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Beyond the pandemic: shifts in healthcare workers' nutritional habits and their relationship with COVID-19 fear, knowledge, misconception and preventive behaviors

Além da pandemia: mudanças nos hábitos nutricionais dos profissionais de saúde e sua relação com a COVID-19 medo, conhecimento, equívocos e comportamentos preventivos

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ABSTRACT

Objective

This study aimed to determine the changing nutritional habits of healthcare workers after the pandemic and to evaluate the fears, knowledge, misconceptions, and preventive behaviors related to Coronavirus Disease 2019 (COVID-19).

Methods

This cross-sectional study conducted with Turkish healthcare workers was conducted between April and June 2021. A total of 354 volunteer adult healthcare workers (58 males and 296 females) aged between 20 and 70 years were included in the study. The study used several scales to measure knowledge, fear, preventive practices, and misconceptions: the Assessment of Knowledge of COVID-19, the Fear of COVID-19, the Self-Reported Assessment of Preventive Behaviors, and the Misconception of COVID-19, respectively.

Results

Women exhibited higher fear (p<0.001) and misconception scores than men (p=0.034). Weight gain was associated with an increase in misconceptions (p=0.017). Married women demonstrated better preventive behaviors compared to single women (p=0.006). Fear of COVID-19 was positively correlated with knowledge (r=0.0130; p=0.014), preventive behaviors (r=0.176; p=0.001), and misconceptions (r=0.206; p<0.001). Additionally, higher knowledge scores were linked to increased consumption of milk (p=0.009), green leafy vegetables (p=0.003), yellow-orange vegetables (p=0.013), and reduced consumption of bread (p=0.014) and chocolate, wafer, and biscuit (p=0.027).

Conclusion
This study reveals that healthcare workers' nutritional habits are influenced by their COVID-19-related knowledge, fear, misconceptions, and preventive behaviors, with higher knowledge associated with healthier food choices.

Keywords: COVID-19. Fear. Health personnel. Knowledge.

RESUMO

Objetivo
Este estudo teve como objetivo determinar as mudanças nos hábitos nutricionais dos profissionais de saúde após a pandemia e avaliar os medos, conhecimentos, equívocos e comportamentos preventivos relacionados à Doença do Coronavírus 2019 (COVID-19).

Métodos
Este estudo transversal com profissionais de saúde turcos foi conduzido entre abril e junho de 2021. Um total de 354 profissionais de saúde adultos voluntários (58 homens e 296 mulheres) com idades entre 20 e 70 anos foram incluídos no estudo. O estudo usou várias escalas para medir conhecimento, medo, práticas preventivas e equívocos: a Avaliação do Conhecimento da COVID-19, o Medo da COVID-19, a Avaliação Auto-Relatada de Comportamentos Preventivos e o Equívoco da COVID-19, respectivamente.

Resultados
As mulheres apresentaram escores mais elevados de medo (p<0,001) e equívocos do que os homens (p=0,034). O ganho de peso foi associado ao aumento de equívocos (p=0,017). Mulheres casadas demonstraram comportamentos preventivos melhores em comparação com mulheres solteiras (p=0,006). O medo do COVID-19 foi correlacionado positivamente com o conhecimento (r=0,0130; p=0,014), os comportamentos preventivos (r=0,176; p=0,001) e os equívocos (r=0,206; p<0,001). Além disso, escores de conhecimento mais elevados estiveram ligados ao aumento do consumo de leite (p=0,009), vegetais de folhas verdes (p=0,003), vegetais amarelo-alaranjados (p=0,013) e à redução do consumo de pão (p=0,014) e chocolate, bolacha e biscoito (p=0,027).

Conclusão
Este estudo revela que os hábitos alimentares dos trabalhadores da saúde são influenciados pelo conhecimento relacionado ao COVID-19, medo, equívocos e comportamentos preventivos, com maior conhecimento associado a escolhas alimentares mais saudáveis.

***Palavras-chave**: COVID-19. Medo. Pessoal de saúde. Conhecimento.*

INTRODUCTION

Pandemics have caused significant individual, social, and economic problems. Healthcare workers, who form the backbone of the healthcare system, were at high risk due to their direct involvement in providing care during the pandemic [1]. Healthcare workers represented 14% of the cases reported to the World Health Organization [2]. The spread of the disease among healthcare workers has been worsened by insufficient awareness of infection prevention practices [3]. Healthcare workers' fear, knowledge, and attitudes toward the pandemic affect their commitment to control measures [4]. Increasing knowledge and preventive behaviors related to the pandemic may enhance infection control practices among healthcare workers, improving patient care while also protecting the health of healthcare workers [5]. Since the effects of pandemics on healthcare workers are still not fully understood, this remains an active area of research and is crucial for shaping future intervention strategies aimed at improving the health of healthcare workers and, ultimately, patient outcomes [6].

