



## Determination of post-traumatic growth status of frontline infection control nurses in the COVID-19 pandemic – a cross-sectional study

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### ABSTRACT

**Introduction and aim.** It is very important for nurses to experience post-traumatic growth in order to protect their mental health after traumatic events such as a pandemic. The aim of this study is to determine the post traumatic growth status of infection control nurses, who play an important role in health services in the COVID-19 pandemic.

**Material and methods.** This study is a cross-sectional, descriptive study. The study was conducted with 170 infection control nurses working in infection control committees of hospitals in Turkey. “Nurse Descriptive Information Form” and “Post Traumatic Growth Inventory (PTGI)” were used as data collection tools in this study.

**Results.** As a result of this research, the mean PTGI total score of the infection control nurses was  $70.73 \pm 23.03$ , and it was determined that they experienced moderate growth from the sub-dimensions of the scale. Also it was determined that there was a statistically significant difference between the changes in philosophy of life sub-dimension scores of PTGI according to the age and marital status of the nurses. In addition, it was determined that there was a significant difference between the total PTGI scores according to the year of working as an infection control nurse and the loss of a relative of the healthcare worker due to the COVID-19 disease.

**Conclusion.** In this study, it can be said that infection control nurses experienced a moderate post-traumatic growth after the COVID-19 pandemic. Age, marital status, working year and loss of a healthcare worker friend during the pandemic period seem to affect nurses’ post-traumatic growth. It is very important to determine the mental health of infection control nurses working on the front lines in the pandemic.

**Keywords.** COVID-19 pandemic, mental health, nurses, posttraumatic growth

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## Introduction

The Coronavirus 2019 (COVID-19), which emerged in Wuhan, China in December 2019 and spread rapidly in many countries and continents, has come to the fore as a world epidemic that has shaken the world deeply in many ways.<sup>1,2</sup> As the geographical area of the rapidly spreading virus expanded, there has been a rapid increase in the number of virus-related deaths.<sup>3</sup> It is seen that the rapid spread of the COVID-19, resulting in death, affects the mental and physical health of people and the economy on a global scale significantly.<sup>4</sup> Especially globally, the health systems of many countries have come to the point of collapse under the sudden and rapid effect of COVID-19, and health workers are among the groups most affected by this pandemic.<sup>4</sup> The World Health Organization reported that more than 35,000 healthcare workers worldwide have been infected with the COVID-19 virus, and some have died while caring for COVID-19 patients.<sup>2</sup>

When COVID-19, which is a contagious disease, first emerged, there were uncertainties about the way of transmission, treatment and prevention of the disease. Due to the rapid increase in COVID-19 cases in hospitals, an important burden and responsibilities have emerged, especially for healthcare professionals working in infection control units, in order to protect patients, patient relatives and healthcare workers from disease and to prevent the spread of the disease.<sup>4,5</sup> In the pandemic process, diagnosis and treatment processes of patients diagnosed with COVID-19 are carried out in a multidisciplinary manner, following the hospital isolation processes, protecting the health of hospital staff, planning the distribution of personnel to be assigned to the hospital units during the pandemic period, taking the infection control measures to be followed in the hospital for the pandemic, and intermittent monitoring of the personnel in this regard. Infection control units took an active role in the planning of inspection and training, and they were under an intense overtime including long working hours.<sup>5</sup> In this process, especially nurses among the health workers working on the front lines, besides their intense working hours, were more exposed to the risk of virus transmission, faced with more risks, being away from their families for a long time, experiencing stigma, and dying more among their colleagues and in the patients they care for. had to testify.<sup>4</sup> All these situations have greatly affected the mental health of the nurses and caused them to experience stress.<sup>6</sup>

Coping responses to stress are a continuum of adaptive and maladaptive responses to stress. It is seen that maladaptive reactions arise from working during the pandemic in nurses providing healthcare services. These reactions include exposure to trauma that can lead to post-traumatic stress disorder, eating and socializing problems, sleep problems (such as nightmares involving negative experiences in the hospital during the COVID-19 period that is flashbacks), exhaustion, frus-

tration, anger and depression.<sup>6–8</sup> However, not everyone who experiences the pandemic elicits maladaptive responses.<sup>4,6,7</sup> In addition to these negative consequences, traumatic events can positively change individuals in a process known as post-traumatic growth.<sup>9</sup> Nurses can also improve post-traumatic growth by saving lives and improving patient outcomes.<sup>7</sup>

