

Evaluation of nutritional status and health behaviors of patients infected with COVID-19

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ABSTRACT

Introduction: Coronavirus disease 2019 (COVID-19) was a health emergency for the world in which started in 2019. Various factors are involved in the pathogenesis of this virus, including age, gender, body mass index (BMI), the type of diet, the degree of observance of health protocols, and the health status of people. The purpose of this study was to evaluate the nutritional status and health behaviors of patients infected with COVID-19. **Methods:** A descriptive-analytical research method was used in this study. One of the outpatient centers for the patients infected with COVID-19 in Kermanshah was selected as the research setting. The study population included all patients infected with COVID-19 and the sample size was 200 people. Data were analyzed by SPSS version 22. **Results:** Most patients (51%) were females and most of them suffered from body aches (81%) and headaches (94%). Most of the patients (76%) did not use a mask. Regarding the nutritional status, a large number of patients used all food groups such as carbohydrates, proteins, fruits, and vegetables less than the standard amount. **Conclusion:** It can be concluded that people with underlying diseases are more prone to the disease than others and adherence to social distancing and mask use helps a lot to control the disease. In addition, the appropriate intake of food groups reduces the severity of the disease by strengthening the immune system in people.

Keywords: Health behaviors, nutritional status, patients infected with COVID-19

Introduction

Coronavirus disease 2019 (COVID-19) is a highly contagious disease, and its prevalence has been described as a health emergency by WHO.^[1] It was first reported in December 2019 in Wuhan City, Hubei province of China. The disease then spread

throughout Hubei province and other parts of the country.^[2] It is speculated that the disease first started in the Wuhan seafood market. However, it was then reported that COVID-19 could be transmitted from person to person by respiratory droplets and contact with contaminated objects.^[3,4] According to studies conducted in China, risk factors for this disease include high age, high SOFA (Sequential Organ Failure Assessment) score, D-dimer higher than 1 µg/mL, hypertension, diabetes, and cardiovascular disease.^[5] In a study conducted on 72,314 Chinese patients, it was found that about 87% of patients were between 30 and 79 years of age, 81% had mild symptoms, and 49%

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had critical symptoms and died. According to this study, the mortality rate was equal to 2.3%, no deaths were recorded under 9 years, and there were more deaths among people over 80 years. A total of 10.5% of the deceased people had cardiovascular disease, 7.3% had diabetes, 6.3% had respiratory disease, 6% had hypertension, and 5.6% had cancer. Healthcare workers constituted 3.8% of the infected people, 14.8% of whom suffered severe and critical symptoms. According to this study, the disease can be transmitted from one city to the whole country in 30 days, which surprised the China Health Services Center.^[6] According to the results of the research, the symptoms of this disease usually include fever, cough with or without sputum, and fatigue, and lymphopenia is often detected during blood tests.^[7] Based on the results from epidemiological studies, patients infected with COVID-19 experience a variety of symptoms, the most common of which include fever, dry cough, and fatigue.^[8] In addition, these patients also experience sleep disorders due to respiratory problems, anxiety, and pain.^[2] The purpose of this study was to evaluate the nutritional status and health behaviors of patients infected with COVID-19 who were referred to a health center in Kermanshah province.

Methods

The present study was conducted by a descriptive-analytical research method. The research setting was a health center located in district 5 of Kermanshah. The study population included all patients referred to this center. The census method was used for sampling. The number of research samples was 200 people who were referred to the abovementioned center in August 2020. The purpose of the present study was to investigate the demographic characteristics, nutrition, health behaviors, etc., of outpatients infected with COVID-19. The study was conducted on June 21, 2020, with research code 3009999 and ethics code IR.KUMS.REC.1399.267 issued by the Vice-chancellor for Research Affairs of Kermanshah University of Medical Sciences. After receiving the approval of the Vice-chancellor, the desired samples were selected and oral consent was obtained from them to participate in the research. To collect data, the interview by the researchers, the demographic information checklist, and the Food Frequency Questionnaire (FFQ) were used. FFQ is one of the famous and important questionnaires to assess the nutritional status of patients, which has been used and reported by many studies. The validity and reliability of this questionnaire have already been confirmed in the Tehran lipid and glucose study, the research conducted by Hosseini *et al.* (2010).^[9] In addition, to assess the reliability of the questionnaire in the present study, a test-retest was used so that the FFQ was initially completed by the pilot group and after 5 days, the same questionnaire was again completed by the given group. Spearman's correlation coefficient was calculated. It was equal to 91%, indicating good reliability. Finally, SPSS version 22 was used to analyze the data.