Social isolation and public health measures, such as quarantine practices, travel restrictions, curfews, and social distancing rules implemented worldwide, along with the fear of the virus with

unknown causes and treatments, have led to changes in individuals' eating habits [7]. During the quarantine period, there were significant decreases in the consumption of rice, meat, poultry, dairy products, fresh vegetables and fruits, while the consumption of highly processed and high-energy foods, such as ready-to-eat foods, snacks, and cereals, increased. Reports indicated that individuals tended to prefer fatty, sugary, and salty foods, and increased stress from social isolation led to overeating [8]. Significant changes in adults' diets during quarantine were found, with an increase in the consumption of sweets and canned meat products [9]. The increased workload and stress caused by the pandemic led to higher consumption of ultra-processed foods, which are low in nutrients and high in sugar and fat content [6]. This has been associated with an increased risk of serious complications, as it contributes to chronic inflammation [10]. Adequate and balanced nutrition, as well as adequate intake of micro- and macronutrients, are important factors influencing immune function across all age groups [11-12]. These dietary changes have particularly increased the risk of chronic diseases such as obesity, diabetes, cardiovascular diseases, and eating disorders, which are further exacerbated by media exposure, disruption of daily activities, social isolation, and fear of infection [13]. Examining the changing dietary habits of healthcare workers, understanding their level of knowledge about exposure to the virus, and identifying factors that influence their attitudes and practices are crucial for protecting them during and after the pandemic [4-5].

This study explores how the pandemic has influenced the nutritional habits of healthcare workers, a group highly vulnerable to both physical and psychological stress. By examining changes in the consumption of food groups such as milk and dairy products, cereals, vegetables and fruits, meats, fats, and sugary foods in relation to participants' COVID-19-related knowledge, preventive behaviors, fear, and misconceptions, this research provides valuable insights into how these psychological and behavioral factors may have altered nutritional habits. Understanding these changes is crucial from a public health perspective, as the findings can inform targeted interventions aimed at supporting the well-being of healthcare workers.

METHODS

Study design and population

This cross-sectional study with Turkish healthcare workers was conducted between April and June 2021. The survey form was sent to healthcare workers via WhatsApp, Twitter, Instagram, and Facebook, which are connected to the researchers' systems, using a Google Forms link. Data was collected using the snowball sampling technique. Before starting the survey, participants filled out the electronic consent form. It took approximately 20 minutes for the participants to complete the survey. Ethical approval was obtained from the Ankara Medipol University Non-Interventional Clinical Research Ethics Committee (April 21, 2021/No. 18).

A total of 354 voluntary adult healthcare workers (58 males and 296 females), aged between 20 and 70 years, were included in the study. Pregnant and lactating women, psychoactive drug users, non-volunteers, and individuals not working in healthcare were excluded.

Instruments

Research data collection tools are categorized into five main headings, which are as follows: 1) General information questionnaire (15 questions); 2) Assessment of knowledge of COVID-19 (15 items); 3) Self-reported assessment of preventive behaviors (9 items); 4) Fear of COVID-19 (7 items); and 5) Misconception of COVID-19 (14 items).

General information questionnaire – In this section, participants' general information, anthropometric measurements, dietary habits, changes in these habits during the COVID-19 pandemic, and their knowledge about COVID-19 were evaluated.

Assessment of knowledge of COVID-19 – An evaluation form consisting of 15 statements about COVID-19 was prepared by Alsoghair et al. participants received 1 point for each correct answer and 0 points for incorrect answers, with the total knowledge score ranging from 0 to 15. A higher score indicates a higher level of knowledge about COVID-19. Using 50% and 75% as cut-off points, participants were classified as having a low knowledge level if their scores ranged from 1 to 7, an average knowledge level if their scores were between 8 and 11, and a high knowledge level if their scores ranged from 12 to 15 [14].

Self-reported assessment of preventive behaviors – The questionnaire developed by Alsoghair et al. to evaluate preventive behaviors in response to COVID-19 consists of 9 statements. Participants' responses were recorded on a 4-point Likert scale, where 'strongly disagree' and 'disagree' were scored as 0, and 'agree' and 'strongly agree' were scored as 1. The total score ranges from 0 to 9. Using 50% and 75% as cut-off points, participants were classified as having low-level preventive behaviors if their scores ranged from 1 to 4, average-level preventive behaviors if their scores ranged from 5 to 6, and high-level preventive behaviors if their scores ranged from 7 to 9 [14]. The Cronbach's alpha value for this scale was=0.815 in this study.

Fear of COVID-19 – In this section, the COVID-19 fear scale developed by Ahorsu et al. (2020) consisting of 7 questions, was used. The scale is a 5-point Likert scale, where the responses were evaluated as: strongly disagree=1, disagree=2, undecided=3, agree=4, and strongly agree=5. The minimum score for each question is 1 and the maximum score is 5. The total score range is between 7 and 35 points. A higher score indicates a higher level of fear of COVID-19 [15]. The Cronbach's alpha value for this scale was=0.865 in this study.

Misconception of COVID-19 – The misconception of COVID-19 form consists of 14 statements. The scale was evaluated using a 5-point Likert scale (1: never, 2: rarely, 3: sometimes, 4: often, 5: always). While preparing this questionnaire, studies on flu infections viewed as pandemics were used as references [16-20]. Media discussions and previous studies also contributed to the construction of the scale. The Cronbach's alpha value for this scale was=0.833 in this study.

