**Abstract**

The coronavirus (COVID-19) epidemic negatively impacted public health on a widespread, international level and caused travel and social distancing restrictions around the world. A pandemic constitutes a crisis that is accompanied by mental health issues such as anxiety, which can affect the general population and healthcare workers in particular.The purpose of this study was to examine the impact of sociodemographic factors and perceptions of coronavirus on levels of anxiety among the general population and among healthcare workers during the start of the coronavirus outbreak in Israel.A cross-sectional questionnaire was distributed through social network avenues through the use of snowball sampling. Participants included 696 individuals from the general population and 470 healthcare workers. Healthcare workers reported higher levels of anxiety than participants in the general population. The demographic factors that explained the variance in anxiety levels among healthcare workers included gender, ethnic background, time spent in isolation, perceptions about coronavirus, and perceptions about the importance of isolation. The relatively low levels of anxiety reported among participants may be due to the timing of the study, which occurred during the initial stages of the coronavirus outbreak in Israel. Additionally, higher levels of anxiety among healthcare workers may be due to their involvement in the organizational planning that took place in medical centers in preparation for the epidemic, including obtaining resources such as ventilators, mobilizing personnel and training them on protective measures; these may have led to a deeper understanding among healthcare workers about the impending crisis.

**Introduction**

The coronavirus (COVID-19) epidemic broke out in China in late 2019 (Lu, Stratton, & Tang, 2020) and, within a few short weeks, spread to many countries around the world (Zu et al., 2020). COVID-19 was identified as the cause of the epidemic by the World Health Organization (World Health Organization, 2020a) and, within three months, the epidemic was declared a pandemic (World Health Organization, 2020b). COVID-19 has been found to mainly affect the respiratory system; in most cases, it causes mild symptoms such as dry cough but, in some cases, it can lead to severe respiratory disease, high contagion rates and mortality (Wang, Tang, & Wei, 2020). This reality has created a challenge to the security of public health on a global level (Li et al., 2020), leading to a series of unprecedented measures including rigorous airport inspections, lockdowns, border closures and cancellations of international events (Chinazzi et al., 2020).

The outbreak of an infectious disease is a time of crisis, especially when it occurs on a global level, and it causes much anxiety and uncertainty (Huang & Zhao, 2020; Roy et al., 2020). Anxiety levels have been shown to increase when infection by a virus is perceived to be an imminent possibility and it is linked to the adoption of new behaviors such as wearing face masks and practicing social distancing (Goodwin, Haque, Neto, & Myers, 2009; Leung, 2005). Research indicates that knowledge and clear behavioral guidelines help to reduce anxiety (Griffin, Neuwirth, Dunwoody, & Giese, 2004; Lim et al., 2020; Rubin, Amlôt, & Wessely, 2009; Wray et al., 2008). Anxiety levels in response to an outbreak of an epidemic have been found to relate to a variety of factors. Studies have found that risk factors for experiencing high anxiety levels during an epidemic include being female, younger age and having a lower educational level (Leung, 2005(. On the other hand, those in higher socioeconomic social classes and who are more educated tend to have higher levels of optimism and to be more likely to adopt practices necessary to stop the virus from spreading than their counterparts (Zhong at al., 2020).

COVID-19 is a new disease, with severe consequences, whose clinical guidelines and prevention methods are constantly being updated. These changes instill confusion, fear and anxiety in the general population (Roy et al., 2020). Among healthcare workers in particular, the severity of anxiety varies. In this population, anxiety may be due to stressful work environments which involve extreme physical exertion, high workloads, unstable patients and lack of protective equipment, as well as simultaneous concern for loved ones at home while they are working on the front lines (Smith, Smith, Kratochvil, & Schwedhelm, 2017; Sun et al., 2020). Hence, the purpose of the present study was to examine the impact of personal factors and perceptions towards the coronavirus on anxiety levels among the general population and among healthcare workers in particular at the outset of the pandemic’s outbreak in Israel.