The concept of “post-traumatic growth” was first introduced by Tedeschi and Calhoun in 1996.<sup>10</sup> Post-traumatic growth refers to the emergence of a significant positive mental change in the life of a person who survived a forcing or traumatic event such as an earthquake or tsunami.<sup>9,10</sup> Previous studies have found that nurses can experience psychological stress responses when working on the front lines of an infectious disease epidemic.<sup>8,11</sup> The COVID-19 pandemic has caused a traumatic experience especially for nurses due to its devastating effect.<sup>11,12</sup> It is stated that individuals can grow as a result of trauma or stressful events, which means that individuals can realize post-traumatic growth.<sup>12</sup> It is stated that the realization of post-traumatic growth in post-pandemic nurses can protect nurses from the psychological effects of the pandemic or improve the psychological effects that may occur after trauma.<sup>4,7,13</sup>

When the studies conducted after the COVID-19 pandemic are examined, it is seen that there are several studies examining the post-traumatic growth status of healthcare workers.<sup>4,7,13,14</sup> Studies with nurses, on the other hand, seem to have been conducted with nurses in China, although there is limited evidence.<sup>7,12,14,15</sup>

## Aim

No study has been found to determine the post-traumatic growth status of infection control nurses working on the front lines, especially during the pandemic period. Therefore, the aim of this study is to examine the post-traumatic growth status of infection control nurses, who play an important role in health services in infectious diseases such as pandemics. It is thought that the data obtained from this study will shed light on the interventions to be made to ensure the psychological empowerment of infection control nurses.

## Material and methods

### *Ethical approval*

Ethics committee approval dated 29.08.2022 and numbered 205981 was obtained from the Human Research Ethics Committee of Zonguldak Bülent Ecevit University to conduct the research. Informed consent was obtained from the infection control nurses participating in the study online.

### *Study design*

This study is a cross-sectional, descriptive study. The research was carried out with infection control nurses

working in infection control committees of hospitals in Turkey in September 2022.

### **Participants**

The population of the study consists of all infection control nurses in Turkey. There is no number of infection control nurses in official sources and records in Turkey. For this reason, snowball sampling method, which is one of the non-probability sampling methods, was used as a sampling method. In this method, after the reference people related to the subject of the study were selected, other people with similar characteristics were reached through these people. The reason for preferring this method is that the number of nurses working actively as infection control nurses in Turkey has not been reached and it is thought that there will be less difficulty in reaching nurses with this method. In addition, this method was used in order to provide the expected benefit in the results to be obtained from this research as soon as possible and to obtain the results quickly. In this direction, infection control nurses who took an active role in the field during the pandemic period were taken as reference through online platforms, and other infection control nurses were tried to be reached through social media, whatsapp and telegram. In this direction, 170 infection control nurses who agreed to participate in the study at the time the research data were collected were reached.

Inclusion criteria: Being between the ages of 18-65, working as an infection control nurse during the pandemic period. Exclusion criteria; refusing to participate in the research.

### **Instruments**

“Nurse Descriptive Information Form” and “Post Traumatic Growth Inventory” were used as data collection tools in the research.

*Nurse Descriptive Information Form:* This form, which was prepared by the researchers by scanning the literature, includes questions such as age, gender, education level, marital status, having a child, working year as a nurse, working year as an infection control nurse, working time in the pandemic.<sup>12-14</sup>

*Post Traumatic Growth Inventory (PTGI):* The scale is one of the most well-known psychometric tools that measure positive changes after trauma. It was first developed by Tedeschi and Calhoun in 1996.<sup>10</sup> The original form of the scale consists of 21 items, 6-point Likert type and 5 sub-dimensions (new possibilities, relating to others, personal strength, spiritual change, and appreciation of life).<sup>10</sup> The Turkish validity and reliability study of the scale was performed by Kağan et al. (2012). The Turkish version is a total of 21 items and a 6-point Likert-type (0,1,2,3,4,5) scale. In this scale, change in self-perception (lowest 0-highest 50 points; items 5, 10, 11, 12, 13, 15, 16, 17, 18, 19), change in philosophy of

