Vitamin D, calcium, zinc and copper in the females group. This result was in agreement with Kheirouri & Alizadeh (2014) study, as they results indicated that zinc and vitamin A deficiency is associated with a lower production of IgA. Also Hasanloei et al. (2017) showed that vitamin C induced increases IgA concentrations, which may in turn contribute to improved immune performance and decreased risk of infectious diseases. Hu et al. (2020) added that serum IgA level was significantly increased by vitamin A intake.

Correlations between Micronutrient and Immunoglobulin-G

Correlations between Micronutrient in the elderly blood and Immunoglobulin-G in serum of them in Table (9).

Table (9) illustrates a significant positive correlation between Immunoglobulin-G level in serum blood and Vitamin A, Vitamin D, calcium and phosphorus at $P< 0.01$, also there is a correlation between Immunoglobulin-G and Vitamin B_1 and Vitamin B_{12} at $P< 0.05$ in males group , as for females there is a positive correlation with Immunoglobulin-G and Vitamin B6, Vitamin D, Vitamin E, calcium, iron, zinc, and manganese. This result was in agreement with Sakem et al. (2013) as they found thay Low levels of 25(OH)D were positively associated with IgG. Also Amin et al. (2019) confirmed that Patients with vitamin D deficiency have significantly low IgG levels. Hasanloei et al. (2017) showed that vitamin C increases IgG concentrations.

Correlations between Micronutrient and Immunoglobulin-M

Correlations between Micronutrient in the elderly blood and Immunoglobulin-M in serum of them in Table (10).

Table 8. Correlations between Micronutrient in the elderly blood and Immunoglobulin-A in serum of them

Variables	Immunoglobulin-A	
	Male	Female
1. Vitamin A	0.713*	0.277
2. Vitamin B1	0.471	0.369
3. Vitamin B2	0.907**	0.242
4. Vitamin B3	0.509	0.312
5. Vitamin B6	0.280	0.662*
6. Vitamin B12	0.982**	0.955**
7. Vitamin C	0.612*	0.807**
8. Vitamin D	0.746*	0.473*
9. Vitamin E	0.018	0.296
10. Vitamin K	0.547	0.244
11. calcium	0.966**	0.930**
12. iron	0.209	0.071
13. zinc	0.750*	0.789**
14. selenium	0.154	0.340
15. phosphorus	0.743*	0. 45
16. potassium	0.504	0.299
17. magnesium	0.529	0.603
18. copper	0.926**	0.932**
19. coblat	0.993	0.989
20. manganese	0.503	0.330
21. iodine	0.543	0.443

**Correlation is significant at the 0.01 level

*Correlation is significant at the 0.05 level

Table 9. Correlations between Micronutrient in the elderly blood and Immunoglobulin-G in serum of them

Variables	Immunoglobulin-G	
	Male	Female
1. Vitamin A	0.931**	0.069
2. Vitamin B1	0.761*	0.145
3. Vitamin B2	0..686	0.263
4. Vitamin B3	0.524	0.425
5. Vitamin B6	0.095	0.608*
6. Vitamin B12	0.798*	0.05
7. Vitamin C	0.490	0.47
8. Vitamin D	0.995**	0.973**
9. Vitamin E	0.533	0.771**
10. Vitamin K	0.440	0.201
11. calcium	0.865**	0.694*
12. iron	0.455	0.742*
13. zinc	0.407	0.540*
14. selenium	0.252	0.273
15. phosphorus	0.875**	0.34
16. potassium	0.32	0.325
17. magnesium	0.185	0.642
18. copper	0.429	0.19
19. coblat	0.654	0.203
20. manganese	0.581	0.570*
21. iodine	0.467	0.119

**Correlation is significant at the 0.01 level
*Correlation is significant at the 0.05 level

Table 10. Correlations between Micronutrient in the elderly blood and Immunoglobulin-M in serum of them