Anthropometric measurements

Since the data were collected during the COVID-19 pandemic, participants' height and body weight measurements were self-reported. Body Mass Index (BMI=kg/m^2) was calculated by dividing body weight in kilograms by the square of height in meters. Participants were classified according to their BMI as follows: normal weight (18.5≤ BMI ≤24.9 kg/m^2), overweight (BMI ≥25.0 kg/m^2), and obese (BMI ≥30.0 kg/m^2) [21].

Statistical analysis

Statistical analysis of the data was performed using the IBM®SPSS® version 25 program. In the study, mean±standard deviation ($\bar{X}$±SD) or median (minimum-maximum) for numerical variables and frequency (n) and percentage (%) for categorical variables were given as descriptive statistics depending on the assumptions. The compatibility of the quantitative variables in the study with normal distribution was examined with the Kolmogorov-Smirnov test. In examining the differences

between the two groups, the Student's t-test was used if the parametric test assumptions were met, and the Mann-Whitney U test was used if not. One-way Analysis of Variance (ANOVA) was used to examine the differences between more than two normally distributed groups, and Tukey's test, one of the multiple comparison tests, was used to determine which groups the difference originated from. Kruskal-Wallis test, which is a nonparametric test, was used to examine the differences between two or more groups in non-normally distributed data, and the Mann-Whitney U test was used to evaluate pairwise comparisons between groups. Spearman's correlation coefficient was used to assess the relationship between fear of COVID-19 and knowledge about COVID-19, reported preventive behaviors in response to COVID-19, and misconceptions about COVID-19. Multiple Linear Regression Analysis was performed to determine the independent variables affecting a numerical dependent variable and the Coefficient of Explanation (R2) was given. In the analysis, $p<0.05$ was considered statistically significant.

RESULTS

Evaluation of participants' body weight changes, COVID-19-related knowledge, preventive behaviors, fear, and misconception scores

A total of 354 individuals (16.4% males and 83.6% females) participated in the study. The median age of the participants was 33 years (range: 20-55). Of the participants, 46.9% were single and 53.1% were married. Among the adults, 232 (65.5%) had normal body weight and 117 (33.1%) were overweight/obese. Most participants had high levels of knowledge and preventive behaviors related to COVID-19 (95.8% and 91.8%, respectively). The mean scores for COVID-19-related knowledge, preventive behavior, fear, and misconception were 13.65±1.205, 8.28±1.542, 17.49±5.739 and 34.81±8.804, respectively (Table 1).

Table 1 – Evaluation of participants' body weight change, COVID-19-related knowledge, preventive behaviors, fear, and misconception scores (n=354).

Variables	N	%
Body mass index		
Normal body weight	232	65.5
Overweight/obesity	117	33.1
Not reported	5	1.4
Changes in body weight		
Not changed	118	33.3
Increased	143	40.4
Decreased	89	25.1
Not reported	4	1.1
Level of COVID-19 knowledge		
Low	-	-
Average	15	4.2
High	339	95.8
Level of self-reported COVID-19 preventive behavior		
Low	-	-
Average	29	8.2
High	325	91.8
Variables	Mean±SD	
COVID-19 knowledge score	13.65±1.205	
Self-reported COVID-19 preventive score-	8.28±1.542	
Fear of COVID-19	17.49±5.739	
Misconception on the COVID-19	34.81±8.804	

Note: M: Mean, SD: Standard Deviation.

Evaluation of individuals' knowledge, preventive behaviors, fear, and related misconception scores about COVID-19 according to demographic information

A significant difference was found between men and women in terms of COVID-19 fear scale and COVID-19 misconception scores ($p<0.001$; $p=0.034$, respectively). Both fear and misconception scores were higher in women than in men (Table 2). A significant difference was found between married and single individuals only in terms of preventive behavior scores ($p=0.066$). The preventive behavior scores of married individuals in response to COVID-19 were higher than those of single individuals (Table 2). No significant difference was found between individuals with normal body weight and those with overweight or obesity according to body mass index ($p>0.05$). A significant difference was found in COVID-19 misconception scores among body weight change status (increase, decrease, no change) during the pandemic period in terms of COVID-19 misconception scores ($p=0.017$). The difference was between individuals whose body weight increased and those whose body weight did not change; and those with increased body weight had higher misconception scores (Table 2). There was no significant difference between men and women regarding weight gain (M_U=233.5; $p=0.148$) or weight loss (M_U=1188; $p=0.517$).

Table 2 – Evaluation of individuals' knowledge, preventive behaviors, fear, and related misconception scores about COVID-19 according to demographic information.

