Evaluation of Anxiety, Depression, and Insomnia Levels of Healthcare Professionals after Inactive COVID–19 Vaccination (CoronaVac)

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ABSTRACT

Objective: The aim of this study was to examine changes in the levels of depression, anxiety, and insomnia after inactive COVID-19 vaccination among healthcare professionals working actively during the COVID-19 pandemic.

Methods: This cross-sectional study was conducted from January 1, 2021, to June 30, 2021, using an online survey across frontline healthcare professionals in Turkey. The Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) scale were used to evaluate the mental health of the participants, and the Insomnia Severity Index-7 (ISI-7) was used to evaluate their sleep problems. The data obtained from two different periods, pre-vaccination and post-vaccination, were examined.

Results: The study included 416 healthcare professionals. The frequency of depression, anxiety, and insomnia was 27.9%, 31.5%, and 41.1%, respectively, in the pre-vaccination period, and there was a decrease in these rates (22.8%, 21.9%, and 34.1%, respectively) in the post-vaccination period. The differences between the two periods were also statistically significant for the PHQ-9 (p=0.000), GAD-7 (p=0.002), and ISI-7 (p=0.038) scores. We determined that the presence of long weekly working hours, being female, living alone, and presence of psychiatric disease were effective in the development of depression and anxiety.

Conclusion: Among frontline healthcare professionals, depression, anxiety, and insomnia symptoms and the frequency of the diagnosis of these clinical conditions increased due to the COVID-19 pandemic. However, after the start of the immunization process, the frequency of these mental disorders and the anxiety levels of the healthcare professionals significantly decreased.

INTRODUCTION

The novel coronavirus 2019 (COVID-19), which was first detected in Wuhan, China, in December 2019, has spread across the world in a short time.[1] The infection caused by this viral agent was accepted as the "2019-nCoV pandemic" on March 11, 2020, with the decision of the World Health Organization, and it was stated to be the first pandemic due to coronavirus.[2] Although physical measures, such as isolation and quarantine, have been successful in limiting the spread of the disease, their lifelong sustainability is not possible. In addition, these measures are not sufficient to protect the high-risk population against the COVID-19 infection and prevent related complications. This led to the urgent need for a "vaccine" to achieve herd immunity.[3] This need for a vaccine emerging with the rapid spread of the COVID-19 pandemic has required rapid action in vaccine studies and resulted in the development

of vaccines in an unprecedentedly short timeframe. The clinical trial of the first vaccine candidate for SARS-CoV-2 started in March 2020, and there are currently 83 vaccines under clinical development.[4,5]

The mass COVID-19 vaccination campaign in Turkey was initiated with the administration of the inactivated CoronaVac (Sinovac Life Sciences, Beijing, China) vaccine in January 2021.[6] In the first stage, healthcare professionals started to be vaccinated, and it was announced in official sources that more than 14.39 million COVID-19 vaccines were administered over a 3-month period.[7]

Healthcare professionals around the world have struggled with both a high risk of COVID-19 transmission and increased workload throughout the pandemic. High viral load in the transmission is the most important factor that causes the COVID-19 infection to be more severe and mortal among healthcare professionals.[8] In February 2020, when the COVID-19 pandemic reached its peak in China, nearly 2000 healthcare professionals had already been infected with the virus.[9] In our country, according to the official statement made in December 2020, more than 120,000 health professionals had a positive COVID-19 test and 216 died due to this disease.[10] While healthcare professionals witnessed the course of critically ill patients struggling with COVID-19, they were also shaken by the news of the loss of their colleagues. Combined with the intense work schedule of healthcare professionals, these negativities have important factors in the deterioration of their mental health. In addition to themselves, healthcare professionals have had to worry about their loved ones in terms of the risk of transmission during this period, and they have practiced social isolation more than the rest of the society. It has been observed that the reflections of the COVID-19 pandemic on mental health among healthcare professionals are mostly in the form of stress-related anxiety disorder, depression, and insomnia.[11]

