Nurses' Mental Health During the Covid-19 Outbreak

A Cross-Sectional Study

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Objective: To describe nurses' mental health status during the Covid-19 outbreak and to explore the factors that might accentuate the negative consequences on their mental health. **Methods:** We conducted an online survey to evaluate demographic variables, working conditions, family dynamics, and mental health variables in nurses working in healthcare settings, in Portugal, during the Covid-19 outbreak. **Results:** Portuguese nurses presented higher depression, anxiety and stress levels, when compared to the Portuguese general population, during the outbreak. Overall, nurses who did not consider the quantity and quality of personal protective equipment as adequate presented significantly higher levels of depression, anxiety, and stress. **Conclusions:** Our results suggest that nurses' mental health status seems to be particularly affected by the Covid-19 outbreak and that some modifiable elements might accentuate the impacts on their mental health.

Keywords: coronavirus, mental health, nurses, observational study, pandemics

The outbreak of the 2019 novel coronavirus (Covid-19) pneumonia began in Wuhan, China in a local market in December 2019.[1] The emergence of Covid-19 pneumonia, despite its global scale, can be compared with the 2003 outbreak of severe acute respiratory syndrome (SARS), which was caused by another coronavirus that killed 349 of 5327 patients with confirmed infection in China.[2]

Fear of the unknown increases the level of anxiety in individuals with pre-existing mental health conditions, but also in healthy individuals. For instance, the 2001 anthrax letter attacks in the USA lead to psychiatric disorders and diminished the health perception regarding the infected employees and responders.[3] The predictions for Covid-19 mental health consequences stated that people's emotional responses would probably include uncertainty and fear. Additionally, negative societal behaviours would be frequently driven by distorted perceptions of risk and fear.[4] These experiences might evolve to include a broad range of public mental health concerns, including distress reactions (such as anger, insomnia or fear of illness even for those not exposed), health risk behaviours (such as social isolation or abuse of alcohol and tobacco), mental health disorders (such as anxiety disorders, post-traumatic stress disorder or stress), and lowered perceived health.[4]

During an epidemic of a novel infectious disease, many healthcare professionals are vulnerable both to high risk of infection and mental health problems[5] and this evidence was learned from the 2003 SARS outbreak. However, considering the Covid-19 outbreak is a global-scale phenomenon, it seems to be even more relevant to pay attention to those potential mental health problems.

Considering the mental health problems which occurred during the 2003 SARS outbreak, the National Health Commission of China, on 26 January 2020, released a notification addressing the basic principles for emergency psychological crisis interventions for the Covid-19.[6] This notification stressed that mental health interventions should be provided not only for patients with Covid-19 pneumonitis, close contacts and suspected cases isolated at home but also for health professionals.

In the context of the Covid-19 outbreak, it is crucial to provide health professionals with clear communication including regular and accurate updates on the Covid-19 outbreak, to address their sense of uncertainty and fear. Also, it is especially important to provide mental health support for health professionals.[7]

Comprising almost 50% of the global healthcare workforce, nurses and midwives are at the forefront of providing care and services across the health spectrum.[8] Being one of the professional groups at the front line of the fight against novel infection diseases, their mental health is most likely to be affected. For example, the peak of the 2003 SARS outbreak in Taiwan revealed that nurses at a hospital caring for suspected cases struggled with psychological problems, such as stress.[9] Also, during the Middle East Respiratory Syndrome coronavirus (MERS-CoV) outbreak, a respiratory infection that was first reported in Saudi Arabia in 2012,[10] nurses who were working at a government-designated hospital during this epidemic presented worse mental health scores than those of shift-work nurses[11] and scrub nurses[12] working at university hospitals which were not associated with the disease in South Korea when using the same measurement instruments.[13]

Considering the abovementioned impact usually observed at the outbreak of an epidemic of a novel infectious disease on the mental health of healthcare professionals, this study aimed to describe nurses' mental health status during the Covid-19 outbreak and to explore the elements that may enhance the negative effects on their mental health. In light of the most commonly reported mental health problems during previous epidemics of novel infectious diseases, the hypotheses of our study are:

(1) Covid-19 outbreak lead to high anxiety, depression and stress levels in nurses.
(2) Poor working conditions (eg, non-adequate personal protective equipment [PPE] or overtime work) during the Covid-19 outbreak lead to higher depression, anxiety and stress levels in nurses.
(3) Changes in family dynamics (eg, being displaced from home) during the Covid-19 outbreak lead to higher depression, anxiety and stress levels in nurses.

