SAR Journal of Medicine

Abbreviated Key Title: *SAR J Med*
Home page: http://sarmedjournals.com

ISSN 2707-773X (P)
ISSN 2709-6920 (O)

Original Research Article

The Role of Immunopotentiation Medicine in Protection against Microbial Infection

Haidar mu'ayad Zaki*, Mohamed said Mohsen, Hakeem yousif, Khalil lsmail. A. Mohammed
College of Medicine, University of Baghdad, Baghdad-Iraq

***Corresponding Author**
Haidar mu'ayad Zaki

Article History: | Received: 16.03.2021 | Accepted: 07.05.2021 | Published: 18.05.2021 |

Abstract: The immune system is highly dependent on precise communication between cells for optimal function, and any damage to the signaling systems involved will result in an impaired ability to mount an immune response. A cross-sectional survey of 212 participants from different cities of Iraq was conducted to explore the effect of eating fruits & vegetables and taking vitamins on the immunity status like recurrent infection, COVID19 and chronic diseases. The data collected by using survey targeted to all cities of Baghdad. The questionnaires were distributed online using Google Forms. It will be a convenient sample. The collected data was analyzed by using statistical package social science (SPSS) program version 23.0 and demonstrated in tables and graphs. Sample test was used to decide if there is statistical difference or not. The survey generated 212 responses. Regarding on the question about the chronic disease 94.3% of the answers don't have chronic diseases and 5.7% were had chronic diseases. Concerning the question about COVID19 infection65.1% of the answers was not infected and 34.9% were infected. The question regarding the recurrent infection 18.4%suffered from recurrent infection and 81.6% were not. The question regarding eating fruits & vegetables89.2% eating frequently and 10.8% were not. The question regarding taking vitamins50.0% of participants were taking vitamins and 50.0% were not. The increase immune protection by immunostimulant factor from food like eating fruits & vegetables or by therapeutic adjuvant like vitamins and minerals is useful in increase immunological status and help in protection against microbial infection.

Keywords: Immunopotentiation medicine, microbial infection, Protection, Iraq.

INTRODUCTION

The immune system is highly dependent on precise communication between cells for optimal function, and any damage to the signaling systems involved will result in an impaired ability to mount an immune response[1]. Oxidant mediated tissue injury is a particular hazard to the immune system because many immune cells produce reactive oxygen species as part of the body's defense against infection [2]. Therefore, adequate amounts of neutralizing antioxidants are required to prevent damage to the immune cells themselves [3]. Many antioxidants can be obtained directly from the diet (for example, vitamin C, vitamin D, vitamin E, carotenoids and polyphenolic flavonoids) or require micronutrients as integral components of protective enzymes (for example, selenium in glutathione peroxidase, and copper and zinc in superoxide dismutase)[4]. Numerous epidemiological studies have found strong associations between diets rich in antioxidant nutrients and a reduced incidence of cancer and it is likely that maintenance of the integrity of the body's immune system by antioxidants is [5] Most common symptoms of infections include Fever, dry cough, tiredness. Less common symptoms include aches and pains, sore throat, diarrhea, conjunctivitis, headache, loss of taste or smell, a rash on skin, or discoloration of fingers or toes. Serious symptoms include difficulty breathing or shortness of breath. Chest pain or pressure, loss of speech or movement[6].

Infection with respiratory system can lead to fibrosis of lung tissue and can aggravates existing co morbidities like asthma and COPD which may have poorer prognosis and poor outcome and less chance compared to healthy individuals[7].

METHODOLOGY

Study Design

A cross-sectional survey was conducted in the period from 13 April to 28 September of 2020 from different cities of Iraq

Sample Size and Sampling Technique

The participants in this study were212 from different cities of Iraq, was conducted to explore the effect of eating fruits & vegetables and taking vitamins on the immunological status like recurrent infection, COVID19 and chronic diseases

Data Collection

The data collected by using survey targeted to all cities of Baghdad. The questionnaires were distributed online using Google Forms

Questionnaires

Different questions were asked in it in Arabic language to reach more people, some related questions include:

- Do you eat fruits & Vegetables?
- Do you take vitamins?
- Have you been infected with COVID19?
- Do you suffer from chronic disease?
- Do you suffer from recurrent infection?