Characteristics	COVID-19			
	Knowledge score ($\overline{X}$±SD)	Preventive behavior score ($\overline{X}$±SD)	Fear score ($\overline{X}$±SD)	Misconception score ($\overline{X}$±SD)
Gender				
Female	13.68±1.173	8.30±1.534	18.08±5.667	35.25±8.782
Male	13.47±1.354	8.19±1.594	14.48±5.175	32.55±8.639
Z[1], *p*	-0.993, 0.321	-0.585, 0.558	-4.394, <0.001	-2.124, 0.034
Marital status				
Single (n=166)	13.58±1.177	8.10±1.635	17.01±5.985	35.33±8.615
Married (n=188)	13.71±1.23	8.44±1.441	17.91±5.495	34.35±8.964
Z[1], *p*	-1.336, 0.182	-2.763, 0.006	-1.661, 0.097	0.847, 0.397
Education status				
High School (n=10)	12.90±1.969	6.90±2.131	16.3±7.645	35.7±6.601
University (n=344)	13.66±1173	8.32±1.506	17.52±5.686	34.78±8.866
Z[1], *p*	-0.762, 0.446	-2.019, 0.044	-0.772, 0.470	0.342, 0.732
BMI (kg/m^2)				
Normal	13.56±1.274	8.28±1.445	17.67±5.751	35.55±8.939
Overweight/obese	13.79±1.055	8.36±1.567	17.15±5.736	33.4±8.026
Z[1], *p*	-1.405, 0.160	-1.324, 0.185	-0.624,0.532	-1.862, 0.063
Body weight change status during the pandemic period (kg)				
Increased	13.64±1.297	8.29±1.486	17.71±5.576	36.16±8.472[a]
Unchanged	13.66±1.119	8.33±1.497	17.04±5.479	33.03±8.296[b]
Decreased	13.65±1.188	8.26±1.585	17.8±6.412	34.97±9.816[a,b]
F[2], *p*	0.007, 0.993	0.058, 0.944	0.581, 0.560	4.151, 0.017

Note: [1]Mann-Whitney U t-test; mean±standard deviation; [2]Variance Analysis; mean±standard deviation. [a, b]Values denoted by different letters are significantly different from each other in column. Statistically significant *p* values are shown in bold.

Correlation (r) between fear of COVID-19 and knowledge, preventive behavior, and misconceptions, along with evaluation of independent variables affecting fear

A weak positive linear relationship was found between fear of COVID-19 and knowledge, behavior, and misconception scores (r=0.014, r=0.176, r=0.206, respectively) (Table 3). When examining

the model of the effect of age, marital status, body weight change, and gender on fear, alongside knowledge, behavior, and misconception scores, only age, gender, misconception, and behavior were found to independently affect fear.

According to the linear regression analysis, the model established as Fear = 0.802 + 0.168 (Misconception) + 0.679 (Behavior) + 0.060 (Age in years) + 3.487 (Gender: female) was statistically significant (p<0.001) (Table 3). Misconception, behavior, age, and gender explained only 16.5% of the model. An increase of 1 unit in the behavior score leads to an increase of 0.679 points in the fear score. Similarly, a 1-unit increase in misconception score leads to a 0.168 increase in fear score and a 1-unit increase in age leads to a 0.060 increase in fear score. The fear score of women is 3.487 points higher than that of men.

Table 3 – Correlation (r) between fear of COVID-19 and knowledge, preventive behavior, and misconceptions, along with evaluation of independent variables affecting fear.

Variables	Fear of COVID-19				
Knowledge of COVID-19	r=0.130*, p=0.014				
Self-reported assessment of preventive behaviors	r=0.176**, p=0.001				
Misconception of COVID-19	r=0.206**, p<0.001				
Variables	Unstandardized beta	Standard error	t	p	95% CI
Age (years)	0.060	0.022	2.757	0.006	0.017-0.103
Gender (female)	3.487	0.778	4.484	<0.001	1.957-5.016
Misconception of COVID-19	0.168	0.032	5.203	<0.001	0.105-0.232
Self-reported assessment of preventive behaviors	0.679	0.184	3.681	<0.001	0.316-1.041

Note: *Correlation is significant at the 0.05 level (2-tailed), **Correlation is significant at the 0.01 level (2-tailed). r=Spearman Correlation Coefficient Dependent Variable: Fear; Model Significance p<0.001; R2=0.165. Model 1: Age; Model 2: Age+Gender; Model 3: Age+Gender+Misconception; Model 4: Age+Gender+Misconception+Behavior. CI: Confidence Interval. Statistically significant p values are shown in bold.

Changes in the consumption of some foods according to individuals' COVID-19-related knowledge, preventive behaviors, fear, and related misconception scores during the pandemic period

According to the COVID-19 knowledge score, the changes in the consumption of milk (p=0.009), bread (p=0.014), green leafy vegetables (p=0.003), yellow-orange vegetables (p=0.013) and chocolate, wafer, and biscuit (p=0.027) during the pandemic period were statistically significant. According to the COVID-19 preventive behavior score, the change in cheese (p=0.008) consumption during the pandemic period was statistically significant. According to the COVID-19 fear score, the changes in milk (p=0.037), yogurt (p<0.001), and cheese (p=0.037) consumption during the pandemic period were statistically significant. According to the COVID-19 misconception score, changes in bread (p=0.004), other cereals (p=0.009), pastry desserts (p=0.004), chocolate, wafer, and biscuit (p=0.032), and butter (p=0.037), soft margarine (p=0.011) consumption during the pandemic period were statistically significant (Table 4). It was found that individuals whose milk consumption increased during the pandemic period had higher levels of COVID-19 knowledge and fear (p=0.009; p=0.037, respectively). Those whose cheese consumption increased had higher levels of COVID-19 preventive behavior and fear (p=0.008; p=0.037, respectively). Additionally, individuals whose bread consumption decreased during the pandemic period had higher COVID-19 knowledge and misconceptions (p=0.014; p=0.004, respectively). Similarly, those whose consumption of chocolate, wafer, and biscuit decreased had higher COVID-19 knowledge and misconception scores (p=0.027; p=0.032, respectively), while individuals whose pastry dessert consumption decreased had higher misconception scores only (p=0.004) (Table 4).