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The study was approved by the Ethical Committee of two Portuguese universities (56/AFP/2020 and FCS/PI-63/20).

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Clinical significance: Considering the non-existence of a vaccine or an antiviral for preventing or treating the SARS-CoV2, which can lead to a second wave of the Covid-19 outbreak, the findings of our study make a contribution to better prepare that potential situation attempting to minimise its impact on nurses' mental health.

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METHODS

Design

This cross-sectional study, which is reported in accordance with STROBE statement, was conducted through an online survey.

Sample/Participants

The sample included nurses working in Portugal, in healthcare settings, during the Covid-19 outbreak (inclusion criterion). The sampling frame did not include nurses who were in quarantine at the moment of data collection (exclusion criterion). Thus, we intended to have a homogeneous sample, which could lead to describe, specifically, the mental health status of nurses working in the front line (healthcare settings) at the time of data collection.

In previous studies carried out during the SARS outbreak, nurses presented better mental health than other health professionals, such as physicians,[14,15] which might be due to their having medical knowledge, their work environment, and having received training in preventing infection.[16,17] In spite of these findings, frontline nurses treating patients with SARS were psychologically challenged when committing themselves to providing high-quality nursing care for patients.[18–20] Thus, and also considering that nurses and midwives comprise almost 50% of the global healthcare workforce, we decided to focus our study only on nurses.

The sample was obtained by the non-probabilistic snowball sampling method. The questionnaire was created using Google Forms and two members of the research team (FS and CS) sent the online questionnaire via email, to all the nurses of their contact list who were working in healthcare settings. Nurses were asked to fill the questionnaire and share it with other nurses in the same professional situation.

Data Collection

Data collection took place in Portugal, from March 31, 2020 to April 7, 2020. In Portugal, the state of emergency was declared on March 18, 2020.[21] The Covid-19 outbreak mitigation phase, due to the detection of community transmission of the virus, started on March 26, 2020. Thus, to contextualise the period of the data collection, on March 31, 2020, Portugal had 7443 infected patients and registered 160 deaths due to Covid-19.[22] On April 7, 2020, the number of infected patients reached 12,442 and the death toll was of 345 people.[23]

Data were collected using a questionnaire which was composed by four major sections: (1) demographic variables (2) working conditions; (3) family dynamics; and (4) mental health variables (depression, anxiety and stress measurement tool).

The demographic variables, such as age, sex, marital status or academic degree, intended to characterise the sample and to evaluate its representativeness of the population (nurses who work in healthcare settings in Portugal). Working conditions, such as the existence of adequate PPE, the fear of being infected, the potential transference to another unit/department or the number of working hours in the last week, intended to identify the potential impact of the working conditions during the Covid-19 outbreak on nurses' mental health status.

Family dynamics, such as being resettled from home or the fear of infecting family members and/or friends, intended to identify the potential impact of the family dynamics related to the Covid-19 outbreak on nurses' mental health status. Finally, mental health variables, such as depression, anxiety and stress, were assessed using measurement tools.