Controlling the pandemic with vaccines is an important milestone that can be effective in improving not only our physical but also our mental health. The initiation of an effective vaccination process has been a starting point for healthcare professionals in this desperate and dark period. Investigating the effects of the vaccination process on mental status and social life can offer results that will assist in meeting the psychological support needs of healthcare professionals. The current study aimed to examine changes in the levels of depression, anxiety, and insomnia after inactive COVID-19 vaccination among healthcare professionals actively working during the COVID-19 pandemic. In addition, the effects of vaccination on healthcare professionals' concerns about COVID-19 and their social lives were evaluated.

MATERIALS AND METHODS

Participants and procedure

The study was planned as a cross-sectional study rather than a face-to-face survey evaluation system due to the conditions of the pandemic. Volunteer frontline healthcare professionals from emergency departments were contacted using social media platforms (official WhatsApp groups and Facebook accounts of the centers participating in the study) and data were collected with an electronic survey. The study included frontline healthcare professionals working in three different centers who had been actively working during the COVID-19 pandemic and had received two doses of the inactive COVID-19 vaccine. The study was conducted between January 1, 2021, and June 30, 2021. Informed consent was obtained electronically before data were collected from the participants. Permission to conduct the research was received from the COVID-19 Scientific Research Evaluation Commission of the Turkish Ministry of Health (number: 2021-02-22T18-51-45). Ethical approval was given by the ethics committee of a university.

Measurements

In the first part of the survey, the demographic characteristics of the participants, occupation (i.e., medical personnel, medical doctors and nurses, and nonmedical personnel), weekly working hours, educational status (≤9 years, i.e., junior high school and lower; >9 years, i.e., senior high school and higher), and marital status (married, unmarried, divorced, and widowed) were questioned. In addition, the presence of comorbidities, presence of psychiatric disease, and history of COVID-19 infection within the last 6 months were also questioned. The second part of the survey comprised scales on mental status and insomnia and included questions concerning the social life of the participants and the use of protective equipment. The nine-item Patient Health Questionnaire (PHQ-9; range: 0–27) and the seven-item Generalized Anxiety Disorder (GAD-7; range: 0–21) scale were used to evaluate anxiety and depression symptoms. The seven-item Insomnia Severity Index (ISI-7; range: 0–28) was used to assess sleep problems.

The PHQ-9 scale consists of nine items, each scored on a 4-point scale ranging from 0 (not at all) to 3 (nearly every day). A total score of 0–4 was defined as "normal," 5–9 as "mild," 10–14 as "moderate," 15–19 as "moderately severe," and 20–27 as "severe."[12] The validity and reliability studies of the Turkish version of this scale were undertaken by Sari et al.[13]

GAD-7 is an anxiety rating scale consisting of seven items rated on a 4-point scale ranging from 0 (not at all) to 3 (nearly every day). The total score was evaluated as "normal" for 0–4, "mild" for 5–9, "moderate" for 10–14, and "severe" for 15–21.[14] Konkan et al.[15] showed that the Turkish version of this scale was valid and reliable.

ISI-7, a self-report index consisting of seven items, was used to evaluate the insomnia and sleep problem levels of the participants.[16] The response to each item was scored on a 5-point scale ranging from 0 to 4. The total score was interpreted as "normal" for 0–7, "subthreshold" for 8–14,

"moderate" for 15–21, and "severe" for 22–28.[17] The validity and reliability of the Turkish version of this scale were examined by Boysan et al.[18] Using PHQ-9, GAD-7, and ISI-7, the cutoff values to identify the presence of major depression, anxiety, and insomnia symptoms were determined to be 10, 7, and 14, respectively.[11,19] The evaluation was undertaken in two separate periods covering the 2-week period before inactivated COVID-19 vaccination (CoronaVac) (pre-vaccination) and the 2-week period after the administration of the second dose of the vaccine (post-vaccination).