Table 4 – Changes in the consumption of some foods according to individuals' COVID-19 related knowledge, preventive behaviors, fear, and related misconception scores during the pandemic period.

Foods	COVID-19			
	Knowledge score ($\overline{X}$±SD)	Preventive behavior score ($\overline{X}$±SD)	Fear score ($\overline{X}$±SD)	Misconception scores ($\overline{X}$ ±SD)
Milk and Dairy Products				
Milk Consumption				
Increased	13.95±1.482[a]	8.09±2.100	19.32±5.973[a]	36.41±10.829
Unchanged	13.60±1.163[b]	8.34±1.409	17.14±5.528[b]	34.29±8.419
Decreased	13.53±1.014[b]	8.20±1.455	17.20±6.291[ab]	35.73±7.967
p	**0.009**	0.820	**0.037**	0.149
Yogurt Consumption				
Increased	13.70±1.156	8.48±1.268	19.08±5.742[a]	35.68±9.776
Unchanged	13.63±1.185	8.28±1.449	17.21±5.423[b]	34.30±8.365
Decreased	13.57±1.550	7.46±2.659	13.21±5.731[c]	35.25±7.919
p	0.866	0.154	<0.001	0.517
Cheese Consumption				
Increased	13.81±1.205	8.51±1.217[a]	18.67±5.760[a]	36.75±10.215
Unchanged	13.61±1.198	8.31±1.439[a]	17.26±5.609[b]	34.22±8.227
Decreased	13.44±1.261	7.20±2.739[b]	15.52±6.306[b]	33.68±8.112
p	0.196	**0.008**	**0.037**	0.138
Vegetables				
Green Leafy Vegetables Consumption				
Increased	36.11±8.840[a]	8.37±1.396	17.99±5.706	36.11±8.840
Unchanged	34.02±8.397[b]	8.22±1.627	17.16±5.666	34.02±8.397
Decreased	32.53±11.286[ab]	8.11±1.792	16.95 ±6.704	32.53±11.286
p	**0.003**	0.837	0.476	0.056
Yellow Orange Vegetables Consumption				
Increased	13.90±1.091[a]	8.24±1.507	17.32±5.594	35.72±9.211
Unchanged	13.52±1.195[b]	8.30±1.580	17.60±5.894	34.28±8.629
Decreased	13.56±1.756[ab]	8.22±1.353	17.22±4.930	35.44±8.183
p	**0.013**	0.556	0.834	0.224
Fruit Consumption				
Increased	13.78±1.285	8.22±1.616	17.58±5.980	36.45±10.058
Unchanged	13.57±1.167	8.32±1.547	17.48±5.700	34.18±7.904
Decreased	13.70±1.190	8.22±1.365	17.35±5.490	34.07±9.455
p	0.118	0.398	0.962	0.308
Fats				
Spread Margarine Consumption				
Increased	14.11±1.167	8.89±0.333	18.44±7.178	36.67±5.196[a]
Unchanged	13.58±1.203	8.15±1.726	17.05±5.501	33.79±8.865[ab]
Decreased	13.74±1.208	8.48±1.145	18.27±6.029	36.62±8.639[ac]
p	0.165	0.150	0.154	**0.011**
Butter Consumption				
Increased	13.77±1.074	8.47±1.094	17.78±6.133	36.19±8.468[a]
Unchanged	13.61±1.210	8.25±1.643	17.27±5.499	33.95±8.463[b]
Decreased	13.62±1.386	8.11±1.613	18.18±6.351	37.04±10.471[a]
p	0.752	0.330	0.658	**0.037**
Cereals				
Bread Consumption				
Increased	13.55±1.221[a]	8.38±1.475	17.16±5.440	33.92±8.974[a]
Unchanged	13.54±1.198[a]	8.31±1.521	17.50±5.646	33.72±8.264[a]
Decreased	13.90±1.184[b]	8.17±1.626	17.68±6.114	37.26±9.212[b]
p	**0.014**	0.505	0.838	**0.004**
Other Cereals Consumption				
Increased	13.67±1.175	8.31±1.675	17.32±5.910	34.89±11.476[a]
Unchanged	13.63±1.169	8.27±1.531	17.41±5.609	33.90±7.649[ab]
Decreased	13.68±1.376	8.27±1.439	17.98±6.061	37.94±8.554[ac]
p	0.716	0.819	0.702	**0.009**

Table 4 – Changes in the consumption of some foods according to individuals' COVID-19 related knowledge, preventive behaviors, fear, and related misconception scores during the pandemic period.