Data Sources/Measurement

Depression, anxiety, and stress were measured using the Depression Anxiety Stress Scales—short version (DASS-21).[24] The DASS is a self-report instrument consisting of a set of three seven-item subscales designed to measure depression, anxiety, and stress. The Depression scale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia. The Anxiety scale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. The Stress scale is sensitive to levels of chronic non-specific arousal. It assesses difficulty in relaxing, nervous arousal, and being easily upset/agitated, irritable/over-reactive, and impatient.[24] The subjects rate the extent to which they have experienced each symptom over the past week, on a four-point severity/frequency scale. Overall scores for the three constructs are calculated as the sum of scores for the relevant seven items. Range of scores for each subscale is 0 to 21, the higher indicating greater depression, anxiety, and/or stress levels. The Portuguese version of the DASS-21 had a Cronbach's alpha of 0.85 for the Depression scale, 0.74 for the Anxiety scale, and 0.81 for the Stress scale.[25]

Ethical Considerations

The study was approved by the Ethical Committee of two universities (56/AFP/2020 and FCS/PI-63/20). All the procedures involving human participants followed the ethical standards of the 1964 Helsinki declaration and its later amendments or similar ethical standards. Participants were asked to sign an informed consent for data use.

Data Analysis

IBM SPSS version 25 was used to analyse the data. Descriptive characteristics of the sample were obtained using absolute and relative frequencies (qualitative variables) or mean and standard deviation (SD) (for quantitative variables). To compare levels of depression, anxiety and stress by two or more groups, independent sample t test or one-way ANOVA were performed. Linear association between levels of depression, anxiety and stress, and continuous variables were evaluated by Pearson correlation coefficient. A significance level of 0.05 was considered.

RESULTS

The sample comprised 767 nurses, with an overall mean age of 39.1 years (SD = 9.5 years, range 22 to 65 y). The majority were Portuguese nurses ($n = 763$, 99.5%) and women ($n = 619$, 80.7%). In terms of marital status, more than 50% were married ($n = 492$, 64.1%), followed by single ($n = 215$, 28.1%). A total of 538 (70.1%) had a graduation's degree, 215 (28.1%) had a master degree and only nine (1.2%) had a PhD. More than 50% were specialist nurses. Finally, the majority were full-time workers (98.3%) and were working on the site (92.7%) (Table 1).

Table 2 shows the mean scores (and SD) of depression, anxiety and stress (obtained by DASS-21) for the overall sample. These findings support the hypothesis ''Covid-19 outbreak leads to high anxiety, depression and stress levels in nurses''.

Table 3 describes the existence of adequate PPE, in terms of quantity and quality.

Overall, nurses that agreed with the quantity and quality of the equipment presented significantly lower levels of depression, anxiety, and stress compared with nurses that disagreed with quantity and quality of adequate PPE ($P < 0.05$ for all personal protective equipment and outcomes, except for DASS-21 and quantity of caps ($F[4,762] = 2.025$, $P = 0.089$, $F[4,762] = 1.126$, $P = 0.343$ and $F[4,762] = 0.348$, $P = 0.846$ for depression, anxiety, and stress, respectively), stress and quantity of cover boots ($F[4,762] = 2.064$, $P = 0.084$), stress and quality of gloves ($F[4,762] = 2.221$, $P = 0.065$), and stress and quality of caps ($F[4,762] = 2.108$, $P = 0.078$)).

Of the total sample, 646 (84.2%) maintain functions in the same service, 94 (12.3%) were assigned to other services, and 27

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TABLE 1. Sample Characteristics

	n (%) or Mean (SD)
Sex	
Female	619 (80.7)
Male	148 (19.3)
Age (y), mean (SD)	39.1 (9.5)
Nationality	
Portuguese	763 (99.5)
Other	4 (0.5)
Marital status	
Married	492 (64.1)
Divorced	52 (6.8)
Single	215 (28.1)
Widowed	8 (1.0)
Level of education	
Bachelor	2 (0.3)
Graduation	538 (70.1)
Master	218 (28.4)
PhD	9 (1.2)
Specialist	
No	351 (45.8)
Yes	416 (54.2)
Professional situation	
Full time	754 (98.3)
Part-time	11 (1.4)
Other	2 (0.3)
Current professional situation	
In site	711 (92.7)
With restrictions	52 (6.8)
In site and telework	4 (0.5)

SD, standard deviation.

