

Effects of the COVID-19 pandemic on lifestyle among Iranian population: A multicenter cross-sectional study

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Background: Quarantine, an unpleasant experience, was implemented in many countries to limit the spread of Coronavirus disease 2019 (COVID-19), which it could associated whit lifestyle changes. The present study aimed to determine the changes in Iranian's lifestyle during COVID-19 pandemic. **Materials and Methods:** In the present cross-sectional study, 2710 Iranian people completed an online researcher-made questionnaire asking lifestyle regarding COVID-19, which includes five sections about physical activity, stress and anxiety, nutrition habit, sleep disorders, and interpersonal relationship in addition to demographic data from January to February 2021, using the multistage cluster sampling method. **Results:** The participants' mean age was 33.78 ± 11.50 years and 68.3% of them were female. Traveling, sightseeing, and family visits have been eliminated from 91%, 83.5%, and 77.5% of participants' lives, respectively. There were increase in stress level ($P < 0.001$), weight of the participants ($P < 0.001$), sleep problems ($P < 0.001$), and healthier foods ($P < 0.001$) but decrease in interpersonal communication ($P < 0.001$) and the amount of physical activity ($P < 0.001$). **Conclusion:** In summary, this study indicates some changes in lifestyle of Iranian people, including changes in some eating practices, physical activity, social communication, and sleeping habits during the pandemic. However, as the COVID-19 pandemic is ongoing, a comprehensive understanding of these behaviors and habits can help develop interventions to mitigate the negative lifestyle behaviors during COVID-19 pandemic.

Key words: Coronavirus disease 2019, Iranian, life style, population, quarantine

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INTRODUCTION

The outbreak of novel coronavirus (2019-nCoV), a severe acute respiratory syndrome, occurred in the late

December 2019 solely in the city of Wuhan, China.^[1,2] Then, it continued to spread rapidly within China and worldwide as the World Health Organization (WHO) characterized this epidemiological phenomenon as a global pandemic on March 11, 2020.^[3]

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According to the published report of WHO until November 17, 2020, there were 3,611,352 confirmed cases of COVID-19 and 91,738 deaths in Eastern Mediterranean Region.^[4] Iran that located in Southwestern Asia was the country most affected by the coronavirus disease 2019 (COVID-19) in the Middle East region.^[5] The first outbreak report of COVID-19 in Iran was in Qom, a city in Central Iran near the capital Tehran on February 20, 2020.^[6]

Since it is a highly contagious viral disease, many countries to combat the COVID-19 started preventive measures such as practice of good hygiene, social distancing, isolation, and quarantine to reduce the spread of the virus.^[7] Quarantine is an unpleasant experience which can create loss of freedom, anxiety, and stress.^[8] Lifestyle changes are main outcomes of quarantine.^[9]

Lifestyle includes three fundamental aspects of human health consisting of nutrition, physical activity, and restorative sleep, which these encompassing a wider range of behaviors such as smoking, alcohol/substance misuse, stress management, social support, and digital technology usage.^[10] Remote working and online learning, digital-education and limitation of outdoors and in-gym physical activity as a result of staying at home for a long time can cause changes in dietary habit, physical activity, and sleep patterns also, psychological status.^[11]

Access limitation to daily shopping due to closure of malls and local businesses can lead to consumption of unhealthy foods including highly processed, ready-to-eat cereals and junk foods.

Furthermore, the greater access to social media and continuously get news about COVID-19 along with fear and anxiety regarding the spread of the disease can be stressful. In this context, previous studies have shown relationship between stress and emotional eating and overeating, especially comfort foods rich in sugar as food craving.^[12] Taken together, these may lead to a sudden and drastic change in the lifestyle of the population that it is associated with an increased risk of chronic diseases such as obesity, heart disease, stroke, type 2 diabetes, some cancers, and chronic kidney disease. Therefore, in this condition, adopting a healthy lifestyle has paramount importance to avoid rising prevalence of chronic noncommunicable diseases.^[13-15]