The participants were also asked about changes that occurred in their social lives, use of protective equipment at the workplace, and habits related to hygiene disinfection after vaccination. In addition, they were asked to score their anxiety levels related to COVID-19 from 0 to 10 for both the pre- and post-vaccination periods.

Statistical analysis

All statistical analyses were performed using Statistical Package for the Social Sciences (version 20.0, USA). Percentages and frequencies were obtained for categorical variables and mean±standard deviation values for continuous variables. The normality of the distribution of continuous variables was assessed using the Shapiro–Wilk test. Student's t-test or the Mann–Whitney U test was used to compare the normality of the distribution of continuous variables in binary comparisons. For categorical variables, the Chi-squared test was used. The logistic regression analysis was performed to investigate variables that might be effective in depression, anxiety, and insomnia. The confidence interval (CI) was determined as 95%, and a value of $p < 0.05$ was accepted as statistically significant.

RESULTS

Demographic characteristics

Of the 416 participants who completed the questionnaire, 226 (54.3%) were female and 190 (45.7%) were male. The mean age was 35.5±7.8 (range: 21–65) years. Of the participants, 404 (97.1%) were medical personnel and 12 (2.9%) were nonmedical personnel, and the distribution by occupation was as follows: doctors, 70.7%; nurses, 16.3%; health technicians/officers, 6.5%; dentists, 1.9%; and other personnel, 4.6%. The distribution of the participants according to their educational status was 95.7% for senior high school and higher and 4.3% for junior high school and lower. The mean total weekly working hours of the participants was calculated as 47.2±12.1 h.

Of the participants, 68.3% were married, 29.6% were unmarried, and 2.2% were divorced. While those living with their family constituted 80.5% of the sample, 16.6% lived alone and the remaining 2.9% lived with their friends. It was determined that 241 participants (57.9%) had children, and the mean number of children was 1.7±0.7. The rate of participants with any chronic disease was 17.1%, and the rate of those with psychiatric diseases was 3.8%. Ninety-three (22.4%) participants had a history of being infected with COVID-19 within the last 6 months. There was a history of smoking at a frequency of 28.8%.

PHQ-9

The mean PHQ-9 score of all the participants was 6.67±5.50 in the pre-vaccination period and 6.00±5.06 in the post-vaccination period. When we accepted the score of 10 as the clinical cutoff value, the PHQ-9 score was 10 or higher in 116 (27.9%) participants in the pre-vaccination period and 95 (22.8%) in the post-vaccination period. This difference between the periods was statistically significant (p=0.000). There was no significant difference between the pre-vaccination and post-vaccination periods in terms of the mean PHQ-9 score (p=0.071). The relationship between the evaluation periods and the severity classification of the PHQ-9 score is presented in Table 1.

GAD-7

The overall mean pre-vaccination GAD-7 score was 4.52±4.82, and the overall mean post-vaccination GAD-7 score was 3.68±3.87. This difference between the mean values was statistically significant (mean difference: 0.84, 95% CI: 0.25–1.44) (p=0.006). When we accepted 7 as the clinical cutoff value in this scoring, 131 (31.5%) of the participants in the pre-vaccination period and 91 (21.9%) of those in the post-vaccination period had a score of 7 and above. This difference between the two periods was statistically significant (p=0.002). The relationship between the evaluation periods and the severity classification of the GAD-7 score is shown in Table 1.

ISI-7

The overall mean ISI-7 score was 13.43±6.62 in the pre-vaccination period and 11.37±5.02 in the post-vaccination period, indicating a statistically significant difference (mean difference: 2.05, 95% CI: 1.25–2.85) (p=0.000). When we accepted 14 as the cutoff value in this scoring, 171 (41.1%) participants in the pre-vaccination period and 142 (34.1%) participants in the post-vaccination period had an ISI-7 score of 14 or higher. There was a statistically significant difference between the two evaluation periods (p=0.038). The relationship between the vaccination periods and the severity classification of the ISI-7 score is shown in Table 1.