(3.5%) were assigned to another unit. No differences were found between groups when comparing levels of depression, anxiety, and stress according to this classification ($F[2,764] = 0.626$, $P = 0.535$, $F[2,764] = 2.333$, $P = 0.098$ and $F[2,764] = 1.737$, $P = 0.177$ for depression, anxiety, and stress, respectively).

In the last 7 days, the mean number of working hours in the specific service was 42.0 hours (SD = 15.1 h, range 0 to 154). A significant and positive, but low, correlation between the number of working hours in the service and depression, anxiety and stress were found. Nurses that worked more hours presented higher levels of depression ($r = 0.104$, $P = 0.004$), anxiety ($r = 0.131$, $P < 0.001$), and stress ($r = 0.124$, $P < 0.001$). Thus, the hypothesis ''poor working conditions (eg, non-adequate PPE or overtime work) during the Covid-19 outbreak lead to higher depression, anxiety and stress levels in nurses'' is generally supported by these findings. Nonetheless being assigned to other services or units did not significantly increased nurses' depression, anxiety and stress levels.

From the total sample, 76 (9.9%) are displaced from home, of which 69 (90.8%) were voluntarily displaced. Comparing levels of depression, anxiety and stress according to this situation (displaced vs non-displaced), differences were found only for depression ($t(765) = -2.017$, $P = 0.044$), with displaced nurses presenting higher levels of depression.

On a scale from 0 to 10, the fear of being infected and fear to infect family members was on average of 7.6 (SD = 2.1) and 8.9 (SD = 1.7), respectively.

A significant and positive correlation between fear (to be infected and to infect family) and depression, anxiety, and stress was found. Nurses that referred higher levels of fear to be infected presented higher levels of depression ($r = 0.294$, $P < 0.001$), anxiety ($r = 0.339$, $P < 0.001$), and stress ($r = 0.334$, $P < 0.001$). Similarly, nurses that reported higher levels of fear to infect family presented higher levels of depression ($r = 0.250$, $P < 0.001$), anxiety ($r = 0.267$, $P < 0.001$), and stress ($r = 0.285$, $P < 0.001$). Thus, in general, the hypothesis ''changes in family dynamics (eg, being displaced from home) during the Covid-19 outbreak lead to higher depression, anxiety and stress levels in nurses'' are supported by these findings.

DISCUSSION

The first objective of this study was to describe nurses' mental health status (depression, anxiety and stress levels) during the Covid-19 outbreak, and our findings present concerns about their psychological well-being. The current sample's means for the DASS-21 depression, anxiety and stress subscales were tendentially higher than the means obtained from a sample of the Portuguese general population during the Covid-19 outbreak,[26] from a sample of the Portuguese general population previous to the Covid-19 outbreak,[27] and from a normative sample of Western Australian nurses[28] (Table 4).

These findings suggest that, using the same measurement tool in the same country and in a similar moment, nurses presented higher depression, anxiety and stress levels than the general population.[26] They also presented higher anxiety and stress levels than the general population of the same country prior to the Covid-19 outbreak. Even though the depression levels present equal means, it is important to point out that data which were on the basis of the study carried out by Pinto et al[27] were collected in 2013, a moment in which the Portuguese population was facing a financial crisis and severe austerity measures were applied by the government. Finally, it was not to be found in literature normative data for Portuguese nurses or for nurses from similar cultural contexts, such as Spain, Italy and Greece. Thus, we decided to compare the current sample's means for the DASS-21 depression, anxiety and stress subscales with a normative sample of Western Australian nurses[28] and the results, clearly, point out to higher depression, anxiety and stress levels in our sample.