Results

After examining patients, the following results were obtained

in this study: most patients (51%) were female and had an academic education (38%). The occupation of most patients was housekeeping. The income of more than half of the patients was between \$100 and \$200 per month. Among the symptoms mentioned by the samples, they suffered mostly

Table 1: Absolute frequency and relative frequency of demographic and therapeutic variables in patients with COVID-19

Variables		n (%)
Gender	Men	98 (49%)
	Women	102 (51%)
Education	Under diploma	70 (35%)
	Diploma	54 (27%)
	Academic	76 (38%)
Job	Retired	2 (%6)
	Unemployed	3 (%3)
	Free	32 (%16)
	Housewife	30 (%40)
Economic	Employed	72 (36%)
	Weak (under \$100 per month)	34 (%17)
	Medium (\$100-200 per month)	140 (%70)
Drug history	Good (upto \$200-300 per month)	26 (13%)
	Yes	40 (20%)
	Losartan	2 (1%)
	Antidepressants	8 (%4)
	Diabetes medications	10 (%5)
Symptom	Atorvastatin	6 (%3)
	No	134 (67%)
	No drug history	116 (58%)
	Weakness and fatigue	34 (17%)
	Fever	162 (81%)
	Body pain	30 (15%)
	Loss of smell and taste	74 (37%)
	Cough	188 (94%)
	Headache	92 (45%)
	Anorexia	36 (18%)
Diarrhea	20 (10%)	
Smoke	Nausea	46 (23%)
	Yes	10 (5%)
Alcohol and addictive substances	No	190 (95%)
	Yes	52 (26%)
Diagnosis	No	148 (74%)
	PCR	186 (93%)
	CT scan	2 (1%)
Present drug	PCR and CT scan	12 (6%)
	Azithromycin	150 (75%)
	Hydroxychloroquine	70 (35%)
	Vitamin C	54 (27%)
	Vitamin D	58 (29%)
Previous disease	Acetaminophen and naproxen	22 (11%)
	Yes	40 (20%)
	Hypertension	8 (4%)
	Diabetes	2 (1%)
Severity of symptoms	Depression	150 (75%)
	No	4 (2%)
	No Previous disease	4 (2%)
	1-3 (Low)	144 (72%)
4-6 (Medium)	4 (2%)	
7-9 (Intense)	46 (23%)	
10 (Very intense)		

from body aches (81%) and headaches (94%). A large number of patients (75%) reported a score between 7 and 9 for the symptom severity, indicating a high severity. After suspecting the infection, most patients (75%) were diagnosed with COVID-19 using polymerase chain reaction (PCR) [Table 1]. In this research, we tried to examine the health behaviors of patients before being infected with COVID-19 to find out what caused the disease. According to the results obtained, the majority of patients (64%) were infected by attending family gatherings and most of them (76%) did not use masks [Table 2]. The mean age of patients was 42.78 ± 1.15 years, the mean Number of sick days was 9.44 ± 2.71 and the mean BMI was 26.14 ± 2.63 [Table 3]. Due to the importance of the patients' physical condition, the researchers also evaluated the nutritional status of patients before and during the disease. Carbohydrate intake for most samples (75%) was between 1 to 5 units per day, which is lower than the standard amount (6 to 11 units). Daily protein intake for a large number of patients was equal to 1 unit, which is less than the standard amount of 2 to 3 units. The fruit consumption was mostly (42%) reported to be only 1 unit per day, and no daily intake of vegetables was reported in most patients (77%). However, the majority of them (44%) reported high fat and sugar intake in their diet [Table 4]. According to the results, there was a significant relationship between the severity of symptoms with the consumption of carbohydrates, proteins, fruits and vegetables. ($P \leq 0.05p$) [Table 5].