Before COVID-19 pandemic, insufficient physical activity or inactivity and excessive screen time was described as sedentary lifestyle that is associated with an increased risk of chronic disease. Nowadays, during COVID-19 pandemic, an international study has been shown an increase in daily sitting time from 5 to 8 h per day that may further worsen this situation.^[14]

According to the literature, several studies on the lifestyle in the COVID-19 crisis were conducted worldwide^[13,16,17] and often have been addressed one of the dimensions of lifestyle such as physical activity and nutrition.^[11,12,18] On the other hand, lifestyle-related behaviors might vary greatly from country to country due to interplay of the COVID-19 infection with different social, economic, and cultural constructs. Further, there is no study that examined various lifestyle dimensions as a comprehensive approach in the population during the COVID-19 pandemic. Therefore, in a multicenter cross-sectional study, the effects of the COVID-19 pandemic on lifestyle among Iranian population were evaluated.

METHODS

Procedure

The present cross-sectional study was conducted on a population aged over 18 years in Iran from January 11 to 30, 2021. The participants were 2710 people who selected using multistage cluster sampling method. First, the country (Iran) was divided into five clusters (north, south, east, west, and center) and two or three provinces were selected from each cluster. Tehran, Markazi, and Chaharmahal-Bakhtiari provinces from the central cluster, Mazandaran and Golestan provinces from the northern cluster, Khuzestan and Bushehr provinces from the southern cluster, Khorasan Razavi, South Khorasan, and Sistan-Baluchistan provinces from the eastern cluster, and Kurdistan and Kermanshah provinces from the western cluster were selected (totally 12 provinces). According to the results of the census of the Statistics Center of Iran in 2016, the population over 20 years of age in the mentioned provinces has been reported as 2,764,9741 people. The sample size was estimated by considering the Cochran's sample size formula for a limited population, with $\alpha = 0.05$, $d = 0.02$, and $P = 0.5$ was determined 2401 people.

$$n = \frac{NZ^2_{1-\frac{\alpha}{2}}pq}{Nd^2 + Z^2_{1-\frac{\alpha}{2}}pq}$$

The research proposal was approved in Research Council of Golestan University of Medical Sciences and the National Ethics Committee in Biomedical Research, with a code of IR.GOUMS.REC.1399.300. The questionnaire was forwarded via the virtual networks in Telegram and WhatsApp groups and channels, and the individuals were asked to optionally complete it and forward it to their friends and acquaintances. The approximate time to complete the questionnaire was about 10 min, and it first started with an explanation of the research objectives.

Measures

Data were collected using a researcher-made questionnaire, which was developed based on the comprehensive literature

review and opinions of experts' panel. It consists of demographic questions (age, gender, education, job, place of residence, marital status, family size, income, weight, height, and COVID-19 history) and questions about lifestyle regarding COVID-19 including five sections (questions about physical activity changes [2 questions], stress and anxiety [2 questions], nutrition habits and weight change [14 questions], sleep disorders [6 questions], interpersonal relationship [5 questions], and activities that have been added or eliminated from your life after COVID-19 pandemic [2 questions]). All questions of the nutrition habits, interpersonal relationship, and sleep disorders were on a 3-point scale (2 = increased, 1 = not changes, and 0 = decreased), and their scores ranged from 0 to 2. Stress and anxiety dimensions included 2 questions; one of them was on a 3-point scale (2 = increased, 1 = not changes, and 0 = decreased). Another question was about the stress and anxiety management methods such as book studying, fun games, indoor exercise, and listening to music.

To determine the content and face validity of the researcher-made questionnaire, the content validity index (CVI) and content validity ratio (CVR) were used. To this end, the questionnaire was evaluated by 11 experts in the fields of health education and health promotion, epidemiology, public health, physiology, and also community health nursing. The mean CVI and CVR were 0.96 and 0.91, respectively.

To determine the reliability of the questionnaire, the questionnaire was completed by 25 individuals matched with the research sample, and the Cronbach's alpha for the whole scale was estimated 0.81.