Also, a study carried out in India, during the Covid-19 outbreak, involving health professionals (the study sample was composed by nurses [39.2%], followed by physicians [29.6%] and allied health professionals [10.6%]), pointed out to an overall mean DASS-21 depression subscale score of 3.1 (4.9). The overall mean DASS-21 anxiety and stress subscales scores were, respectively, 3.2 (4.3) and 4.6 (5.5).[29] The findings of our study indicate tendentially higher levels of anxiety, stress and depression, which can be explained by the fact that our sample is composed only by nurses, that is, by personnel who had contact with patients with Covid-19. Thus, for instance, during the SARS epidemic a study carried out by Poon et al[30] pointed out to higher anxiety levels among personnel who had contact with patients with SARS.

The second objective of this study was to evaluate the impact of the working conditions during the Covid-19 outbreak on nurses' mental health status. At this level, our findings show that 15.8% of the nurses had been assigned to other departments or units. However, surprisingly, this circumstance had no significant impact on their depression, anxiety or stress levels. As being assigned to a different ward potentially leads to the need of facing novel

TABLE 2. Nurses' Mental Health Status

	Mean (SD)
DASS-21	
Depression	4.0 (3.8)
Anxiety	4.2 (4.0)
Stress	7.3 (4.5)

SD, standard deviation.

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TABLE 3. Existence of Adequate PPE, in Terms of Quantity and Quality

	Quantity					Quality				
	Totally Disagree	Disagree	Neither Agree nor Disagree	Agree	Totally Agree	Totally Disagree	Disagree	Neither Agree nor Disagree	Agree	Totally Agree
Facial mask	109 (14.2%)	239 (31.2%)	71 (9.3%)	246 (32.1%)	102 (13.3%)	147 (19.2%)	252 (32.9%)	80 (10.4%)	200 (26.1%)	88 (11.5%)
Gloves	35 (4.6%)	75 (9.8%)	63 (8.2%)	340 (44.3%)	254 (33.0%)	45 (5.9%)	90 (11.7%)	67 (8.7%)	363 (47.3%)	202 (26.3%)
Gowns	114 (14.9%)	198 (25.8%)	95 (12.4%)	257 (33.5%)	103 (13.4%)	120 (15.6%)	216 (28.2%)	102 (13.3%)	229 (29.9%)	100 (13.0%)
Glasses or visors	189 (24.6%)	226 (29.5%)	78 (10.2%)	189 (24.6%)	85 (11.1%)	175 (22.8%)	206 (26.9%)	88 (11.5%)	207 (27.0%)	91 (11.9%)
Caps	143 (18.6%)	150 (19.6%)	87 (11.3%)	255 (33.2%)	132 (17.2%)	146 (19.0%)	161 (21.0%)	86 (11.2%)	247 (32.2%)	127 (16.6%)
Cover boots	297 (38.7%)	209 (27.2%)	68 (8.9%)	126 (16.4%)	67 (8.7%)	279 (36.4%)	199 (24.9%)	78 (10.2%)	136 (17.7%)	75 (9.8%)

workplace conditions and new clinical situations, this finding contradicts some theories that state that fear of the unknown may be or otherwise is the major fear motivating anxiety.[31] On the other hand, in Portugal, nurses who work in public healthcare facilities, are supposed to work 35 hours per week while in private healthcare facilities, the working time is usually 40 hours per week. In this study, the results indicate that during the Covid-19 outbreak nurses were working, in mean, 42 hours per week and, although we cannot infer working time is directly related to the outbreak, that overtime work was related to higher depression, anxiety, and stress levels. This finding is in line with the literature, which suggests that overtime work leads to a detrimental effect on nurses' mental health.[32] Moreover, it contributes to poor/fair quality of care, poor or failing patient safety, and more unprovided care,[33] a problem which is particularly significant during a global outbreak.