Sampling Procedure and Analysis Plan

It will be a convenient sample. The collected data was analyzed by using statistical package social science (SPSS) program version 23.0 and demonstrated in tables. Sample test was used to measure the association or it is statically significant or not.

Ethical Approval and Human Subject Protection

The names of the participants will be hidden and the consent taken from the people before answering the questionnaire .So all responses are anonymous.

RESULTS

The survey generated 212 responses. Regarding on the question about the chronic disease 94.3% of the answers don't have chronic diseases and 5.7% were had chronic diseases. Concerning the question about COVID19 infection 65.1% of the answers were not infected and 34.9% were infected. The question regarding the recurrent infection 18.4% suffered from recurrent infection and 81.6% were not. The question regarding eating fruits & vegetables 89.2% eating frequently and 10.8% were not. The question regarding taking vitamins 50.0% of participants were taking vitamins and 50.0% were not, frequency tables are shown below in Table (1, 2, 3, 4, 5).

Table-1: Descriptive statistics of samples Eating Fruits & Vegetables

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	23	10.8	10.8	10.8
	Yes	189	89.2	89.2	100.0
	Total	212	100.0	100.0	

Table-2: Descriptive statistics of samples taking Vitamins.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	106	50.0	50.0	50.0
	Yes	106	50.0	50.0	100.0
	Total	212	100.0	100.0	

Table-3: Descriptive statistics of samples infected with COVID19.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	138	65.1	65.1	65.1
	Yes	74	34.9	34.9	100.0
	Total	212	100.0	100.0	

Table-4: Descriptive statistics of samples infected with Chronic Disease.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	200	94.3	94.3	94.3
	Yes	12	5.7	5.7	100.0
	Total	212	100.0	100.0	

Table-5: Descriptive statistics of samples infected with Recurrent Infection.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	173	81.6	81.6	81.6
	Yes	39	18.4	18.4	100.0
	Total	212	100.0	100.0	

Also, the results obtained from the sample analytics and to the alpha value of statistics (p value) is less than 5% and the 95% confidence interval. There is association between eating fruits & vegetables on up regulate of immunological status.

Table-6: Association between taking fruits & vegetables and infection with COVID19.

Crosstab				
Count		COVID19 Infection		Total
		No	Yes	
Eating Fruits & Vegetables	No	15	8	23
	Yes	123	66	189
Total		138	74	212

Table-7: Association between eating fruits & vegetables and chronic diseases

Crosstab				
Count		Chronic Disease		Total
		No	Yes	
Eating Fruits & Vegetables	No	22	1	23
	Yes	178	11	189
Total		200	12	212

Table-8: Association between taking fruits vegetables and recurrent infection

Crosstab				
Count		Recurrent Infection		Total
		No	Yes	
Eating Fruits & Vegetables	No	16	7	23
	Yes	157	32	189
Total		173	39	212

For a descriptive purpose our participants were 52.8% female and 47.2% mal

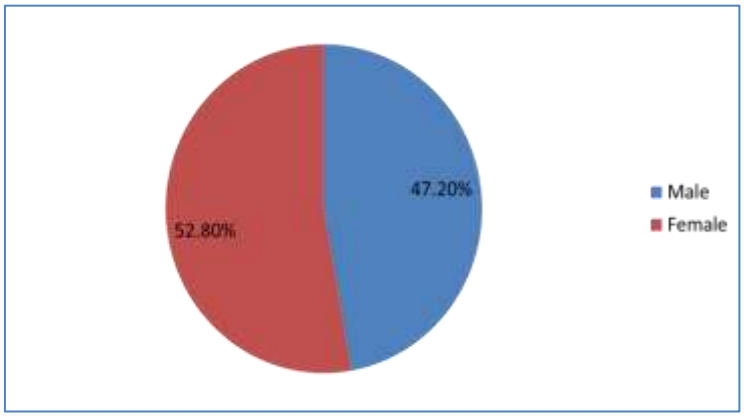

Fig-1: Pie chart of participants' sex

Most of the participants asked about what type of vitamins they took and 40.6% were taking vitamin C, 33% taking vitamin D, 4.7% taking vitamin E, 30.2% taking multivitamin ,1.9% taking selenium supplement, 12.3% taking iron supplement,26.4% taking zinc and 32.1% take no vitamin no minerals (Fig -2).