Variables	Immunoglobulin-M	
	Male	Female
1. Vitamin A	0.485	0.812*
2. Vitamin B1	0.689	0.648
3. Vitamin B2	0.636	0.972**
4. Vitamin B3	0.906**	0.496
5. Vitamin B6	0.523	0.595
6. Vitamin B12	0.064	0.418
7. Vitamin C	0.26	0.286
8. Vitamin D	0.237	0.278
9. Vitamin E	0.568	0.595
10. Vitamin K	0.522	0.565
11. calcium	0.343	0.153
12. iron	0.485	0.695*
13. zinc	0.404	0.837**
14. selenium	0.724*	0.879**
15. phosphorus	0.595*	0.660*
16. potassium	0.451	0.669*
17. magnesium	0.185	0.252
18. copper	0.207	0.261
19. coblat	0.265	0.041
20. manganese	0.314	0.016
21. iodine	0.340	0.865**

**Correlation is significant at the 0.01 level
*Correlation is significant at the 0.05 level

concerning to Immunoglobulin-M, Table (10) explains that there is a positive correlation between Immunoglobulin- M and Vitamin B3, selenium, and phosphorus, in elderly males. Compared to a positive correlation between Immunoglobulin- M and Vitamin A, Vitamin B2, iron, zinc, selenium, phosphorus, potassium and iodine in the females group. This result was in agreement with Hu et al. (2020) as they found that vitamin A supplementation highly increased serum immunoglobulin M level when compared with the control group. Also Amin et al. (2019) confirmed that there was no significant difference between IgM and vitamin D deficiency. The results of Zhu et al. (2019) indicated that vitamin C injection increased immunoglobulin M (IgM).

CONCLUSIONS

The results indicate that most of the studied elderly suffered from high risk of inflammation and infection (high levels of serum C-reactive protein). The low percentage of IgA and IgG among most of the participants confirms the weakness of their immune system.

It could be concluded that most of participants suffered from low levels of most of the studied vitamins, especially vitamins C and D for men, and vitamins A, B_1, B_3, C and D for women.

Also, it could be concluded that more than half of the participant suffered from abnormal blood levels of most of the studied minerals, especially iron, zinc, potassium, magnesium and copper for both gender, and selenium for men.

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الملخص العربي

العناصر الغذائية الدقيقة و المناعة بين كبار السن داخل دار المسنين بالاسكندرية مصر

سهير فؤاد نور ، سمير محمد أحمد ، آية محمد توفيق فهمى حسن

من المتوقع أن يزداد عدد كبار السن (فوق ٦٠ سنة) في العالم. ومن المتوقع أن تصل إلى ٢٠,٨٪ في عام ٢٠٥٠ في مصر. ازدادت دور رعاية المسنين في مصر خلال العشرين عامًا الماضية بسبب التغير الديموغرافي السريع. يعاني معظم كبار السن الذين تزيد أعمارهم عن ٦٠–٦٥ عامًا من بعض اضطرابات الجهاز المناعي التي تجعلهم أقل قدرة على الاستجابة للتحديات المناعية. إن تناول الأطعمة الصحية والمغذيات الكافية قد يحافظ على قوة جهاز المناعة. لذلك ، كان الهدف من هذه الدراسة هو التعرف على تأثير بعض المغذيات الدقيقة على وظيفة المناعة لدى الأشخاص الذين يعيشون في دور رعاية المسنين في الإسكندرية ، مصر. تكونت عينة البحث من واحد وعشرين رجلاً مسنًا ، وعشرين سيدة مسنة تم اختيارهم من دور رعاية المسنين بالإسكندرية (٢٠٢١) ، لتقييم مستوى البروتين التفاعلي CRP، IgA، IgG، IgM كمؤشرات لحالة المناعة وكذلك لبعض الفيتامينات و المعادن في الدم لمعرفة تأثير حالة المغذيات الدقيقة على المناعة.

وتشير النتائج الى ان معظم كبار السن الذين شملتهم الدراسة يعانوا من مستويات عالية من بروتين سي التفاعلي في الدم. ٣٨,١٠ ٪ من الذكور لديهم معدل طبيعي مقارنة بـ ٣٠ ٪ من الإناث. كان لدى الذكور مستويات طبيعية أعلى من IgG من الإناث ولكن الإختلاف ليس كبيرا. غالبية الذكور ٩٠,٤٨٪ وفقط ٣٥٪ من الإناث لديهم مستويات طبيعية من.IgM

الخلاصة: إن انخفاض نسبة IgA و IgG بين معظم المشاركين يؤكد ضعف جهاز المناعة لديهم.

الكلمات المفتاحية: العناصر الغذائية ؛ المناعة ؛كبار السن؛ دار المسنين