life (lowest 0-highest 35 points; items 1, 2, 3, 4, 7, 14) and change in relationships (lowest 0-highest 25 points; items 6, 8, 9, 20, 21).<sup>16</sup> The lowest and highest score that can be obtained from the scale total score is between 0 and 105. High scores obtained from the total score of the scale and in the sub-dimensions indicate that the person has experienced a high level of growth after the traumatic experience. The cronbach's alpha coefficient is 0.92, and the internal consistency of the subscales varies between 0.77 and 0.88.<sup>16</sup> The Posttraumatic Growth Inventory (PTGI) The cronbach alpha value in this study is 0.94.

### **Data collection**

This study data were collected by contacting infection control nurses on online platforms such as social media, whatsapp groups, and telegram, after obtaining the permission of the ethics committee. Nurses were invited to participate in the research by sharing study information, study aim and survey links on online platforms. Each infection control nurse reached was asked to reach another infection control nurse.

### **Statistical analysis**

The data obtained in this study were evaluated in SPSS 22.0 statistical program (IBM, Armonk, NY, USA). Frequency and percentage analyzes were used to determine the descriptive characteristics of the nurses participating in the study, and mean and standard deviation statistics were used in the analysis of the scale. Kurtosis and Skewness values were examined to determine whether the research variables showed a normal distribution. It was determined that the study variables did not show a normal distribution. Non-parametric methods were used in the analysis of the data. Man Whitney U test and Kruskal Wallis analyzes were used to examine the differences in scale levels according to the sociodemographic characteristics of the nurses. The results were evaluated at the 95% confidence interval, at the  $p < 0.05$  level of significance.

### **Results**

Of the infection control nurses participating in the study, 97.1% were over 30 years old, 98.2% were female, 80.0% were married, 80.6% had children and 65.5% had a bachelor's degree. While 91.2% of the nurses have been working as nurses for more than 10 years, 56.5% have been working as infection control nurses for less than 10 years. Considering the weekly working hours during the pandemic period; there was an increase in the working hours of 75.3% of the nurses. 52.4% of the infection control nurses intervened in the patient diagnosed with Covid-19, and 63.5% were diagnosed with Covid-19 disease. Of the infection control nurses participating in the study, 17.1% lost a family member due to illness during

**Table 1.** Personal characteristics of infection control nurses (n=170)

| Characteristics of Infection Control Nurses   | n   | %    |
|---|-----|------|
| <b>Age</b>  |     |      |
| ≤ 30  | 5   | 2.9  |
| >30   | 165 | 97.1 |
| <b>Gender</b>   |     |      |
| Female  | 167 | 98.2 |
| Male  | 3   | 1.8  |
| <b>Education status</b>   |     |      |
| Associate degree  | 8   | 4.7  |
| Bachelor's degree   | 113 | 65.5 |
| Master degree   | 46  | 27.1 |
| PhD degree  | 3   | 1.8  |
| <b>Marital status</b>   |     |      |
| Married   | 136 | 80   |
| Single  | 34  | 20   |
| <b>Status of having children</b>  |     |      |
| Yes   | 137 | 80.6 |
| No  | 33  | 19.4 |
| <b>Years of work as a nurse</b>   |     |      |
| ≤ 10  | 15  | 8.8  |
| >10   | 155 | 91.2 |
| <b>Years of work as an infection control nurse</b>                                    |     |      |
| ≤ 10  | 96  | 56.5 |
| >10   | 74  | 43.5 |
| <b>Has there been an increase in weekly working hours during the pandemic period?</b> |     |      |
| Yes   | 128 | 75.3 |
| No  | 42  | 24.7 |
| <b>Intervention of a patient diagnosed with COVID-19 during the pandemic period</b>   |     |      |
| Yes   | 89  | 52.4 |
| No  | 81  | 47.6 |
| <b>Getting diagnosed with COVID-19 during the pandemic</b>                            |     |      |
| Yes   | 108 | 63.5 |
| No  | 62  | 36.5 |
| <b>Losing a family member due to COVID-19 during the pandemic period</b>              |     |      |
| Yes   | 29  | 17.1 |
| No  | 141 | 82.9 |
| <b>Losing a healthcare worker relative due to COVID-19 during the pandemic period</b> |     |      |
| Yes   | 55  | 32.4 |
| No  | 115 | 67.6 |