**Method**

**Participants and Procedure**

Participants were recruited through snowball sampling. A questionnaire link was circulated on social networks via email, WhatsApp and Facebook focusing on groups of healthcare professionals. Participants were asked to forward the link to friends and colleagues. A total of 1,166 Hebrew-speaking participants over the age of 18 with internet access participated in the survey. Participants included 696 individuals from the general population and 470 healthcare workers. The sample characteristics are described in Table 1.

A cross-sectional study was conducted. Data were collected online for one week (from March 13, 2020 to March 20, 2020). When the questionnaire was first distributed, 126 patients reported to be diagnosed with COVID-19, two of whom were in moderate-to-severe condition and the others in mild condition. On the final day of the questionnaire, 677 patients reported to suffer from COVID-19, 6 of whom were severely ill, 13 were moderately ill and the others were in mild condition. The study was reviewed and approved by the institution’s ethics committee.

The survey was available as a Google Form document. The beginning of the document included information about the purpose of the survey and a section related to participant consent. It was emphasized that participation in the survey was voluntary and anonymous, and that it was possible to stop the survey at any stage. Data were collected and stored on Google Drive with access available only to the researchers.

**Measures**

**Socio-demographic factors.** Participants reported on their age, gender, marital status, number of children, ethnicity, level of education, employment status, residence, and occupation within the healthcare profession (if relevant). In addition, COVID-19 related information was collected, including whether the participant was in isolation and, if so, the amount of time they have been in isolation and the reason requiring isolation.

**Perceptions about coronavirus.** The questionnaire was developed for the current research study and was validated by five experts: an infectious disease physician, a Ministry of Health epidemiology nurse, an epidemiology nurse employed at a medical center, a senior manager of a medical center, and a social worker. The measure included 11 items, such as: “The coronavirus is a dangerous virus that can spread from person to person”; “Coronavirus is highly contagious requiring stringent isolation measures to prevent continuous infection”; “The healthcare system is working properly to prevent the outbreak of coronavirus in Israel”. Subjects were asked to rate their agreement on a Likert-type scale ranging from 0 (strongly disagree) to 3 (strongly agree). The Cronbach’s alpha of the questionnaire was 0.61. Principal factor analysis was subsequently performed, which demonstrated three factors which explained 49% of the variance: (1) perceptions and COVID-19 (α=0.59), (2) isolation and COVID-19 (α=0.60), and (3) Ministry of Health’s functioning during the COVID-19 pandemic (α=0.70). Table 1 represents incorporation of all the variables regarding each of the factors.

**The Hospital Anxiety and Depression Scale) HADS(**. The measure was developed by Zigmond and Shait (1983) and contained 7 self-report items assessing anxiety levels, based on a 4-point Likert-type response scale ranging from 0 to 3. The score was calculated as a sum of the scores on all items, and ranges from 0 to 21. Higher scores indicated higher levels of anxiety. Cronbach’s alpha for this measure was 0.85.

**Results**

Table 2 shows that most of the participants were Jewish women between 18-32 years old, who were married and had no pre-existing conditions. Among the healthcare workers, most of the participants worked as nurses and the vast majority worked in clinical positions.

Healthcare workers reported higher anxiety levels than the general population and their satisfaction with the healthcare system’s actions was lower (Table 3). Since anxiety levels among healthcare workers were higher than the general population, we examined factors that predicted healthcare worker anxiety. We first ran *t*-tests and then performed hierarchical linear regressions. Table 3 includes the results of the *t*-test for independent samples analyses which examined the differences between healthcare workers and the general population on anxiety levels and the three components of the coronavirus questionnaire. We found that non-Jewish participants, those who hold clinical positions, those who work full-time, those below the age 32, those who live alone and those who were not in isolation, reported higher levels of anxiety than their counterparts (Table 4).

A hierarchical linear regression analysis was then performed, in which the first step included socio-demographic variables that were found to significantly correlate with anxiety (gender, age, ethnicity, clinical position and employment). Table 5 presents the results of the regression analysis. The same regression analysis was performed on the study’s general population participants just report final step.