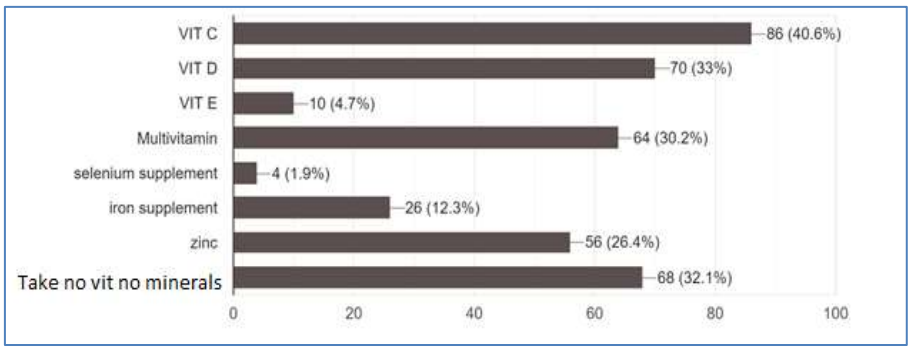

Fig-2: Types of vitamins taken by participants

As shown in Figure (3), 92% of the participants eat citrus as source of vitamins C, 4% eat fruit include melon and 4% eat vegetables include broccoli.

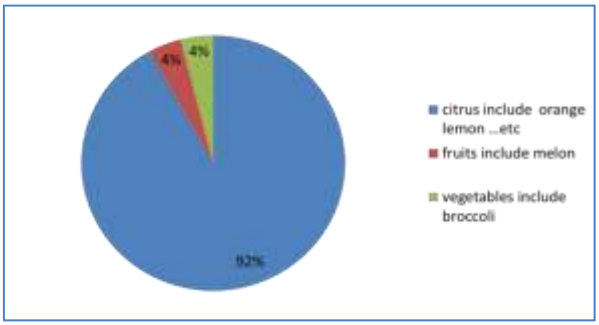

Fig-3: The sources of vitamin C taken by participants

After asking the participants how usual they take vitamins when they are healthy free of sickness, 63.7% answered as un regularly , 14.2% answered as daily , 14.2 % answered as weekly and only 8 % answered as Following physician advise as shown in (Fig-4).

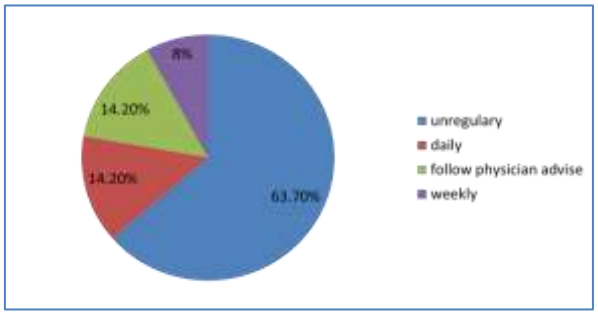

Fig-4: The periods of Vitamins taken by participants

After asking the participants concerning the item taken after getting sick or infected, 18% answered they take vitamins,45% answered they take paracetamol, 30% answered they do nothing, 3.55% answered they take herbals and 3.55% answered they go to physician as shown in (Fig-5).