**Table 2.** PTGI scores and PTGI sub-dimension score of infection control nurses (n=170)

| Post Traumatic Growth Inventory  | $\bar{X} \pm SD$ | min-max |
|----------------------------------|------------------|---------|
| PTGI total score                 | 70.73±23.03      | 21–115  |
| <b>PTGI sub-dimension scores</b> |                  |         |
| Change in self-perception        | 35.83±12.66      | 10–58   |
| Change in philosophy of life     | 20.69±6.14       | 6–34    |
| Change in relationships          | 14.20±6.27       | 5–28    |

the pandemic period, and 32.4% lost a healthcare worker relative during the pandemic period (Table 1).

The mean PTGI score of the infection control nurses was 70.73±23.03. Nurses' PTGI scale sub-dimension scores are given in Table 2.

The comparison of nurses' personal characteristics with PTGI total score and sub-dimension score is given in Table 3.

Nurses over the age of 30 had statistically significantly higher scores on the PTGI change in philosophy of life sub-dimension scores than those of nurses under the age of 30 ( $U=156.500$ ,  $p=0.018$ ); it was determined that the change in philosophy of life sub-dimension score of married nurses were statistically significantly higher than the scores of single nurses ( $U=1723.000$ ,  $p=0.022$ ) (Table 3).

It was determined that there was a statistically significant difference between the PTGI total score and sub-dimension scores according to the year of work as an infection control nurse ( $p<0.05$ ). It has been determined that my nurses who have worked for less than 10 years, PTGI total score and all sub-dimension scores are statistically significantly higher than the scores of those who have worked for more than 10 years ( $p<0.05$ ) (Table 3).

It was determined that the PTGI total score and the change in self-perception sub-dimension scores of the nurses who lost their relatives due to the COVID-19 disease during the pandemic period were statistically significantly higher than the scores of the nurses who did not lose their relatives due to the COVID-19 disease during the pandemic period ( $p<0.05$ ) (Table 3).

## Discussion

The sudden and emergency occurrence of the COVID-19 pandemic can be considered as a traumatic event that may trigger mental problems such as post-traumatic stress disorder for nurses.<sup>9,17</sup> Post-traumatic growth is a positive psychological indicator for nurses after the COVID-19 pandemic, which is a traumatic situation. Post-traumatic growth is critical for frontline nurses during the COVID-19 pandemic.<sup>12</sup> In this study, it was aimed to determine the post-traumatic growth status of infection control nurses, who played an important role in health services in the COVID-19 pandemic. Since there is no study in the literature with infection control nurses working on the front lines after the covid 19 pandemic, it is thought that the results of this study are very valuable as the first results obtained in this field. When the results obtained from the study were examined, it was seen that the infection control nurses experienced moderate post-traumatic growth, and the post-traumatic growth score was affected by age, marital status, working year as an infection control nurse, and losing a healthcare worker friend due to COVID-19.

**Table 3.** Comparison of personal characteristics of infection control nurses with PTGI total scores and sub-dimension scores