Statistical analysis

In this study, SPSS 19 (SPSS Inc., Chicago, Illinois, USA) was used to analyze the data. Quantitative variables were described using mean and standard deviation, and qualitative variables were described using percentage and number. A fixed number comparison test was used to examine the trend of lifestyle changes. Thus, according to the scoring of the questionnaire (increased = 2, unchanged = 1 and decreased = 0), the mean score of individuals that is equal to one means a change in lifestyle. Significance level in the tests was considered 0.05.

RESULTS

The age range of the participants was 18–78 years, with a mean and standard deviation of 35.78 ± 11.5 . Demographic characteristics of the participants are shown in Table 1.

Social networks with 73.7% were the most important source of information in the time of Corona outbreak. Other Corona

Table 1: Frequency distribution of demographic characteristics of the participants

Variable	n (%)
Gender	
Male	858 (31.7)
Female	1852 (68.3)
Marital status	
Single	816 (30.1)
Married	1828 (67.5)
Divorced/widow	66 (2.4)
Education stages	
Elementary and high school	474 (17.4)
Diploma	103 (3.8)
Associate's degree/bachelor's degree	1363 (50.3)
Master's degree and upper	770 (28.5)
Occupation	
Healthcare worker	472 (17.4)
Faculty member	107 (3.9)
Homemaker	470 (17.3)
Employee	698 (25.8)
Simple worker	31 (1.1)
Skilled worker	37 (1.4)
Farmer/livestock	11 (0.4)
Businesspeople	96 (3.5)
Retired	146 (5.4)
Unemployed	110 (4.1)
University student	532 (19.6)
Socioeconomic status	
Very low	223 (8.2)
Low	608 (22.4)
Middle	1366 (50.4)
High	443 (16.3)
Very high	70 (2.6)
Impact of COVID-19 on employment income	
No changed	1825 (67.3)
Decreased to 50%	586 (21.6)
Decreased to 0	137 (5.1)
Increased	162 (6)
Suffering from COVID-19	
Yes	530 (19.6)
No	1471 (54.3)
I do not know	346 (12.8)
I have experienced the symptoms, but I am not sure	363 (13.4)
Family infection with COVID-19	
Yes	781 (28.8)
No	1465 (54.1)
I do not know	193 (7.1)
They have experienced the symptoms, but not sure	271 (10)
Province of residence	
Khorasan Razavi	239 (8.8)
Southern Khorasan	223 (8.2)
Golestan	498 (18.4)
Mazandaran	153 (5.6)
Charrmahal va Bakhtiari	219 (8.1)

Contd...

Table 1: Contd...

Variable	n (%)
Markazi	
Bushehr	101 (3.7)
Sistan and Baluchestan	188 (6.9)
Tehran	211 (7.8)
Kurdistan	503 (18.6)
Khuzestan	64 (2.4)
Kermanshah	250 (9.2)

COVID-19=Coronavirus disease 2019

information sources and items that have been removed or added from people's lives after Corona are demonstrated in Table 2.

Table 3 shows exercise decreased among 57.1% of individuals. Further, 60.9% stated that their anxiety and stress increased and 34.1% had weight gain after Corona outbreak, respectively.

The results showed that in terms of lifestyle dimensions, the nutritional style of the participants has changed compared to pre-Corona. According to the positive confidence interval, it can be concluded that more people have moved to healthier foods. Furthermore, there was a significant difference in sleep compared with pre-Corona. The high score of the questions related to sleep disorders indicated sleep problems.

Regarding interpersonal communication, due to the negative confidence interval, interpersonal communication and exercise have significantly decreased, and the weight of participants significantly increased. Stress of the participants has significantly also increased [Table 4].

DISCUSSION

This study was aimed at determining the trend of changes in the lifestyle of Iranians in the period after the outbreak of COVID-19.