For all three scoring systems, scores at cutoff values and above were considered to indicate the presence of depression, anxiety, or insomnia. We used the logistic regression analysis to examine variables that might be associated with the development of depression, anxiety, and insomnia in the pre-vaccination period. Independent variables that might be associated with depression were determined as female gender [p=0.007; odds ratio (OR): 1.93; 95% CI: 1.19–3.11], presence of psychiatric disease (p=0.007; OR: 0.22; 95% CI: 0.07–0.66), and total weekly working hours (p=0.000; OR: 1.04; 95% CI: 1.02–1.05). Variables that might be associated with anxiety were found to be the

Table 1. Severity categories of depression, anxiety, and insomnia measurements in total cohort and subgroups

Severity category	Evaluation period		p
	Pre-vaccination, n (%)	Post-vaccination, n (%)	
Nine-item Patient Health Questionnaire			
Normal	160 (38.5)	163 (39.2)	
Mild	140 (33.7)	153 (36.8)	
Moderate	82 (19.7)	76 (18.3)	0.632
Moderately severe	25 (6.0)	18 (4.3)	
Severe	9 (2.2)	6 (1.4)	
Seven-item Generalized Anxiety Disorder			
Normal	236 (56.7)	265 (63.7)	
Mild	123 (29.6)	123 (29.6)	0.004
Moderate	34 (8.2)	21 (5.0)	
Severe	23 (5.5)	7 (1.7)	
Seven-item Insomnia Severity Index			
Normal	128 (30.8)	162 (38.9)	
Subthreshold	148 (35.6)	160 (38.5)	0.000
Moderate	70 (16.8)	83 (20.0)	
Severe	70 (16.8)	11 (2.6)	

presence of psychiatric disease (p=0.023; OR: 0.28; 95% CI: 0.09–0.84), total weekly working hours (p=0.011; OR: 1.02; 95% CI: 1.00–1.04), and living alone (p=0.024; OR: 0.44; 95% CI: 0.22–0.89). When the variables that might be associated with insomnia were examined, no statistically significant results were obtained.

Changes in social life and anxiety levels

Table 2 presents the questions directed to the participants to evaluate changes in their social lives during the post-vaccination period and the distribution of their responses. When the COVID-19-related anxiety levels were examined, the mean score was 6.69±2.39 in the pre-vaccination period and 4.98±2.48 in the post-vaccination period, revealing a statistically significant difference (mean difference: 1.71, 95% CI: 1.38–2.04) (p=0.000). Changes in the sensitivity of using protective equipment in both work and social life were questioned in the post-vaccination period.

In this 5-point scale evaluation, 57% of the participants responded that the level of changes was "very low," 19.7% responded as "low," 13.5% as "moderate," 5.5% as "high," and 4.3% as "very high." The level of changes in the handwashing habits of the participants in both work and social life during the post-vaccination period was also questioned based on a 5-point scale, and the distribution of the participants' responses was 63.9% "very low," 18.5% "low," 10.6% "moderate," 3.6% "very high," and 3.4% "high." Finally, the level of changes in the disinfectant usage habits in both work and social life during the post-vaccination period was "very low" in 63.0%, "low" in 20.4%, "moderate" in 9.9%, "very high" in 3.8%, and "high" in 2.9% of the participants.

DISCUSSION

In this study, we aimed to evaluate whether there was an improvement in the mental status and social life of front-

Table 2. Distribution of the healthcare professionals' responses to survey questions concerning changes in their social lives in the post-vaccination period