| Personal characteristics  | PTGI total score<br>$\bar{X} \pm SD$ | PTGI sub-dimension scores                     |  |   |
|---|--------------------------------------|---|--|---|
|   |                                      | Change in self-perception<br>$\bar{X} \pm SD$ | Change in philosophy of life<br>$\bar{X} \pm SD$ | Change in relationships<br>$\bar{X} \pm SD$ |
| <b>Age</b>  |                                      |   |  |   |
| ≤ 30  | 54.8±14.72                           | 30±10.95                                      | 14.8±2.48  | 10±3.8                                      |
| >30   | 71.21±23.09                          | 36.01±12.69                                   | 20.87±6.13                                       | 14.33±6.29                                  |
|   | U 230                                | 293.5   | 156.5  | 246.5                                       |
|   | p 0.092                              | 0.272   | 0.018  | 0.125                                       |
| <b>Gender</b>   |                                      |   |  |   |
| Female  | 54.80±14.72                          | 30±10.95                                      | 14.8±2.48  | 10±3.8                                      |
| Male  | 71.21±23.09                          | 36.01±12.69                                   | 20.87±6.13                                       | 14.33±6.29                                  |
|   | U 209                                | 203.5   | 245.5  | 234   |
|   | p 0.623                              | 0.578   | 0.953  | 0.845                                       |
| <b>Education status</b>   |                                      |   |  |   |
| Associate degree  | 65±25.57                             | 32.25±14.21                                   | 19.00±6.21                                       | 13.75±6.73                                  |
| Bachelor's degree   | 69.99±23.34                          | 35.51±12.75                                   | 20.47±6.3  | 14.00±6.32                                  |
| Master degree   | 72±21.61                             | 36.43±12.22                                   | 21.26±5.7  | 14.30±5.96                                  |
| PhD degree  | 94.66±21.03                          | 48.33±8.32                                    | 24.66±7.02                                       | 21.66±6.02                                  |
|   | $\chi^2$ 3.609                       | 3.992   | 2.657  | 3.85  |
|   | p 0.307                              | 0.262   | 0.448  | 0.278                                       |
| <b>Marital status</b>   |                                      |   |  |   |
| Married   | 72.14±23.34                          | 36.53±12.76                                   | 21.16±6.23                                       | 14.44±6.48                                  |
| Single  | 65.08±21.13                          | 33.02±12.01                                   | 18.82±5.43                                       | 13.23±5.33                                  |
|   | U 1874.5                             | 1865  | 1723   | 2072  |
|   | p 0.088                              | 0.081   | 0.022  | 0.349                                       |
| <b>Status of having children</b>  |                                      |   |  |   |
| Yes   | 71.62±22.85                          | 36.36±12.45                                   | 20.94±6.08                                       | 14.31±6.36                                  |
| No  | 67.06±23.73                          | 33.63±13.46                                   | 19.66±6.36                                       | 13.75±5.95                                  |
|   | U 2041.5                             | 2006  | 1917.5   | 2157.5                                      |
|   | p 0.388                              | 0.316   | 0.176  | 0.684                                       |
| <b>Years of work as a nurse</b>   |                                      |   |  |   |
| ≤ 10  | 70.06±22.10                          | 36.53±12.32                                   | 20.26±6.26                                       | 13.26±5.49                                  |
| >10   | 70.80±23.18                          | 35.76±12.73                                   | 20.73±6.14                                       | 14.29±6.35                                  |
|   | U 1116.5                             | 1137.5  | 1070   | 1053  |
|   | p 0.8                                | 0.891   | 0.611  | 0.547                                       |
| <b>Years of work as an infection control nurse</b>                                    |                                      |   |  |   |
| ≤ 10  | 74.59±22.42                          | 38±11.89                                      | 21.50±6.28                                       | 15.09±6.38                                  |
| >10   | 65.72±22.99                          | 33.02±13.14                                   | 19.64±5.82                                       | 13.05±5.98                                  |
|   | U 2757.5                             | 2758.5  | 2884   | 2877  |
|   | p 0.013                              | 0.013   | 0.036  | 0.034                                       |
| <b>Has there been an increase in weekly working hours during the pandemic period?</b> |                                      |   |  |   |
| Yes   | 70.89±23.02                          | 36.05±12.60                                   | 20.78±6.29                                       | 14.06±6.29                                  |
| No  | 70.23±23.31                          | 35.16±12.96                                   | 20.42±5.69                                       | 14.64±6.27                                  |
|   | U 2592                               | 257   | 2540.5   | 2552.5                                      |
|   | p 0.729                              | 0.672   | 0.594  | 0.624                                       |