Foods	COVID-19			
	Knowledge score ($\overline{X}$±SD)	Preventive behavior score ($\overline{X}$±SD)	Fear score ($\overline{X}$±SD)	Misconception scores ($\overline{X}$ ±SD)
Meats				
Red Meat Consumption				
Increased	13.83±1.062	8.35±1.675	17.24±6.375	35.36±9.627
Unchanged	13.65±1.121	8.27±1.541	17.60±5.536	34.77±8.588
Decreased	13.07±1.911	8.13±1.137	17.30±5.639	33.63±8.277
p	0.132	0.085	0.742	0.694
Poultry Consumption				
Increased	13.81±1.175	8.13±1.860	16.68±5.986	33.75±9.158
Unchanged	13.65±1.167	8.27±1.556	17.81±5.656	35.09±8.983
Decreased	13.42±1.401	8.52±0.839	17.10±5.776	34.94±7.364
p	0.270	0.826	0.337	0.663
Egg Consumption				
Increased	13.73±1.075	8.23±1.643	17.53±5.487	34.20±8.545
Unchanged	13.58±1.152	8.28±1.563	17.42±5.874	34.97±8.871
Decreased	13.74±1.879	8.48±0.851	17.77±6.026	36.23±9.458
p	0.120	0.775	0.902	0.362
Nuts Consumption				
Increased	13.76±1.240	8.22±1.740	17.75±5.457	34.95±9.023
Unchanged	13.57±1.214	8.29±1.452	17.45±6.009	34.57±8.590
Decreased	13.57±0.843	8.57±0.728	16.22±5.248	35.87±9.435
p	0.166	0.923	0.448	0.640
Sugary Foods				
Pastry Desserts Consumption				
Increased	13.67±1.138	8.42±1.317	17.63±5.989	35.21±9.194[a]
Unchanged	13.62±1.115	8.09±1.866	17.11±5.642	33.32±8.469[ab]
Decreased	13.66±1.387	8.46±1.058	17.97±5.704	36.79±8.657[ac]
p	0.645	0.334	0.631	**0.004**
Chocolate, Wafer, Biscuit Consumption				
Increased	13.39±1.310[a]	8.14±1.743	17.47±5.730	34.62±9.483[a]
Unchanged	13.81±1.061[b]	8.19±1.702	17.55±5.751	33.83±8.266[ab]
Decreased	13.68±1.255[ab]	8.58±0.876	17.42±5.791	36.54±8.659[ac]
p	**0.027**	0.105	0.926	**0.032**

Note: Calculated with Kruskal-Wallis. **[abc]**:Values denoted by different letters are significantly different from each other in the column (Mann-Whitney U *post hoc* test applied). Statistically significant *p* values are shown in bold.

DISCUSSION

This study aimed to assess the complex interplay between COVID-19-related knowledge, preventive behaviors, fear, misconceptions, and their impact on healthcare workers' health behaviors, particularly nutritional habits, and included a total of 354 volunteer adult healthcare workers. In the fight against COVID-19, it is crucial to evaluate the fear, knowledge, preventive behaviors, and misconceptions of healthcare workers regarding the pandemic, as they are on the front lines and at high risk of contracting the disease [22]. The findings of this study are expected to provide valuable insights into the changing dietary habits of healthcare workers during the pandemic, as well as their fear, knowledge, preventive behaviors, and misconceptions related to the virus. This information could help guide the systematic design of policies for infection prevention, protection, and control.

During the pandemic, healthcare workers have been the most psychologically, socially, and mentally affected group due to the additional responsibilities placed on their duties. Studies

have reported that a significant portion of healthcare workers are at high risk for developing poor mental health during this period [23]. Quarantine measures and restrictions have contributed to mood disorders, depression, anxiety, fear, and stress in individuals [24]. Additionally, there has been an increase in the number of people seeking treatment for anxiety and depressive disorders [25]. Changing quarantine protocols, restrictions, lack of information, long working hours, and insufficient personal protective equipment have physically and emotionally exhausted healthcare workers, heightening their fears of contracting the disease and even leading to resignations [26-28]. A study conducted by Labrague et al. (2021) reported a mean score of 19.92±6.15 on the COVID-19 fear scale [29]. In this study, the COVID-19 fear scale score was 17.49±5.73 (Table 1). Compared to studies on fear levels in the general population, the mean score in this study is like some studies but higher than that in others [30,31]. Among healthcare workers, anxiety and fear can negatively impact their health, well-being, and job performance during a pandemic crisis [15]. To effectively contribute during the pandemic, healthcare workers must prioritize and maintain their psychological and mental health [32].

A study conducted in Bangladesh found that COVID-19 fear is strongly associated with women in both the general population and healthcare workers [33]. In this study, not only were the mean scores for COVID-19 fear and misconceptions high, but women also have higher scores for both fear and misconceptions compared to their male counterparts (Table 2). Similarly, a study by Feleke et al. also found that misconceptions were more prevalent among women than men [34]. Although men face a higher risk of morbidity and mortality from the pandemic, women report higher levels of fear [35]. Another study indicated that women experience higher levels of fatigue, anxiety, and depression compared to men [28]. This has been attributed to women bearing a heavier burden than men during the pandemic, including household chores, childcare, and family responsibilities, in addition to their professional duties [36]. However, the finding that female medical students report higher levels of fear than their male counterparts suggests that, beyond work-related pressures, other gender-related factors may also contribute to fear [37]. It has been suggested that women, due to a more sensitive hypothalamic-pituitary axis compared to men, are more prone to fear. This highlights the need for greater focus on women's mental health and the development of targeted strategies [28]. Among healthcare workers, the most significant factors associated with COVID-19 fear are, in order: the fear of infecting family members, becoming infected themselves, being quarantined, not receiving medical treatment, and death [26]. Indeed, this study found that married individuals exhibited significantly higher preventive behaviors (Table 2), suggesting that the concern about infecting family members may trigger more preventive actions among married individuals.