	Yes, increased n (%)	Yes, decreased n (%)	No change n (%)
Has there been a change in the number of days you go out for shopping/ socializing in the post-vaccination period?	116 (27.9)	48 (11.5)	252 (60.6)
Has there been any change in the frequency of meeting with your friends in the post-vaccination period?	116 (27.9)	45 (10.8)	255 (61.3)
Has there been a change in the frequency of contact with your family (with whom you do not live) in the post-vaccination period?	97 (23.3)	34 (8.2)	285 (68.5)
Has there been any change in your anxiety about infecting people who live in the same house (family, friends, etc.) when you return home from work?	6 (1.4)	166 (39.9)	244 (58.7)

line healthcare professionals working actively during the COVID-19 pandemic after CoronaVac vaccination. In the COVID-19 pandemic, healthcare professionals have followed an exhaustive and intensive work schedule that can cause an increase in depression-, anxiety-, and insomnia-related symptoms. The start of the immunization process against COVID-19 marks a new era for healthcare professionals to make them feel safer. We used three different scales to evaluate depression-, anxiety-, and insomnia-related symptoms among frontline healthcare professionals before and after vaccination. We also aimed to evaluate their anxiety levels related to social life and COVID-19. We found a decrease in the participants' PHQ-9, GAD-7, and ISI-7 scores and anxiety levels in the post-vaccination period. However, we observed no major change in their social lives in the post-vaccination period, and the participants continued to take routine precautions.

Healthcare professionals have worked under intense conditions during the pandemic and have been away from their families. However, these reasons alone are not sufficient to explain mental and physical fatigue. Many other factors, such as uncertainties about COVID-19, feeling concerns about contracting the virus in the work environment, and the fatal course of COVID-19 pneumonia increase psychological stress.[20,21] There has been a serious increase in the incidence of psychiatric symptoms during the pandemic. In the literature, there are many studies evaluating the mental status of healthcare professionals during the pandemic. For example, Tian et al.[22] investigated the mental health of frontline healthcare professionals during the COVID-19 pandemic using the PHQ-9, GAD-7, and ISI-7 scales. The authors reported that two-thirds of the participants stated that they had moderate to high levels of stress. In a study by Wang et al.,[23] it was stated that approximately 30% of frontline healthcare professionals had anxiety and depressive symptoms. In the current study, we found that approximately 30% of the participants had depression- and anxiety-related symptoms based on the data obtained from the pre-vaccination period. However, the frequency of these symptoms significantly decreased in the post-vaccination period. This led us to consider that immunization against COVID-19 reduced the psychological stress level of healthcare professionals.

In addition to the anxiety scoring systems routinely used in the literature, anxiety levels due to coronavirus have also been investigated. Lee stated that the specificity and sensitivity of the COVID-19-specific scoring system were higher than those of the GAD-7 scoring system.[24] In the current study, while assessing the level of anxiety associated with COVID-19, we questioned the concerns of healthcare professionals about passing the virus onto their families when they returned home from work. We had the opportunity to periodically compare the data based on scoring we performed separately for the pre-vaccination and post-vaccination periods. We found a serious and significant decrease in the anxiety levels of the participants in the post-vaccination period.

Increased anxiety and stress among healthcare professionals are also reported to cause sleep disorders. Lai et al.[11] found that the frequency of insomnia among healthcare professionals was around 35% during the COVID-19 pandemic. Similarly, Liang et al.,[25] evaluating ISI, stated that the frequency of mild insomnia in healthcare professionals was approximately 40%. These rates are consistent with the frequency of insomnia we detected among healthcare professionals in the pre-vaccination period. However, we also determined that this rate significantly decreased in the post-vaccination period.

Independent variables that have an effect on the increased frequency of depression and anxiety in the COVID-19 pandemic have been examined in the literature. Huang and Zhao suggested that the time spent associated with COVID-19 might be a risk factor for the development of psychological problems.[26] In our study, we determined that high weekly working hours was one of the effective variables in the development of depression and anxiety among healthcare professionals, which is in agreement with the literature. In addition, we found that variables such as female gender, living alone, and having a psychiatric disease were also effective in the development of depression and anxiety separately. The literature contains studies reporting the effects of these variables on mental disorders.[27,28]

We observed no change in isolation in the social lives of frontline healthcare professionals who were immunized against COVID-19. In addition, their post-vaccination habits concerning the use of protective equipment, disinfection, and handwashing in both their work and social lives did not change compared to the pre-vaccination period. This suggests that even after vaccination, healthcare professionals did not reduce protective measures and continued to isolate themselves against the possibility of transmission.