| Intervention of a patient diagnosed with COVID-19 during the pandemic period   |             |             |            |            |
|--|-------------|-------------|------------|------------|
| Yes  | 72.77±20.95 | 37.04±11.41 | 21.30±5.93 | 14.42±5.95 |
| No   | 68.44±25.06 | 34.50±13.85 | 20.02±6.33 | 13.96±6.63 |
|  | U 3309.5    | 3305.5      | 3195.5     | 3436.5     |
|  | p 0.357     | 0.351       | 0.201      | 0.599      |
| Getting diagnosed with COVID-19 during the pandemic                            |             |             |            |            |
| Yes  | 70.88±22.94 | 36.04±12.77 | 20.44±6.12 | 14.39±6.15 |
| No   | 70.46±23.36 | 35.46±12.55 | 21.12±6.18 | 13.87±6.51 |
|  | U 3339      | 3272        | 3137       | 3147.5     |
|  | p 0.977     | 0.807       | 0.494      | 0.515      |
| Losing a family member due to COVID-19 during the pandemic period              |             |             |            |            |
| Yes  | 69.24±22.22 | 36.13±12.26 | 19.79±5.99 | 13.31±5.93 |
| No   | 71.04±23.25 | 35.77±12.78 | 20.87±6.17 | 14.39±6.34 |
|  | U 1909.5    | 2042        | 1782.5     | 1841.5     |
|  | p 0.576     | 0.992       | 0.277      | 0.399      |
| Losing a healthcare worker relative due to COVID-19 during the pandemic period |             |             |            |            |
| Yes  | 76.56±20.73 | 38.98±11.72 | 22.05±5.33 | 15.52±5.94 |
| No   | 67.94±23.63 | 34.33±12.86 | 20.04±6.40 | 13.57±6.35 |
|  | U 2524      | 2484.5      | 2609.5     | 2591       |
|  | p 0.033     | 0.024       | 0.065      | 0.056      |

As a result of the study, it was determined that the after pandemic post-traumatic growth status of the infection control nurses was moderate (70.73±23.03). This finding suggests that infection control nurses working on the front lines of the pandemic experienced possible post-traumatic growth. Although a similar study with infection control nurses has not been found in the literature, it is seen that there are similar results in a small number of studies conducted in China with nurses from other fields.<sup>12,14,15,17</sup> The after pandemic post-traumatic growth status of the infection control was moderate above in the study of Cui et al. (70.53±17.26), in the study of Peng et al. (65.65±11.5), and in the study of Li et al. (63.28±23.41). In another study conducted with nurses in China, it was determined that nurses showed a high level of growth (96.26±21.57).<sup>14</sup> It is very important for nurses to experience posttraumatic growth as a result of traumatic situations such as pandemics, even if at a moderate level, in terms of protecting mental health. In order to increase this post-traumatic growth, nurse managers' awareness of the posttraumatic growth status of nurses and what factors affect this will shed a great light on the interventions to be planned.

As a result of this study, when the results of the PTGI sub-dimension of the nurses were examined, the change in self-perception sub-dimension was above the medium level ( $35.83 \pm 12.66$ ), from the change in philosophy of life sub-dimension above the medium level ( $20.69 \pm 6.14$ ), and from the change in relationships sub-dimension, a moderate growth ( $14.2 \pm 6.27$ ), have been detected. Studies with nurses after the pandemic are limited in the literature. Since different versions of the posttraumatic growth inventory are used in these studies, the sub-dimensions of the version used in this study differ. For this reason, it is not sufficient to compare the sub-dimension scores obtained from this study with the results in the literature. However, as a result of this study, it is seen that nurses experienced moderate posttraumatic growth in terms of sub-dimensions. In future research, nurses should be evaluated comprehensively in this dimension.

As a result of this study, nurses over the age of 30 compared to the nurses under the age of 30; It was determined that married nurses had significantly higher changes in philosophy of life sub-dimension scores than single nurses. It is seen that PTGI scores according to gender and age are compared in very few of the limited studies conducted during the pandemic period in the literature.<sup>15,17</sup> As a result of the study of Li et al. (2022), it was determined that being married is an important factor that positively affects posttraumatic growth. The reason why married nurses experience more positive posttraumatic growth may be related to the fact that they have more social and moral support from the family, because social support has been found to play a vital role in balancing and protecting.<sup>15,17</sup> In another study conducted in China, it was determined that there was no significant relationship between age and marital status and posttraumatic growth scores.<sup>17</sup> In this sense, it is very important to increase social support resources and strengthen family dynamics in order to strengthen the psychological empowerment of nurses.