In terms of lifestyle dimensions, the results showed that the nutritional style of the participants has shifted to healthier foods. It is in accordance with a survey conducted by Di Renzo *et al.*^[19] and is in contrast with the study by Giacalone *et al.* that more than half of the respondents had a low adherence to the Mediterranean diet.^[18]

One possible explanation is that several studies have shown a rise in home-cooking foods and reduction in the frequency of fast-food consumption during COVID-19.^[12,16,20] This could be due to the changes that have occurred after the outbreak of this pandemic. Due to restrictions on community attendance and the relative closure of restaurants and food preparation centers during the COVID-19 outbreak, eating out, which is

sometimes known as a cultural habit in Iranian society, has declined. On the other hand, the widespread publicity about the use of supplements and vitamins, especially Vitamins D and C, and their roles in increasing the body's immunity, has increased the desire of people to use these supplements. It is noticeable that healthy foods and adequate dietary nutrient are directly associated with immune system functioning and the proper functioning of the gut microbiota that indirectly modulating the immune response.^[21] Therefore, it seems that the adoption of a healthy diet by people is a prerequisite for the functioning of a good and strong immune system to resist infections, including the coronavirus.

The findings showed that nearly three-fifths of people (57.1%) reported that their exercise decreased after COVID-19 and more than three-fifths of people (60.9%) believed that their anxiety and stress increased after COVID-19. In addition, more than a third of people (34.1%) stated that they had weight gain after Corona outbreak.

Our results are consistent with the survey conducted by Mut *et al.* in 2020 in Germany that indicated leisure time sport and exercise activities declined significantly which were almost 60% inactive,^[22] and it is in contrast with Fitbit *et al.* in 2020 that found smaller decreases in physical activity levels ranging from 7% to 12%.^[23] In other words, the restrictions due to the wide social distance that was applied after COVID-19, such as observing social distance and not being in crowded places, can be effective in this weight gain and reducing exercise and physical activity. Although some sports venues have been open for some time over the past year after the relative control of the COVID-19 outbreak, it seems that people do not willing to go to the sports venues in spite of being open for fear of getting infected.

Three unhealthy behaviors including higher intake of food, lower levels of physical activity, and weight gain are interconnected.^[15,24] It seems that the high stress of people along with the significant reduction of physical activity has provided the ground for their weight gain. Decrease in physical activity during COVID-19 can affect both the physical and mental health. Stress in turn leads to overeating; especially comfort foods rich in simple carbohydrates can increase risk of development of obesity, chronic diseases, and lower immunity.^[25] The constant spread of news about this disease also causes anxiety and stress in people. The media highlights COVID-19 news as a public threat, increasing panic and stress.^[26] Therefore, paying attention to doing physical activity and stress management in the days of COVID-19 and the need to maintain it in any way can have positive effects on people's mental health these days.

In terms of sleep status, the results showed that after the outbreak of COVID-19, the participants reported more sleep

Table 2: Frequency distribution of Corona information source and items that have been removed or added from people's lives after Corona

Variables	Yes, n (%)	No, n (%)
Source of information about COVID-19		
Radio and TV	1448 (53.4)	1262 (46.6)
Health personnel	1018 (37.6)	1692 (62.4)
Magazines and newspapers	205 (7.6)	2505 (92.4)
Internet and social networks	1996 (73.7)	714 (26.3)
Friends and acquaintances	711 (26.2)	1999 (73.8)
Items that have been added to life after the COVID-19 outbreak		
Study	992 (36.6)	1718 (63.4)
Sport activities	696 (25.7)	2014 (74.3)
Make video calls with friends and relatives	1772 (65.4)	938 (34.6)
Spend more time with family	1672 (61.7)	1038 (38.3)
Observe personal hygiene	2168 (80)	542 (20)
Communicate more with God and read prayers	1083 (40)	1672 (60)
Make more use of the mask	2416 (89.2)	294 (10.8)
Items that have been eliminated from life after the COVID-19 outbreak		
Travel	2466 (91)	244 (9)
Recreational visits	2263 (83.5)	447 (16.5)
Outdoor sports	1612 (59.5)	1098 (40.5)
Family visit	2099 (77.5)	611 (22.5)
Going to sports clubs	2012 (74.2)	688 (25.8)