Our findings also indicate that, despite rare exceptions, nurses who considered their workplace had sufficient and adequate PPE presented lower depression, anxiety, and stress levels. At the early stage of the SARS epidemic, for instance, nurses may have been less likely to be warned about exposure or provided with adequate protections.[34] However, considering that the non-existence of sufficient and adequate PPE can be considered a threat to nurses' safety in the workplace, our findings corroborate the literature. For example, a study carried out in the United Kingdom, pointed out to higher stress levels in nurses when they presented poorer perceptions of safety and not being able to provide safe care.[35]

The third and last objective of this study was to evaluate the impact of changes in family dynamics due to the Covid-19 outbreak on nurses' mental health status. Our findings indicate that nurses who were displaced from home, mainly voluntarily (to protect their families of being infected), presented significantly more depressive symptoms. Moreover, nurses reported an increased fear of being infected, and even a higher fear of infecting their family or friends, and that fear led to higher levels of depression, anxiety, and stress. These findings corroborate the results of the 2003 SARS outbreak in Toronto, in which healthcare professionals' fear of contagion and of infecting family, friends and colleagues triggered anxiety, frustration, and anger.[36]

Limitations

One of the constraints is due to the type of study involved, a cross-sectional study, which hinders to determine cause and effect relationships between variables. Also, since the research involved participant self-report, we must consider the risk of response bias.

Another potential problem lies on the sampling method (snowball sampling), that can also be considered a limitation by itself because it attracts respondents who are already interested in the topic and well engaged, which can lead to a potential sampling bias.

We have decided to exclude nurses who were in quarantine from the sample of our study. However, as it might be that some of the nurses in this group were using quarantine to avoid the fear and anxiety of working in the Covid-19, that exclusion criterion can also be considered a limitation in itself.

Finally, on December 31, 2019, there were 75,928 nurses registered at Ordem dos Enfermeiros, the professional association which regulates the professional activities of nurses in Portugal. However, some of these registered nurses were unemployed, or not working in healthcare settings, or not working in Portugal, or were not working at the moment of the data collection. Despite these numbers and according to the data from April 7, 2020, obtained through a survey answered by 20,771 nurses showing that about 50% of the nurses work in the public Portuguese National Health Service, with 363 infected nurses, 1984 in active surveillance and 1810 in passive surveillance, our results present a margin of error of less than 3.52%.

TABLE 4. A Comparison of Current Study Sample and SD with Portuguese General Population Mean During the Covid-19 Outbreak, Portuguese General Population Mean Before the Covid-19 Outbreak and West Australian Nurses Normative Sample Mean

DASS-21 Subscales	Current Sample Mean (SD)[†]	Moreira et al[26] Mean (SD)[‡]	Pinto et al[27] Mean (SD)[§]	Hegney et al[28] Mean (SD)[¶]
Depression	4.0 (3.8)	3.7 (4.0)	4.0 (3.9)	2.9 (3.8)
Anxiety	4.2 (4.0)	2.6 (3.3)	2.7 (3.3)	2.2 (2.8)
Stress	7.3 (4.5)	6.1 (4.4)	6.6 (3.9)	4.8 (3.8)

SD, standard deviation.
[†]Current sample, $n = 767$.
[‡]Portuguese general population sample during the Covid-19 outbreak, $n = 1280$.
[§]Portuguese general population sample before the Covid-19 outbreak, $n = 280$.
[¶]West Australian nurses normative sample, $n = 132$.

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CONCLUSION

To our knowledge, this is the first study to investigate nurses' mental health status during the Covid-19 outbreak and to explore the factors that might accentuate the negative consequences on their mental health. Our findings suggest that nurses' mental health status seemed to be particularly affected by the Covid-19 outbreak and that some modifiable elements, such as non-adequate PPE or overtime work, might accentuate the negative consequences on their mental health. Considering that nurses comprise almost 50% of the global healthcare workforce and the findings from previous studies carried out during the SARS outbreak, it is possible that other healthcare professionals who were working and living in similar conditions present similar results.

Protecting health professionals is an important component of public health measures for addressing the Covid-19 outbreak. Thus, in a potential second wave of the Covid-19 outbreak, providing them better working conditions, such as adequate PPE and not working overtime, seems to be crucial in order to protect their mental health status.

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