As a result of this study, it was determined that the PTGI total score and all sub-dimension scores of the nurses who worked as an infection control nurse for less than 10 years were higher than the scores of those who worked for more than 10 years. In a similar study conducted with nurses in China, the opposite result was determined, and it was determined that nurses with more than 10 years of work had higher PTGI scores.<sup>12</sup> In another study, it was determined that the working year did not affect the PTGI score.<sup>17</sup> The reason why the result of this study is different from the studies conducted in China can be explained as the fact that nurses with high working years may have experienced burnout and fatigue due to working for many years, and that nurses with more working years have other burdens and responsibilities (home, children, etc.) in their lives that

may affect their post-traumatic growth. It is a fact that the working year affects post-traumatic growth. However, considering these different results, the reasons why the working year affects the growth of nurses should be determined, and interventions that will strengthen nurses psychologically should be planned for these reasons.

As a result of this study, it was determined that the scale total score and the Change in Self-Perception sub-dimension scores of “nurses who lost their relatives due to COVID-19 disease during the pandemic period” were higher than the nurses who did not lose their relatives. This finding suggests that the loss of a healthcare worker’s relative affects posttraumatic growth. When the limited studies conducted with nurses during the pandemic period were examined, it was seen that the post-traumatic growth status of the nurses who lost their relatives was not examined. Losses experienced during the pandemic process are a traumatic experience for individuals. The loss of colleagues by nurses during this period may further increase the trauma caused by the pandemic. Face-to-face with death in the immediate environment may have created a trauma for nurses, and this trauma may have contributed to them becoming stronger than before the trauma period. In addition, it provided an opportunity for nurses who lost a loved one to question the meaning of life and develop their coping skills based on experiencing the stressful event after trauma. may have spurred growth.

### **Limitations**

This study provides new evidence about the post-traumatic growth status of nurses for interventions to strengthen the mental health of infection control nurses. However, there are several limitations in the research. First, the collection of research data in online environments is a limitation of the research. There is no institution in Turkey where infection control nurses can be reached. For this reason, although the online data collection method was preferred, this data collection method may have caused response bias. Respondents may have more positive views of posttraumatic growth than nonresponders. The lack of information about non-responders is a limitation of this study. Secondly, the number of male nurses working as infection control nurses is quite low in the country where this study was conducted. The low number of male nurses may have affected the findings. The third limitation is that this study was a cross-sectional type and evaluated posttraumatic growth status only at a certain time, without longitudinal observation of nurses.

### **Conclusion**

As a result of this study, it can be said that infection control nurses experienced a moderate growth after the trauma of the COVID-19 pandemic. It is seen that

age, marital status, working year and loss of a health-care worker friend during the pandemic period affect the post-traumatic growth of nurses. Since there is no study in the literature with infection control nurses working on the front lines after the COVID-19 pandemic, it is thought that the results of this study are very valuable as the first results obtained in this field. It is very important to determine the mental health of nurses working on the front lines during the pandemic. In this direction, it is necessary to plan interventions that will improve the mental health of infection control nurses. Nursing leaders should pay attention to posttraumatic growth and its influencing factors and offer solutions to protect the mental health of nurses. Nursing administrators should be aware of the mental state of nurses, strengthen psychological interventions such as psychological guidance and mental health protective training, especially for nurses with more working years, increase social support resources, take into account the psychological experiences of nurses comprehensively to support psychological growth and reduce post-traumatic psychological burden. should be maintained regularly. In addition, multicenter longitudinal studies with larger sample sizes are needed to evaluate posttraumatic growth and the factors affecting it, including infection control nurses, in future studies.

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#### Author contributions

Conceptualization, S.Ç.İ.; Methodology, S.Ç.İ. and A.Ç.B.; Software, S.Ç.İ.; Validation, S.Ç.İ. and A.Ç.B.; Formal Analysis, S.Ç.İ. and A.Ç.B.; Investigation, S.Ç.İ. and A.Ç.B.; Resources, S.Ç.İ. and A.Ç.B.; Writing – Original Draft Preparation, S.Ç.İ.; Visualization, S.Ç.İ. and A.Ç.B.; Supervision, S.Ç.İ. and A.Ç.B.; Project Administration, S.Ç.İ.; Funding Acquisition, S.Ç.İ. and A.Ç.B.

#### Conflicts of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

#### Data availability

Data available on request from the authors.

#### Ethics approval

Ethical approval to conduct the study was obtained from the Human Research Ethics Committee of Zonguldak Bulent Ecevit University (decision number: 205981, Decision date: 29.08.2022). Informed consent was obtained from the infection control nurses participating in the study online.

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