COVID-19=Coronavirus disease-2019

Table 3: Frequency distribution of changes in anxiety and stress, exercise, and weight of the participants after Corona pandemic

Variable	Increased, n (%)	Not changed, n (%)	Decreased, n (%)
Anxiety and stress	1651 (60.9)	845 (31.5)	205 (7.6)
Exercise	11 (279)	865 (31.9)	1548 (57.1)
Weight change	923 (34.1)	1427 (52.6)	360 (13.3)

problems. This is not unexpected due to the increased stress and anxiety reported by most participants. Our findings are in accordance with the study by Ismail *et al.* in 2019 that reported an increase in sleep hours during the pandemic compared to before the pandemic,^[11] while a study in China indicated that 42.8% of people had insomnia after the outbreak of COVID-19.^[27]

In addition, sleep through impaired mitogenic proliferation of lymphocytes, the upregulation of CD14+, and variations in CD4+ and CD8+ T-lymphocytes is considered as an important modulator of immune response so that shorter duration of sleep and sleep disturbance are associated with weakening of the immune system and susceptibility to infection such as COVID-19.^[28]

Interpersonal communication decreased significantly due to the negative confidence interval. This seems normal due to social constraints and distances that reduce communication and interaction with friends and relatives; however, in terms of communication with family members, the results

show that fights and arguments with family members have increased so much that these factors have reduced interpersonal relationships. Outbreaks are considered as a public health crisis and can lead to negative emotions such as anxiety, fear, anger, aggression, depression, and posttraumatic stress disorder. These feelings can be due to fear of infection, social isolation, insufficient health communication, reduction of social support systems, and loss of job and income.^[29] Thus, while social distancing is an effective measure of infection control, it can lead to significant social, economic, and psychological consequences, which act as a catalyst for stress and lead to violence.^[30]

Other results of this study have been the addition or removal of new items in people's lives. The vast majority of people have eliminated travel, recreation, family visits, and outdoor exercise from their lives, which can be due to the fear and stress of getting sick along with limitations taken by the government to prevent the spread of the disease. On the other hand, the outbreak of this disease has added items to the lives of people, the most important of which are personal hygiene, use of masks, spending time with family, and video calls with relatives and friends.^[20] Although these restrictions and healthcare are effective to control the spread of the coronavirus, they can lead to unintended negative consequences on lifestyle behaviors.

Our study exhibited that the most important source of information acquisition during COVID-19 was social

Table 4: Changes in lifestyle dimensions after suffering from coronavirus disease-2019 in study participants

Variable	Mean±SD	Test - statistic Value=1	P	95% CI	
				Lower	Upper
Nutrition	1.2886±0.25370	59.229	<0.001	0.2791	0.2982
Sleep	1.1290±0.32211	20.843	<0.001	0.1168	0.1411
Communication	0.7576±0.41241	-30.602	<0.001	-0.2580	-0.2269
Weight gain	1.21±0.656	16.411	<0.001	0.18	0.23
Stress	1.53±0.633	43.902	<0.001	0.51	0.56
Exercise	0.54±0.684	-35.132	<0.001	-0.49	-0.44

SD=Standard deviation; CI=Confidence interval

networks with 73.7%. Social media platforms are one of the easiest and most effective ways to disseminate information during major events such as a sport event, a disease or a natural disaster.^[31] Our study is in line with Ismail *et al.* in 2019 that they showed that the most resource of information for health and nutrition updates was social media applications, i.e., 70.3% and 70.8%, respectively,^[11] and in contrast with the study by Sambhav *et al.* that reported 38.9% of respondents used television and the rest go for newspaper and radio to get information about coronavirus.^[32] One possible explanation is that hearing or listening to news about the COVID-19 pandemic including its spread or mortality can be associated with elevated levels of stress and anxiety.^[33]

Strengths and limitations

This study was conducted with a relatively high sample size and with distribution in the five clusters of the country, and the results reflect the changes caused by COVID-19 in the dimensions of Iranian life. In addition, to our knowledge, this study was one of the first to investigate the impact of the COVID-19 lockdown on lifestyle changes among Iranian residents.