Discussion

In this study, the mean age of patients was 42.78 ± 1.15 years. The highest history of previous diseases was related to hypertension and diabetes, respectively. In the research conducted by Nikpouraghdam *et al.*^[10] (2020), the most common underlying diseases of people with coronavirus disease included diabetes, respiratory diseases, and hypertension. Ma CH *et al.*^[11] (2020) and Wu *et al.*^[5] (2020) referred to diabetes and hypertension as the most frequent underlying diseases in patients suffering COVID-19. Thus, according to the results obtained in this research and other studies, it can be concluded that people with underlying diseases of diabetes and hypertension are at a higher risk of being infected with COVID-19. In the present study, most patients were definitively diagnosed with COVID-19 by PCR. In the study by Zhang *et al.*^[12] (2020) and Fang *et al.*^[13] (2020), *polymerase chain reaction* (PCR) was also the method used to diagnose COVID-19 in patients. It has been recognized that PRC is currently used in almost all countries for the definitive diagnosis of COVID-19. In their study, the symptoms in patients mainly included headache, body aches, weakness and fatigue, cough, and loss of sense of smell and taste. The results of other studies are in line with the results of our study.^[2,14] It can be said that symptoms such as headache, fatigue, and cough are seen frequently in a large number of patients. According to the results obtained in this study, a great number of participants did not use masks (76%) and did not observe social distancing (80%). Examining the impact of mask use on the spread of the COVID-19 pandemic and the severity of the disease, the study

Table 2: Absolute frequency and relative frequency percentage of patients observing health tips

Variables		n (%)
Infection of family and relatives	Yes	128 (64%)
	No	72 (36%)
Use a mask	Yes	48 (24%)
	No	152 (76%)
Observance of social distance	Yes	24 (12%)
	No	176 (88%)

Table 3: Mean and standard deviation of age, number of hospitalization days, BMI, and oxygen saturation

Variables	Means±SD
Age	42.78±1.15
Number of sick days	9.44±2.71
Oxygen saturation	94.95±2.06
BMI	26.14±2.63
Sleep (h)	8±1.58

Table 4: Nutritional status of patients with COVID-19

Variables	Unit	n (%)	Means±SD
Carbohydrate	1-5	150 (75%)	4.5±1.59
	6-11	50 (25%)	
	UP11	0 (0%)	
Protein	1	120 (60%)	1.63±0.91
	2	48 (24%)	
	3	18 (9%)	
	4	14 (7%)	
Fruits	Nothing	42 (21%)	1.36±1.12
	1	84 (42%)	
	2	46 (23%)	
	3	22 (11%)	
Vegetables	4	6 (3%)	0.8±0.62
	Nothing	154 (77%)	
	1	36 (18%)	
	2	6 (3%)	
Liquids	3	4 (2%)	6.7±1.74
	4-6	60 (30%)	
	6-8	58 (29%)	
	8-10	74 (37%)	
Sugar and fat	10-12	8 (4%)	4.35±1.42
	Low	52 (26%)	
	Medium	60 (30%)	
	Much	88 (44%)	

Table 5: Investigating the relationship between severity of symptoms

Variables	BMI	Carbohydrate	Protein	Fruits	Vegetables
Severity of symptoms	P=0.8	P=0.012	P=0.001	P=0.001	P=0.000

by Eikenberry *et al.*^[15] (2020) indicated that mask use decreased significantly the rate of disease transmission. Their study demonstrated that mask use could prevent the disease by 80% and