**Discussion**

The purpose of the current study was to examine the influence of sociodemographic factors and perceptions of the coronavirus on the level of anxiety among healthcare workers and the general population at the beginning of the outbreak of the pandemic in the State of Israel. Results indicated that the degree of anxiety among the participants was relatively low, but that healthcare workers reported higher levels of anxiety as compared to the general population. These results may be explained by the timing of the data collection, which was conducted during the initial stages of the coronavirus outbreak in Israel. The fact that the number of verified patients was low and that there were no deaths may possibly explain the low anxiety levels and that the consequences of the disease were perceived as being very severe. In addition, the Ministry of Health’s guidelines for the general population focused on specific details such as restrictions on those returning from foreign countries and on events with large numbers of people (over 5,000 people), which may have served to control people’s anxiety.

In addition, the public is required to enter isolation if exposed to a verified coronavirus patient, a requirement which is in response to the findings of the epidemiological investigations conducted by the Ministry of Health (Ministry of Health Israel, 2020). These actions may have led to a sentiment that the disease is under control. Further, as the Ministry of Health provides details on the locations visited by verified patients, it may serve to reduce fear surrounding contagion. Furthermore, the disparity between the relatively controlled situation in the State of Israel and the reports put forth from other places in the world that reflected a different and more difficult situation, for example in Italy, was reported in early March 2020. In those reports, the Israeli public learned that 10 percent of patients needed ventilation and intensive care and that 20% of medical staff contracted the illness during their treatment of patients (Remuzzi, & Remuzzi, 2020). Moreover, although Israel was relatively in control of the epidemic compared to other countries, reports of the dire situation in various countries around the world, such as Italy and Spain, resulted in increased anxiety among healthcare workers in Israel, fueling fear of the most pessimistic outcomes. In early March 2020, it was reported that about 10% of those infected in Italy required life support respirators and hospitalization and 20% of medical personnel contracted COVID-19 (Remuzzi, & Remuzzi, 2020). Additionally, in Spain over 1,000 new cases were reported daily (Legido-Quigley et al., 2020). The announcement by the World Health Organization that COVID-19 was a pandemic (World Health Organization, 2020b) influenced the degree of anxiety among the research participants.

Healthcare workers reported higher anxiety levels compared to the general population. This result might be explained by the increased knowledge of healthcare workers related to the consequences of the disease, as well as the fact that healthcare workers were part of the medical organizational preparation process for the pandemic. These preparations included increasing resources, both physical and human resources, so that healthcare professionals would be able to care for infected patients, and particularly for those who would need to be ventilated. In addition, healthcare workers expressed lower levels of support than the general population in the handling of the pandemic by the Ministry of Health. It appears that healthcare professionals understood the potential limits of the healthcare system at that point in time to cope with the pandemic if it were to hit the country at full force, as had occurred in other countries such as Italy (Remuzzi, & Remuzzi, 2020).

The examination of sociodemographic characteristics that contributed to the degree of anxiety among healthcare workers indicated that minority group women reported a higher level of anxiety than their counterparts. These findings coincided with prior studies (Leung et al., 2005; Rubin et al., 2009). It is possible that the women felt less supported during stressful situations, which may have led them to experience higher levels of anxiety, similar to what has been found in other research (Othman, 2020). Minorities working in the healthcare system were also more concerned about their family members when they were work at the front lines of medical centers and reported being unable to support their family members and to communicate the Ministry of Health guidelines to them. It should be noted that during the research period, the guidelines were not yet made accessible in the Arabic language. It can be further assumed that the fear of infecting family members also contributed to the anxiety among minority healthcare workers.

Research limitations included the method of sampling (snowball sampling) and of data collection ­­­­­­(online questionnaires), which may have led to a biased sample that might not represent the larger population. In addition, the survey was conducted one time only, when the outbreak was relatively new. Recommendations for continued research include repeating the survey with other populations and conducting a longitudinal study to examine changes over time.

**References**

Chinazzi, M., Davis, J. T., Ajelli, M., Gioannini, C., Litvinova, M., Merler, S., . . . & Viboud, C. (2020). The effect of travel restrictions on the spread of the 2019 novel coronavirus (COVID-19) outbreak. *Science*, *368*(6489), 395-400.