However, there are some limitations that should be considered in generalizing the results. First, this study was conducted in cyberspace, which, of course, many people in the community for some reasons do not have access to smartphones or social networks used in this study; therefore, it is suggested that a study be conducted from all regions of the country, especially among people who do not have access to smartphones and social media. The second limitation is the self-reporting nature of the tools used in this study and the cross-sectional nature of the study, which has its own inherent limitations. The third limitation is the lack of information about the lifestyle of people before COVID-19 and its comparison with the period after COVID-19. Therefore, conduction of longitudinal studies with a larger sample size can help to better understand the resulting changes in Iranian lifestyles.

CONCLUSION

COVID-19 pandemic has made changes in the lifestyle of the Iranian people, some of which are positive and

some of which are negative. Promoting healthy eating is one of the positive changes in the lifestyle of Iranians people, while increasing weight and stress levels and reducing physical activity are negative changes. Decreased social communication can be seen as a positive change in the Corona outbreak but, in the long term, can have adverse effects. Designing programs to strengthen and perpetuate positive changes and counteract negative lifestyle changes is recommended to moderate the effects of the COVID-19 pandemic.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, *et al.* A novel coronavirus from patients with pneumonia in China, 2019. *N Engl J Med* 2020;382:727-33.
- Nayeri ND, Nadali J, Divani A, Basirinezhad MH, Meidani M. Clinical manifestation, laboratory and radiology finding, treatment and outcomes of COVID-19: A systematic review and meta-analysis. *J Res Med Sci* 2021;26:41.
- Kassie BA, Adane A, Tilahun YT, Kassahun EA, Ayele AS, Belew AK. Knowledge and attitude towards COVID-19 and associated factors among health care providers in Northwest Ethiopia. *PLoS One* 2020;15:e0238415.
- Al-Mandhari AS, Brennan RJ, Abubakar A, Hajjeh R. Tackling COVID-19 in the Eastern Mediterranean Region. *Lancet* 2020;396:1786-8.
- Takian A, Raoofi A, Kazempour-Ardebili S. COVID-19 battle during the toughest sanctions against Iran. *Lancet* 2020;395:1035-6.
- WHO. Coronavirus Disease 2019 (COVID-19): Situation Report, 82. WHO; 2020.
- World Health Organization. Coronavirus disease (COVID-19) advice for the public 2020 [cited 2020 29 April]. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public>.