During the COVID-19 pandemic, psychological distress including anxiety, depression, stress, and fear – among Jordanian healthcare workers was significantly associated with being over 40 years old and having more clinical experience [38]. In this study, COVID-19 fear was also found to be associated with increasing age. An increase of 1 unit in age resulted in a 0.060 increase in the fear scale score (Table 3). Similarly, in the study by Kabasakal et al., the COVID-19 fear score for healthcare workers aged 45 and over was found to be 4.041 times higher compared to individuals in the 18-24 age group. In healthcare workers, the increase in age can be considered to parallel work experience, knowledge, fear, and coping abilities [35].

To reduce the spread of the virus, the level of knowledge among healthcare workers is directly associated with strict preventive behaviors. Several studies have investigated the level of COVID-19 knowledge among healthcare workers and found it to be high [4,39]. Ebrahimi et al. (2023) found that most healthcare workers (73.6%) had high levels of knowledge and preventive behavior [40].

In this study, most healthcare workers found to have high levels of COVID-19 knowledge (95.8%) and engaged in preventive behaviors to ensure protection (91.8%) (Table 1). This suggests that professional training received by individuals may have contributed to these results. In contrast, most healthcare workers in Pakistan who reported high levels of fear (88.1%) indicated that health education on topics such as infection control measures in COVID-19 centers and maintaining good hygiene practices is necessary to prevent the spread of infection [26]. Healthcare workers who are in direct contact with patients must protect their own health while providing care. A lack of information about the pandemic can significantly contribute to the increase in case numbers and hinder healthcare workers from protecting their own health. It is well-established that the level of knowledge directly influences susceptibility to the disease and the adoption of preventive behaviors [27]. Although the literature suggests that gender is a factor associated with knowledge, this study found no significant difference in COVID-19 knowledge levels between genders among healthcare workers (Table 2) [41]. The educational level is a significant factor associated with knowledge levels. Several studies have shown that as the educational level increases, knowledge about COVID-19 also significantly improves [41,42]. However, Taghrir et al. [43] did not find a significant difference between educational level and COVID-19 knowledge. Similarly, in this study, although COVID-19 knowledge increases with higher educational levels, the difference is not statistically significant (Table 2).

Healthcare workers' direct involvement in patient care increases their risk of contracting COVID-19 compared to the general population [44]. In this study, a statistically significant correlation was found between COVID-19 fear and knowledge, preventive behaviors, and misconceptions (Table 3). It can be inferred that elevated levels of COVID-19 fear trigger increased knowledge and misconceptions, as well as the adoption of preventive measures. Misconceptions are likely to be fueled by misinformation, disinformation, myths, low literacy, and limited access to reliable sources, such as healthcare services and professionals [45]. During the pandemic, the presence of various information sources about the outbreak, coupled with the uncertainty regarding disease treatment, may contribute to misconceptions, which in turn could heighten fear among individuals [46]. A statistically significant difference was found between the fear of contracting the disease and COVID-19 knowledge levels in medical students. Those with a low level of knowledge reported higher levels of fear of infection, while those with a high level of knowledge expressed a lower level of fear [43,47]. Indeed, in this study, individuals with higher levels of COVID-19 fear were found to have greater knowledge levels, more preventive behaviors, and increased misconceptions (Table 3).

While some studies reported an increase in body weight due to the intense work pace of healthcare workers during the pandemic period, along with social restrictions and quarantine measures introduced to reduce the spread of the disease, other studies found no change in body weight [48-50]. In a study conducted with healthcare workers in Türkiye, it was reported that 51.4% of participants experienced weight gain, 17.8% had weight loss, and 30.9% reported no change in body weight [7]. In this study, during the pandemic period, 40.4% of healthcare workers reported weight gain, 25.1% reported weight loss, and 33.3% reported no change in weight (Table 1). While changes in body weight serve as an indicator of nutritional status, body fat percentage and its distribution are crucial for maintaining health and preventing the risk of chronic diseases. Although this study did not assess body composition, it is important to note that muscle loss can occur even in individuals who experience no change in body weight. A study conducted with healthcare workers in Brazil found that, during the post-pandemic period, there was a significant increase in body weight, waist circumference, and body fat percentage, while lean mass decreased by an average of 1.4 kg [51].

The pandemic disrupted healthcare workers' professional activities and daily routines [52]. Gomes et al. [52] observed an increase in body weight among physicians due to reduced physical activity levels caused by social distancing measures. Factors such as stress related to social distancing, fear of contamination, and reduced income can lead to changes in dietary and physical activity habits [53,54]. Oliver et al. [55] reported that a reduction in physical activity was a contributing factor to the increase in body weight during the COVID-19 pandemic. However, some studies suggest that negative changes in dietary habits, rather than physical inactivity, have had a more significant impact [56,57]. The COVID-19 pandemic was a period of increased incidence of eating behavior disorders in individuals [58]. A study conducted during the pandemic found a positive association between night eating syndrome and body mass index [59].