Goodwin, R., Haque, S., Neto, F., & Myers, L. B. (2009). Initial psychological responses to Influenza A, H1N1 ("Swine flu"). *BMC Infectious Diseases*, *9*(1), 166.

Griffin, R. J., Neuwirth, K., Dunwoody, S., & Giese, J. (2004). Information sufficiency and risk communication. *Media Psychology*, *6*(1), 23-61.

Huang, Y., & Zhao, N. (2020). Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 epidemic in China: A web-based cross-sectional survey. *medRxiv*.‏

Legido-Quigley, H., Mateos-García, J. T., Campos, V. R., Gea-Sánchez, M., Muntaner, C., & McKee, M. (2020). The resilience of the Spanish health system against the COVID-19 pandemic. *The Lancet Public Health.*

Leung, G. M., Ho, L. M., Chan, S. K., Ho, S. Y., Bacon-Shone, J., Choy, R. Y., ... & Fielding, R. (2005). Longitudinal assessment of community psychobehavioral responses during and after the 2003 outbreak of severe acute respiratory syndrome in Hong Kong. *Clinical Infectious Diseases*, *40*(12), 1713-1720.

Li, R., Pei, S., Chen, B., Song, Y., Zhang, T., Yang, W., & Shaman, J. (2020). Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV2). *Science*, *368*(6490), 489-493.

Lim, J. M., Tun, Z. M., Kumar, V., Quaye, S., Offeddu, V., Cook, A. R., ... & Tam, C. C. (2020). Population anxiety and positive behaviour change during the COVID-19 epidemic: Cross-sectional surveys in Singapore, China and Italy. *medRxiv*.

Lu, H., Stratton, C. W., & Tang, Y. W. (2020). Outbreak of pneumonia of unknown etiology in Wuhan China: The mystery and the miracle. *Journal of Medical Virology, 92*(4), 401-402.

Ministry of Health Israel (2020). Retrieved from <https://www.health.gov.il/Subjects/disease/corona/Pages/press-release.aspx>

Othman, N. (2020). Depression, anxiety, and stress in the time of COVID-19 pandemic in Kurdistan region, Iraq. *Kurdistan* *Journal of Applied Research*, *5*(3), 37-44.‏

Remuzzi, A., & Remuzzi, G. (2020). COVID-19 and Italy: What next?. *The Lancet, 395*(10231), 11-17.

Roy, D., Tripathy, S., Kar, S. K., Sharma, N., Verma, S. K., & Kaushal, V. (2020). Study of knowledge, attitude, anxiety & perceived mental healthcare need in Indian population during COVID-19 pandemic. *Asian Journal of Psychiatry*, 51.

Rubin, G. J., Amlôt, R., Page, L., & Wessely, S. (2009). Public perceptions, anxiety, and behaviour change in relation to the swine flu outbreak: Cross sectional telephone survey. *Bmj*, *339*, b2651.

Smith, M. W., Smith, P. W., Kratochvil, C. J., & Schwedhelm, S. (2017). The psychosocial challenges of caring for patients with Ebola virus disease. *Health Security*, *15*(1), 104-109.

Sun, N., Shi, S., Jiao, D., Song, R., Ma, L., Wang, H., ... & Wang, H. (2020). A qualitative study on the psychological experience of caregivers of COVID-19 patients. *American Journal of Infection Control*.

Wang, W., Tang, J., & Wei, F. (2020). Updated understanding of the outbreak of 2019 novel coronavirus (2019‐nCoV) in Wuhan, China. *Journal of Medical Virology*, *92*(4), 441-447.

World Health Organization (2020a). Novel coronavirus (2019-nCoV): situation report. Retrieved from https://www.who.int/docs/default-source/coronaviruse/situationreports

World Health Organization (2020b). Current novel coronavirus (2019-nCoV) outbreak. Retrieved from <https://www.who.int/health-topics/coronavirus>

Wray, R. J., Becker, S. M., Henderson, N., Glik, D., Jupka, K., Middleton, S., ... & Mitchell, E. W. (2008). Communicating with the public about emerging health threats: Lessons from the pre-event message development project. *American Journal of Public Health*, *98*(12), 2214-2222.