the adoption of effective masks in Washington had reduced the mortality rate by 65%–24%. According to the abovementioned studies, it can be said that the main cause of disease in patients who studied in the present research was mostly the lack of mask use and observance of social distancing. In this study, most of the samples had a body mass index (BMI) above 25. Reviewing other studies made it clear that in the research conducted by Cai *et al.*^[16] (2020), the majority of patients had also a BMI above 25. Due to the prevalence of overweight among patients with COVID-19, several studies have been performed to investigate the effect of overweight on symptoms of this disease, and it has been recognized that there is a direct relationship between patients' BMI, the severity of the disease symptoms, and the mortality, and people with higher weight experience more severe symptoms.^[17-19] Regarding the diet of patients before being infected with COVID-19, it was recognized in this research that there was a direct relationship between patients' nutritional status, the ability of their immune system to prevent coronavirus disease, and the severity of symptoms. Unfortunately, investigations showed that most of the patients used various food groups less than the standard amount. The nutritional status of people has long been considered an indicator of resistance to pathogens. Several studies have shown that there is a relationship between nutrition and the physical and mental health of people.^[20-23] Concerning carbohydrate intake, most of the patients (75%) consumed 1 to 5 units per day, whereas the standard daily amount of carbohydrates intake is 6–11 units. There was also a significant relationship between carbohydrate intake and the severity of disease symptoms ($P \leq 0.05$). In 71% of patients whose carbohydrate intake was less than 6 units, the score of the symptom severity ranged from 7 to 10, indicating high severity. According to a study conducted by Spadaro *et al.*^[24] (2015), the use of carbohydrates regulates serotonin and reduces stress in people. However, it should be noted that the consumption of carbohydrates should not be increased since it causes weight gain. In a study by Sanlier *et al.*^[25] (2020), they concluded that people can experience better sleep quality if they consume standard carbohydrates. Therefore, it can be hypothesized that reduced carbohydrate intake in patients can cause a reduced amount of serotonin in the body. Serotonin plays a significant role in regulating a person's mood and reducing symptom severity. In more than half of the patients (60%), protein intake was less than 1 unit, which is lower than the standard amount of 2–3 units per day. There was also a significant relationship between symptom severity and protein intake ($P \leq 0.05$).

Protein foods are a source of the amino acid tryptophan that is involved in the regulation of serotonin and melatonin, strengthening the immune system and reducing the risk of respiratory infections.^[26,27] Proteins increase the activity of phagocytes, cytokines production, and the sensitivity of the immune system to respiratory and intestinal infections.^[28] The other groups of foods studied in this research were fruits and vegetables. Unfortunately, the results indicated a very low consumption of these food groups. Most patients (42%) received only 1 unit of fruit per day and the majority of them (77%) did not consume

any vegetables per day, whereas the standard amount of fruit consumption is 2 to 4 units and vegetables are 3 to 5 units per day. In addition, it was found that there was a significant relationship between symptom severity and the number of fruits and vegetables consumed by patients with COVID-19. Furthermore, 62% of people who reported the score of their symptoms above 7 (severe) consumed fruits less than 2 units, and 95% of them consumed vegetables less than 3 units per day. Numerous studies have shown that eating fruits and vegetables strengthens the immune system, and the reason for it is that fruits and vegetables are rich in vitamins C, E, D, beta-carotene, and antioxidants.^[28] Antioxidants in fruits and vegetables increase the number of lymphocytes and enhance the immune system's response to a variety of pathogens.^[29,30] Studies of diet in patients with COVID-19 have shown that the consumption of fruits and vegetables has played an important role in the recovery of patients.^[31,32]

Conclusion

According to the results obtained from the study, it can be concluded that people with underlying diseases are more prone to COVID-19 than others, and the observance of social distancing and mask use helps a lot to control the disease. Moreover, the intake of appropriate amounts of food groups reduces the severity of the disease symptoms in people by strengthening the immune system.

Plagiarism

The Ithenticate platform and Plagiarism.com site were used to investigate plagiarism.

The key points

1. The most common cause of COVID-19 disease in the current study was not wearing a mask and not observing social distance.
2. Most people received the disease from their families. The most common symptoms in patients were headache, body ache, weakness, and fatigue.
3. Most patients consumed less than the standard diet, including carbohydrates, proteins, fruits, and vegetables.
4. There was a direct relationship between the severity of symptoms and the consumption of food groups.

Ethical and institutional permission taken

The study was conducted on June 22, 2020, with research code 3009999 and ethics code IR.KUMS.REC.1399.267 issued by the Vice-chancellor for Research Affairs of Kermanshah University of Medical Sciences.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and

due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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