8. Giubilini A, Douglas T, Maslen H, Savulescu J. Quarantine, isolation and the duty of easy rescue in public health. *Dev World Bioeth* 2018;18:182-9.
9. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, *et al.* The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *Lancet* 2020;395:912-20.
10. Firth J, Ward PB, Stubbs B. Editorial: Lifestyle psychiatry. *Front Psychiatry* 2019;10:597.
11. Ismail LC, Osaili TM, Mohamad MN, Al Marzouqi A, Jarrar AH, Zampelas A, *et al.* Assessment of eating habits and lifestyle during coronavirus pandemic in the MENA region: A cross-sectional study. *Br J Nutr* 2021;126:757-66.
12. Di Renzo L, Gualtieri P, Pivari F, Soldati L, Attinà A, Cinelli G, *et al.* Eating habits and lifestyle changes during COVID-19 lockdown: An Italian survey. *J Transl Med* 2020;18:229.
13. Canello R, Soranna D, Zambra G, Zambon A, Invitti C. Determinants of the lifestyle changes during COVID-19 pandemic in the residents of northern Italy. *Int J Environ Res Public Health* 2020;17:E6287.
14. Ammar A, Brach M, Trabelsi K, Chtourou H, Boukhris O, Masmoudi L, *et al.* Effects of COVID-19 home confinement on eating behaviour and physical activity: Results of the ECLB-COVID19 international online survey. *Nutrients* 2020;12:E1583.
15. Heidari-Beni M, Kelishadi R. Reciprocal impacts of obesity and coronavirus disease 2019. *J Res Med Sci* 2020;25:110.
16. Husain W, Ashkanani F. Does COVID-19 change dietary habits and lifestyle behaviours in Kuwait: A community-based cross-sectional study. *Environ Health Prev Med* 2020;25:61.
17. He M, Xian Y, Lv X, He J, Ren Y. Changes in body weight, physical activity, and lifestyle during the semi-lockdown period after the outbreak of COVID-19 in China: An online survey. *Disaster Med Public Health Prep* 2021;15:e23-8.
18. Giacalone D, Frøst MB, Rodríguez-Pérez C. Reported changes in dietary habits during the COVID-19 lockdown in the Danish population: The Danish COVIDiet study. *Front Nutr* 2020;7:592112.
19. Di Renzo L, Gualtieri P, Pivari F, Soldati L, Attinà A, Cinelli G, *et al.* Eating habits and lifestyle changes during COVID-19 lockdown: an Italian survey. *J Transl Med* 2020;18:1-5.
20. Baghernezhad Hesary F, Salehiniya H, Miri M, Moodi M. Investigating preventive behaviors toward COVID-19 among Iranian people. *Front Public Health* 2021;9:590105.
21. Aslam MF, Majeed S, Aslam S, Irfan J. Vitamins: Key role players in boosting up immune response – A mini review. *Vitam Miner* 2017;6:2376-1318.
22. Mutz M, Gerke M. Sport and exercise in times of self-quarantine: How Germans changed their behaviour at the beginning of the COVID-19 pandemic. *Int Rev Soc Sport* 2021;56:305-16.
23. Lucini D, Gandolfi CE, Antonucci C, Cavagna A, Valzano E, Botta E, *et al.* # StayHomeStayFit: UNIMI's approach to online healthy lifestyle promotion during the COVID-19 pandemic. *Acta Biomed* 2020;91:e2020037.
24. Simonnet A, Chetboun M, Poissy J, Raverdy V, Noulette J, Duhamel A, *et al.* High prevalence of obesity in severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) requiring invasive mechanical ventilation. *Obesity* 2020;28:1195-9.
25. Rodríguez-Martín BC, Meule A. Food craving: New contributions on its assessment, moderators, and consequences. *Front Psychol* 2015;6:21.
26. Jiloha R. COVID-19 and mental health. *Epidemiol Int* 2020;5:7-9.
27. Wang Y, Zhu LY, Ma YF, Bo HX, Deng HB, Cao J, *et al.* Association of insomnia disorder with sociodemographic factors and poor mental health in COVID-19 inpatients in China. *Sleep Med* 2020;75:282-6.
28. Ibarra-Coronado EG, Pantaleón-Martínez AM, Velázquez-Moctezuma J, Prospéro-García O, Méndez-Díaz M, Pérez-Tapia M, *et al.* The bidirectional relationship between sleep and immunity against infections. *J Immunol Res* 2015;2015:678164.
29. Campbell AM. An increasing risk of family violence during the COVID-19 pandemic: Strengthening community collaborations to save lives. *Forensic Sci Int Rep* 2020;2:100089.
30. Usher K, Bhullar N, Durkin J, Gyamfi N, Jackson D. Family violence and COVID-19: Increased vulnerability and reduced options for support. *Int J Ment Health Nurs* 2020;7.
31. González-Padilla DA, Tortolero-Blanco L. Social media influence in the COVID-19 pandemic. *Int Braz J Urol* 2020;46:120-4.
32. Sambhav S. Role of mass media and communication during pandemic key role at crucial stage: Categories and challenges. *Int J Creat Res Thoughts* 2020;8:3786-90.
33. Gao J, Zheng P, Jia Y, Chen H, Mao Y, Chen S, *et al.* Mental health problems and social media exposure during COVID-19 outbreak. *PLoS One* 2020;15:e0231924.