Zhong, B. L., Luo, W., Li, H. M., Zhang, Q. Q., Liu, X. G., Li, W. T., & Li, Y. (2020). Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: A quick online cross-sectional survey. *International Journal of Biological Sciences*, *16*(10), 1745-1752.

Zigmond, A. S., & Shait, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica, 67*(36), 361-370.

Zu, Z. Y., Jiang, M. D., Xu, P. P., Chen, W., Ni, Q. Q., Lu, G. M., & Zhang, L. J. (2020). Coronavirus disease 2019 (COVID-19): A perspective from China. *Radiology*, 200490.‏

Table 1

*Factor Analysis with Varimax Rotation: Perceptions of COVID-19 Questionnaire*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number | Item | Factor loadings | | |
| Perceptions  and  COVID-19 | Isolation and COVID-19 | Ministry of Health’s functioning during COVID-19 |
| 2 | COVID-19 complications | **.646** | .267 | -0.08 |
| 9 | Society's perception towards people exiting isolation | **.633** | .029 | .112 |
| 8 | Society's perception towards people in isolation | **.618** | -.163 | -.044 |
| 5 | Perception of treatment | **.579** | -.058 | .172 |
| 4 | Risks associated with isolation | **.553** | .245 | -.002 |
| 6 | Disease exacerbation signs | .407 | -.008 | .277 |
| 3 | Tools for reducing contagion | .006 | **.769** | .098 |
| 7 | Mandatory isolation for confirmed COVID-19 patients | -.037 | **.703** | .090 |
| 1 | Means of contagion | .144 | **.697** | .088 |
| 10 | Preventative measures by the Ministry of Health against the virus outbreak | .061 | .117 | **.850** |
| 11 | Advocacy activity of the health system | .013 | .167 | **.841** |

Table 2

*Number of Study Participants by Demographic Characteristics*

|  |  |  |  |
| --- | --- | --- | --- |
| Healthcare workers  (n = 470) | General population  (n = 696) |  | Variable |
| 126 (26.8) | 215 (30.9) | Men | Gender |
| 344 (73.2) | 481 (69.1) | Women |
| 198 (42.1) | 386 (55.5) | Below age 32 | Age |
| 272 (57.9) | 310 (44.5) | Above age 32 |
| 148 (31.5) | 266 (38.2) | Single | Marital status |
| 322 (68.5) | 430 (61.8) | In relationship |
| 278 (59.1) | 545 (78.3) | Jewish | Ethnicity |
| 192 (40.9) | 151 (21.7) | Non-Jewish (Muslim/Christian/ Druze) |
| 410 (87.2) | 618 (88.8) | Yes | Comorbidity |
| 60 (12.8) | 78 (11.2) | No |
| 75 (16) | 79 (11.4) | Yes | Smoking |
| 395 (84) | 617 (88.6) | No |
| 55 (11.7) | 102 (14.7) | Yes | Isolation |
| 415 (88.3) | 594 (85.3) | No |
|  | 50 (10.6) | Doctor | Role |
| 291 (61.9) | Nurse |
| 69 (14.7) | Para-medical |
| 34 (7.2) | Senior- management |
| 26 (5.5) | Administrative |
| 410 (87.2) | Clinical | Clinical position |
| 60 (12.8) | Non-clinical |

Table 3

*Differences in Main Study Variables between the General Population and Healthcare Workers*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *t* | Mean (Standard Deviation) | | | Variable |
|  | Healthcare workers | General population | |  |
| -2.63\*\*\* | 6.72 (4.47) | 6.04 (4.22) | Anxiety (0-21) | |
| 1.28 | 1.65 (0.38) | 1.67 (0.35) | Perceptions of COVID-19 (0-3) | |
| -1.68 | 2.64 (0.46) | 2.59 (0.45) | Isolation and COVID-19 (0-3) | |
| 2.19\* | 2.02 (0.74) | 2.11 (0.70) | Ministry of Health’s functioning during the COVID-19 pandemic (0-3) | |
| -1.43 | 36.00 (11.6) | 34.8 (14.4) | Age (year) | |