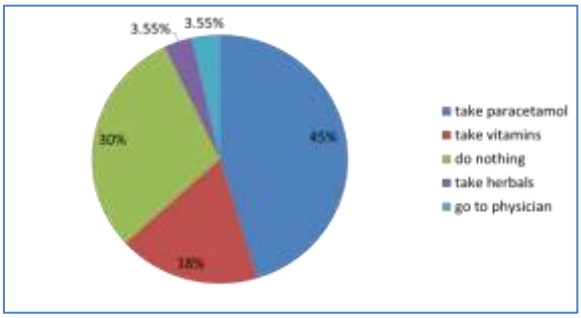

Fig-5: Items taken by participants after getting sick or infected

After asking the participants what is the effect of eating fruit & vegetables and taking vitamin on their immunity, 41% answered it is good , 30% answered it is medium,26% answered it is accepted and 3.30% answered it is not good as shown in (Fig-6).

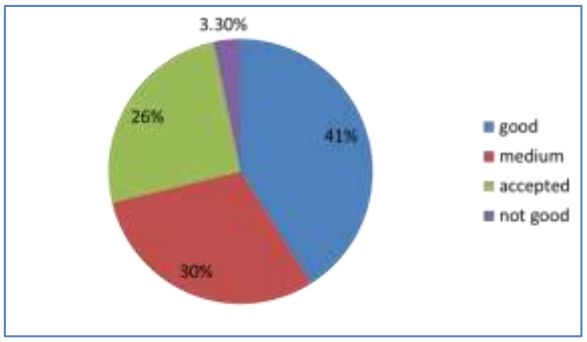

Fig-6: The effect of eating fruit & vegetables and taking vitamins onparticipants immunity

DISCUSSION

Eating fruits & vegetables and taking vitamins rich in minerals and anti-oxidants are important for enhancing the immunity against infective microbes. According to our sample 89.2% eating fruits & vegetables and 50% taking vitamins which has an essential role immune enhancement which makes it essential for prevention against infection like emerging COVID19 now days.

Vitamin C is an essential micronutrient for humans, with Pleiotropy functions related to its ability to donate electrons. It is a potent antioxidant and a cofactor for a family of biosynthetic and gene regulatory enzymes. Vitamin C contributes to immune defence by supporting various cellular functions of both the innate and adaptive immune system. Vitamin C supports epithelial barrier function against pathogens and promotes the oxidant scavenging activity of the skin, thereby potentially protecting against environmental oxidative stress. Vitamin C accumulates in phagocytic cells, such as neutrophils, and can enhance chemotaxis, phagocytosis, generation of reactive oxygen species, and ultimately microbial killing [8, 9]. It is also needed for apoptosis and clearance of the spent neutrophils from sites of infection by macrophages, thereby decreasing necrosis and potential tissue damage.

The role of vitamin C in lymphocytes is less clear, but it has been shown to enhance differentiation and proliferation of B- and T-cells, likely due to its gene regulating effects [10]. Vitamin C deficiency results in impaired immunity and higher susceptibility to infections. In turn, infections significantly impact on vitamin C levels due to enhanced inflammation and metabolic requirements. Furthermore, supplementation with vitamin C appears to be able to both prevent and treat respiratory and systemic infections. Prophylactic prevention of infection requires dietary vitamin C intakes that provide at least adequate, if not saturating plasma levels (i.e., 100-200 mg/day), which optimize

cell and tissue levels. In contrast, treatment of established infections requires significantly higher (gram) doses of the vitamin to compensate for the increased inflammatory response and metabolic demand [11].Most of the participants asked about what type of vitamins they took and 40.6% were taking vitamin C (Fig 2). 33% of the participants take vitamin D (Fig-2).

The beneficial effects of vitamin D on protective immunity are due in part to its effects on the innate immune system. It is known that macrophages recognize lipopolysaccharides LPS, a surrogate for bacterial infection, through toll like receptors (TLR). Engagement of TLRs leads to a cascade of events that produce peptides with potent bactericidal activity such as cathelocidin and beta defensin 4. These peptides co localize within phagosome with ingested bacteria where they disrupt bacterial cell membranes and have potent anti-micro bacterial activity [12, 13, 14] 4.7% take Vitamin E (Fig-2). The mechanisms responsible for the immunomodulatory effects of vitamin E have been explored in cell-based, animal, and human studies. Vitamin E has both direct and indirect effects on immune cells, with most evidence obtained from studies focused on the effects on T cell function. It is generally recognized that, similar to the effects on other cells, the scavenging of reactive oxygen species and reduction of oxidative stress play a key role in vitamin E's effects on the immune system.