Limitations

The most important limitation of our study is the small number of participants due to the inclusion of only frontline healthcare professionals working in the emergency department while planning the study. In addition, the post-vaccination survey only covered the 2-week period after vaccination. The absence of long-term data can be considered a limitation.

CONCLUSION

The start of the immunization process with vaccination has been the most important cornerstone that has illuminated our path and ensured that we do not lose hope during this pandemic, all aspects of which have not been elucidated yet. This survey study we have done shows that, in the post-vaccination period, there was a significant regression in depression, anxiety, and insomnia symptoms of frontline healthcare professionals.

Ethics Committee Approval

This study approved by the Ataturk University Faculty of Medicine Clinical Research Ethics Committee (Date: 23.01.2020, Decision No: 2021-02-22T18-51-45).

Informed Consent

Prospective study.

Peer-review

Internally peer-reviewed.

Authorship Contributions

Concept: S.D., R.D., A.O.K.; Design: İ.A., T.D.; Supervision: S.A., S.D., R.D.; Materials: T.D., A.O.K., İ.A.; Data: S.D., S.A.; Analysis: S.D.; Literature search: T.D., İ.A., D.T.; Writing: A.O.K., S.D.; Critical revision: R.D.

Conflict of Interest

None declared.

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İnaktif COVID–19 Aşısı (CoronaVac) Sonrasında Sağlık Çalışanlarının Anksiyete, Depresyon ve İnsomnia Düzeylerinin Değerlendirilmesi

Amaç: COVID-19 pandemi sürecinde ön saflarda görev yapan sağlık çalışanlarının inaktif COVID-19 aşısı sonrasındaki depresyon, anksiyete ve insomnia düzeylerindeki değişimleri incelemek.

Gereç ve Yöntem: Bu kesitsel çalışma, 1 Ocak–30 Haziran 2021 tarihleri arasında Türkiye'de ön saflarda yer alan sağlık profesyonellerini değerlendirmek için çevrimiçi bir anket kullanılarak yürütülmüştür. Katılımcıların mental sağlığını değerlendirmek için Patient Health Questionnaire-9 (PHQ-9), Generalized Anxiety Disorder-7 (GAD-7) ölçekleri kullanıldı. Uyku problemlerini değerlendirmek için Insomnia Severity Index-7 (ISI-7) kullanıldı. Çalışmada aşılama öncesi (AÖ) ve sonrası (AS) olmak üzere iki ayrı döneme dair veriler incelendi.

Bulgular: Çalışmaya 416 sağlık çalışanı dahil edildi. AÖ dönemde depresyon, anksiyete ve insomnia sıklığı sırasıyla; %27.9, %31.5 ve %41.1 şeklindeydi. Bu oranlarda AS dönemde azalma olup; %22.8, %21.9 ve %34.1 şeklinde olduğu görüldü. Dönemler arasındaki bu farklar PHQ-9 (p=0.000), GAD-7 (p=0.002) ve ISI-7 (p=0.038) için istatistiksel olarak da anlamlıydı. Çalışmamızda yüksek haftalık çalışma saatleri, kadın cinsiyet, tek başına yaşam ve psikiyatrik hastalık varlığı faktörlerinin depresyon ve anksiyete gelişiminde etkili olduğunu tespit ettik.

Sonuç: Ön saflardaki sağlık çalışanlarında depresyon, anksiyete ve insomnia semptomları ve bu kinik tablolara tanı konma sıklığının COVID-19 pandemisine bağlı olarak arttığı görülmektedir. Ancak bağışıklama süreci başladıktan sonra bu mental bozuklukların sıklığı ve sağlık çalışanlarının endişe düzeyleri belirgin bir şekilde azalma göstermiştir.

Anahtar Sözcükler: Anksiyete; CoronaVac; COVID-19; depresyon; insomnia; sağlık çalışanları.