\**p*<0.05 \*\*\**p*<.001

Table 4

*Anxiety level Differences by Demographic Characteristics among the General Population and Healthcare Workers*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Healthcare workers | | | General population | | | Values | Variable |
| *t* | Standard Deviation | Mean | *t* | Standard Deviation | Mean |
| -4.48\*\*\* | 3.48 | 5.15 | -5.07\*\* | 3.86 | 4.84 | Men | Gender |
| 4.59 | 7.17 | 4.26 | 6.57 | Women |
| 4.59\*\*\* | 4.62 | 7.70 | 1.61 | 4.35 | 6.27 | Below age 32 | Age (nominal) |
| 4.08 | 5.84 | 4.03 | 5.75 | Above age 32 |
| 4.06\*\*\* | 4.67 | 7.83 | 2.17\* | 4.35 | 6.48 | Single | Marital status |
| 4.18 | 6.07 | 5.76 | 4.10 | In relationship |
| -2.03\* | 4.43 | 6.25 | -0.35 | 4.02 | 5.74 | Full | Employment |
| 4.21 | 7.15 | 4.20 | 5.86 | Not full |
| -6.05\*\*\* | 1.01 | 5.64 | -4.43\*\* | 4.14 | 5.67 | Jewish | Ethnicity |
| 4.57 | 8.06 | 4.25 | 7.37 | Non-Jewish (Muslim/Christian/ Druze) |
| 0.00 | 4.40 | 6.63 | 0.64 | 4.30 | 6.07 | Yes | Comorbidity |
| 4.50 | 6.62 | 3.50 | 5.75 | No |
| 1.28 | 4.76 | 7.23 | 1.20 | 4.35 | 6.58 | Yes | Smoking |
| 4.34 | 6.51 | 4.20 | 5.97 | No |
| -3.61\*\*\* | 3.75 | 4.63 | -2.13\* | 3.86 | 5.22 | Yes | Isolation |
| 4.43 | 6.89 | 4.26 | 6.18 | No |
| 2.44\* | 4.45 | 6.82 | No relevant | | | Clinical | Clinical position |
| 3.93 | 5.33 | Non-clinical |

\**p*<0.05 \*\*\**p*<.001

Table 5

*Results of the Hierarchical Linear Regression Analyses Predicting Anxiety among Healthcare Workers*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *R*2 | *t* | β | B | Variable | Step |
| 0.142 | 5.01\*\*\* | 0.24 | 2.42 | Gender | 1 |
| 0.47 | -0.02 | -.206 | Employment |
| 4.52\*\*\* | 0.24 | 2.23 | Ethnicity |
| -0.64 | -0.03 | -.312 | Age (nominal) |
| -1.74 | -0.08 | -.81 | Marital status |
| 0.90 | -0.00 | -0.06 | Clinical position |
| 0.155 | 4.75\*\*\* | 0.23 | 2.25 | Gender | 2 |
| 0.52 | -0.02 | 0.22 | Employment |
| 3.69\*\*\* | 0.20 | 1.88 | Ethnicity |
| -0.93 | -0.05 | -0.45 | Age (nominal) |
| -1.96 | -0.09 | -0.91 | Marital status |
| -0.20 | -0.01 | -0.12 | Clinical position |
| 2.54\* | 0.11 | 1.69 | Isolation |
| 0.193 | 4.63\*\*\* | 0.22 | 2.17 | Gender | 3 |
| 0.54 | -0.02 | 0.23 | Employment |
| 2.97\*\*\* | 0.17 | 1.50 | Ethnicity |
| -0.69 | -0.03 | -0.33 | Age (nominal) |
| -2.39\* | -0.11 | -1.09 | Marital status |
| -0.19 | 0.00 | -0.11 | Clinical position |
| 2.49\* | 0.11 | 1.55 | Isolation |
| 2.07\* | 0.09 | 1.00 | Perceptions of Coronavirus |
| 4.03\*\*\* | 0.19 | 1.71 | Isolation and Coronavirus |
| -1.68 | -0.07 | -0.44 | Ministry of Health’s |

\**p*<0.05 \*\*\**p*<.001