It is known that eating habits are influenced by psychological symptoms such as fear, depression, anxiety, and stress, and it has been observed that these conditions, which developed during the pandemic, affected eating habits and diet quality [60,61]. COVID-19 fear, increased workload, stress levels, restrictions, long shifts, and emotional eating have been reported to lead to an increase in fast food and processed food consumption, resulting in higher dietary intake of energy, fat, and simple sugars [7,51]. A study conducted in Türkiye during the pandemic found that healthcare workers had higher levels of emotional eating compared to the general population [62]. Increased fear and stress during the pandemic may lead to changes in eating habits. Additionally, losing a relative to COVID-19 has been identified as an independent risk factor influencing changes in dietary habits among healthcare workers [7].

On the other hand, some studies have reported that healthcare workers adopted healthier eating habits as a coping mechanism to maintain their health during the pandemic. Increased awareness of health and immunity led healthcare workers to consume more fruits and vegetables [7]. Additionally, for some healthcare workers, the transition to remote work provided more opportunities to prepare or eat meals at home. A study conducted with healthcare workers in Qatar found that, compared to before the pandemic, 55.6% of participants ate out at restaurants less frequently, while 19.4% either did not eat out at all or exclusively consumed home-cooked meals. Furthermore, during the pandemic, the consumption of foods such as fish, red meat, jam, sugary drinks, sugar, ice cream, and pickles increased, while the consumption of sugar-free beverages, sweets, cakes, chocolates, and nuts decreased [63]. In this study, a significant relationship was found between high COVID-19 misconception scores and a decrease in the consumption of pastries, chocolate, wafers, and biscuits during the pandemic (Table 4).

Yaman and Hocaoğlu (2023) reported that during the pandemic, 43.2% of healthcare workers in Türkiye increased their consumption of fresh vegetables, fruits, ginger, turmeric, onions, and garlic, believing these foods helped protect them from illnesses [7]. Specific nutrients, including omega-3 fatty acids, vitamins C and D and other antioxidant compounds found in the Mediterranean diet foods, such as fish, olive oil, nuts, fruits and vegetables, can support the optimal function of the immune system [64]. Doğan et al. [65] reported that during the pandemic, Turkish healthcare workers increased their consumption of frozen foods, canned foods, fresh fruits, dried fruits, nuts, tea/coffee, red meat, and honey products. The study by Molina-Montes et al. [66]) emphasizes that quarantine measures led to an improvement in dietary habits, increasing adherence to the Mediterranean diet across 16 European countries. About 10-15% of participants reported an increase in their consumption of olive oil, legumes and fish during the lockdown, while approximately 20-25% reported consuming more fruits and vegetables. In contrast, their consumption of red meat, soft drinks and pastries generally decreased. In this study, healthcare workers with higher average

COVID-19 knowledge scores were found to have increased their consumption of milk, green leafy vegetables, and yellow-orange vegetables, while reducing their intake of bread, chocolate, wafers, and biscuits (Table 4). Similarly, among healthcare workers on the front lines of patient care, healthy eating behaviors have been identified as an independent determinant of COVID-19 fear. Additionally, it has been shown that healthcare workers with higher healthy eating behavior scores e lower levels of COVID-19 fear [67]. Among healthcare workers in Vietnam, a state of well-being has been linked to healthy eating habits, regular exercise, and adherence to COVID-19 preventive measures [68]. This study found a significant relationship between COVID-19 preventive behaviors and an increase in only cheese consumption (Table 4). Similarly, this study found that, although no changes were observed across all food groups, healthcare workers who made positive changes in their eating habits due to the COVID-19 pandemic had higher scores in knowledge, preventive behaviors, fear, and misconceptions. The results underscore the need for additional interventions to promote health and well-being among healthcare workers during the pandemic. Further research is needed to expand the investigation beyond healthcare settings to other working environments affected by the pandemic. Comparing the unique challenges faced by healthcare workers with findings from remote workers, as highlighted by several studies, could provide a more comprehensive understanding of how COVID-19 influenced dietary habits, stress, lifestyle behaviors, and other factors. Such comparisons could inform targeted interventions for various occupational groups during future health crises [69-73].

CONCLUSION

During the pandemic, healthcare workers have shouldered significant responsibilities. The findings indicate that, although not statistically significant, healthcare workers, especially women, possess good knowledge and positive preventive behaviors towards COVID-19. The results suggest that interventions should pay closer attention to men and older healthcare workers. Unhealthy eating behaviors may contribute to more severe issues of overweight and obesity, potentially leading to a greater burden of chronic diseases in later life. This study focuses on the impact of the pandemic, providing valuable lessons for designing interventions aimed at improving the well-being of healthcare workers and supporting the sustainability of health systems. Understanding the current state of dietary patterns will be valuable for numerous stakeholders, including healthcare professionals and policymakers, as it allows for consideration of potential outcomes when making future decisions. The results of this study provide valuable insights for public health, informing both clinical practice and policy-making during the unprecedented pandemic period. Further research is needed to enable policymakers to develop strategies, and intervention plans for healthcare workers, with particular attention to high-risk groups.

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