Membrane integrity, inflammation, signal transduction, and cell cycle division are all processes that are sensitive to oxidative stress [15] a- Direct effects: alterations of membrane integrity and signalling As mentioned above, immune cells are particularly enriched in vitamin E, likely to protect high membrane content of polyunsaturated fatty against oxidative damage produced as a result of their high metabolic activity and their normal defensive function. Immune cells are highly dependent on cell membrane composition and structure as their membranes are a primary site where external signals are translated through different signal transduction mechanism to plasma and nucleus to modulate key regulatory genes. By preventing lipid peroxidation and the associated cell membrane damage, vitamin E may assist in the maintenance of membrane integrity, maintain signal transduction and production of key proteins and other mediators and directly affect the function of immune cells. Additionally, vitamin E may directly modulate certain properties of cell membranes, including lipid raft mobility, which may influence movement and activation of surface signalling molecules as reviewed previously. Modulation of cell membrane integrity may result in alteration of signal transduction ultimately leading to functional changes, specifically in T cells.

The direct effects of vitamin E on alterations of membrane integrity and signalling have been demonstrated in both in vitro and in vivo models. Isolated splenic naïve T cells from old mice had a significantly lower ability to divide and produce IL-2 compared to T cells from young mice. In vitro supplementation of vitamin E (46 μmol/L of d-α-tocopherol), comparable to plasma concentrations of vitamin E in humans consuming 200 IU d-α-tocopherol/d, was shown to improve these age-associated declines. These improvements in age-associated impairments of T cell function were only observed in naïve T cells [16] b- Indirect effects: suppression of inflammatory factors Vitamin E exerts indirect regulatory effects on T cells through modulation of inflammatory mediators such as pro-inflammatory cytokines and prostaglandin E2 (PGE2), a lipid mediator. The effect of vitamin E in modulation of PGE2 production by macrophages has been reviewed previously briefly; PGE2 activates adenylyl cyclase to increase cyclic adenosine monophosphate (cAMP) levels leading to suppressed T cell response. PGE2 affects both the innate and adaptive immune system including inhibition of T cell proliferation, IL-2 receptor expression and IL-2 production. The T cell suppressive effects of PGE2 involve inhibition of several early signalling events that occur after T cell activation.

Although the mechanism by which vitamin E inhibits PGE2 production is not yet fully understood [17] 1.9% of the participants take selenium (Fig-2).Se-supplementation of individuals completely prevents the development of Keshan disease. The aetiology of Keshan disease has been attributed in part to an endemic coxsackievirus (CVB3) and Se-supplementation acts not only to elevate antiviral immunity, but to prevent genetic adaptations in the viral genomic RNA that lead to increased virulence and cardiac pathology. In fact, the data are much clearer regarding how Se levels affect CVB3 itself than how low Se affects the host's immune responses to the virus [18] 26.4% of the participants take zinc (Fig-2). Zinc changes in extracellular zinc levels, such as serum hypozincaemia during acute phase reactions, have been suggested to activate immune cells, functioning as a "danger signal". In addition, cytokines, integrin binding, growth factors and other immune cell receptor ligands trigger intracellular zinc flux. In recent years more and more regulatory pathways have been demonstrated in various immune cells to directly or indirectly involve zinc signalling General concepts, such as the effect of intracellular zinc concentrations on the activities of phosphodiesterase (PDE), phosphor-tyrosine phosphatase (PTP) and their antagonists the tyrosine kinases (TK), or the translocation of signalling molecules and transcription factors such as NFκB to the nucleus, can probably be extrapolated to other examples of receptor-induced signalling pathways. However, cell type dependent exceptions to the paradigm might exist, underlining the importance of testing the general concepts for each individual cell type and pathway [19].

CONCLUSIONS

The increase immune protection by immunostimulant factor from food like eating fruits & vegetables or by therapeutic adjuvant like vitamins and minerals is useful in increase immunological status and help in protection against microbial infection

REFERENCES

1. Allard, J. P., Aghdassi, E., Chau, J., Tam, C., Kovacs, C. M., Salit, I. E., & Walmsley, S. L. (1998). Effects of vitamin E and C supplementation on oxidative stress and viral load in HIV-infected subjects. Aids, 12(13), 1653-1659.
2. Bendich, A. (1996). Antioxidant vitamins and human immune responses. Vitamins and hormones, 52, 35-62.
3. Chandra, R. K. (1992). Effect of vitamin and trace-element supplementation on immune responses and infection in elderly subjects. LANCET-LONDON-, 340, 1124-1124.
4. Hughes, D. A. (1999). Beta-carotene and immune function: is it a case of defining the right intake? Nutrition (Burbank, Los Angeles County, Calif.), 15(5), 405-407.
5. Hughes, D. A., Haslam, P. L., Townsend, P. J., & Turner-Warwick, M. (1985). Numerical and functional alterations in circulatory lymphocytes in cigarette smokers. Clinical and experimental immunology, 61(2), 459.
6. Sohrabi, C., Alsafi, Z., O'Neill, N., Khan, M., Kerwan, A., Al-Jabir, A., Iosifidis, C., & Agha, R. (2020). World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19).International Journal of Surgery.
7. Davidson, S., Ralston, S., Penman, I., Britton, R., Strachan, M., & Hobson, R. (2018).Davidson's principles and practice of medicine. 23rd ed, 545-628.
8. Perrin, R., Riste, L., Hann, M., Walther, A., Mukherjee, A., & Heald, A. (2020). Into the looking glass: Post-viral syndrome post COVID-19. Medical hypotheses, 144, 110055.
9. Haase, H., & Rink, L. (2014). Multiple impacts of zinc on immune function. Metallomics, 6(7), 1175-1180.
10. Fukada, T., & Kambe, T. (Eds.). (2014). Zinc signals in cellular functions and disorders. Springer Japan.
11. Hojyo, S., & Fukada, T. (2016). Roles of zinc signaling in the immune system. Journal of immunology research, 2016.
12. Fukada, T., Hojyo, S., & Furuichi, T. (2013). Zinc signal: a new player in osteobiology. Journal of bone and mineral metabolism, 31(2), 129-135.
13. Gallo, R. L., Murakami, M., Ohtake, T., & Zaiou, M. (2002). Biology and clinical relevance of naturally occurring antimicrobial peptides. Journal of Allergy and Clinical Immunology, 110(6), 823-831.
14. Liu, P. T., Stenger, S., Li, H., Wenzel, L., Tan, B. H., Krutzik, S. R., ... & Modlin, R. L. (2006). Toll-like receptor triggering of a vitamin D-mediated human antimicrobial response. Science, 311(5768), 1770-1773.
15. Coquette, A., Vray, B., & Vanderpas, J. (1986). Role of vitamin E in the protection of the resident macrophage membrane against oxidative damage. Archives internationales de physiologie et de biochimie, 94(5), S29-34.
16. Hatam, L. J., & Kayden, H. J. (1979). A high-performance liquid chromatographic method for the determination of tocopherol in plasma and cellular elements of the blood. Journal of lipid research, 20(5), 639-645.
17. Wang, X., & Quinn, P. J. (1999). Vitamin E and its function in membranes. Progress in lipid research, 38(4), 309-336.
18. Kalinski, P. (2012). Regulation of immune responses by prostaglandin E2. The Journal of Immunology, 188(1), 21-28.
19. Sreeramkumar, V., Fresno, M., & Cuesta, N. (2012). Prostaglandin E2 and T cells: friends or foes? Immunology and cell biology, 90(6), 579-586.