ORIGINAL RESEARCH

The psychological effect of the COVID-19 pandemic on rural appalachian nurses

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ABSTRACT

The coronavirus disease 2019 (COVID-19) pandemic has affected all individuals around the globe, spreading rapidly in late 2019. Confirmed cases of COVID-19 continue to be on the rise causing healthcare facilities to be overwhelmed. In the Appalachian region of the US, the pandemic has been devastating for the community. Healthcare workers on the frontline have had to respond to the pandemic by working directly with patients infected in both the hospital and community setting and have placed themselves and their families at risk of physical and psychological harm. Nurses are especially at risk due to their close personal contact with patients with COVID-19. The aim of this study was to assess the psychological impact of the pandemic on rural Appalachian nurses working directly with patients with COVID-19 in the acute care hospital setting. A cross-sectional design was utilized for this study. The Depression, Anxiety, Stress Scale (DASS-21) was administered to 77 nurses. The results of the study found that 66.3% of the nurses self-reported their level of depression between a moderate to extremely severe level when caring for COVID-19 patients. In addition, 72.8% of participants reported their anxiety level between moderate to extremely severe and finally, 58.5% reported their stress levels between moderate to extremely severe during this time period. Based on the results of this study, it is imperative that healthcare facilities develop strategies and interventions to address the physical and mental health needs of nurses caring for patients in these stressful work environments.

Key Words: COVID-19, Depression, Anxiety, Stress, Appalachian, Nurses

1. INTRODUCTION

During late 2019, coronavirus disease (COVID-19) spread rapidly across the world affecting many individuals. COVID-19 is an infectious disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). According to the Centers for Disease Control and Prevention (CDC), this disease can lead to either a mild or severe illness with symptoms fluctuating from patient to patient. Most individuals who experience the disease will return to their previous health within weeks of recovering from COVID-19. Some experience post-coronavirus conditions such as shortness of breath, fatigue, difficulty thinking or concentrating, coughing or headaches to name a few.[1] Worldwide, there have been over 253 million confirmed COVID-19 cases with over 5.1 million deaths reported as of November 2021.[2] The United States (US) continues to be the county with the highest number of confirmed cases at 47 million with over 761,000 deaths as of November 2021.[1] These numbers have continued to climb as COVID-19 remains a threat worldwide.

In the Appalachian region of the US, the pandemic has been devastating to the community. The Appalachian region is in the Eastern US and stretches from New York to Alabama. There are thirteen states that make up this area, including parts of New York, Pennsylvania, Virginia, Ohio, Kentucky, Georgia, Tennessee, Maryland, North Carolina, South Car-

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olina, Alabama, Mississippi, and all of West Virginia. According to the Appalachian Regional Commission, there are over 25 million residents that live in the Appalachian region with a per capita average income of $41,155 (national average $51,640) with 15.2% living below the poverty level. Of the 25 million people that live in the Appalachian region, 2.5 million reside in rural communities.[3] The target population for this study was nurses that work in the Appalachian region of West Virginia and Kentucky. According to the West Virginia Department of Health and Human Resources, there have been over 285,000 total confirmed cases and 4,698 deaths from COVID-19 in West Virginia as of November 2021.[4] In Kentucky, there have been over 746,000 confirmed cases and 10,318 deaths during the same time period.[5]

Healthcare workers, especially nurses, have had to respond to the pandemic by working directly with patients infected with COVID-19 in the hospital and community settings. Frequently, critically ill patients with COVID-19 required mechanical ventilation and admission into intensive care units (ICU). With the mandatory hospital restrictions, many patients were unable to have family members at their bedside during this time. Therefore, nurses not only served as the primary caregiver for the patients but also served as the communicator between the patient and family and had to attend to the emotional needs of both. Nurses during the pandemic have had to witness considerable amounts of suffering, grief, sorrow, and death, putting them at increased risk of emotional distress.

1.1 Significance of the problem world-wide

In the last year, several studies have examined the impact of the COVID-19 pandemic on the mental health of healthcare workers throughout the world. A systemic review and meta-analysis were conducted on the prevalence of depression, anxiety, and insomnia among healthcare workers in China during the COVID-19 pandemic. In twelve studies reviewed, anxiety was assessed with a pooled prevalence of 23.2% and depression was assessed in 10 studies with a pooled prevalence rate of 22.8%. Five studies estimated insomnia at 38.9%. Results of this review found that female healthcare providers and nurses had higher rates of affective symptoms compared to male and medical staff, respectively.[6]

A study in Egypt and Saudi Arabia evaluated healthcare workers (physicians, nurses, and other healthcare workers) level of depression, anxiety, and stress during the pandemic. The study found 69% had depression, 58.9% had anxiety, and 55.9% had stress. This study also found that 37.3% had inadequate sleep (less than 6 hours a day). Results from this study observed that females working nightshift who watched

or read about COVID-19 more than 2 hours a day, and did not receive emotional support from family, society, and the hospital were more likely to have depression, anxiety, stress, and inadequate sleep.[7]

A large study examined the mental health among medical and nonmedical professionals during the COVID-19 pandemic in eight European countries. Across all surveyed countries, participants reported a moderate level of depression at 18% and a severe/extremely severe level of depression at 17%. Regarding anxiety, 15% reported a moderate level and 22% reported a severe/extremely severe level of anxiety. In terms of stress, 14% reported moderate levels and 27% reported severe/extremely severe stress. It was found that participants in France and the United Kingdom reported higher levels in all three domains compared to participants in Germany, Austria, Switzerland, Italy, Spain, and Portugal. In this study, the most reported reasons for stress were "Uncertainty about when the epidemic would be under control" and "Worrying about inflicting COVID-19 on family".[8]

A study in Nepal assessed the level of stress, anxiety, and depression in health care workers during the outbreak. The symptoms of stress, anxiety, and depression among the participants were found to be 28.9%, 35.6%, and 17.0%, respectively. The study found females were two times more likely to have anxiety and depression than males. Nurses were two times more likely to have anxiety than doctors. Health care workers who lacked or had insufficient personal protective equipment (PPE) were almost three times more likely to have depression and those working in high-risk areas were almost two times more likely to have depression.[9]

A study in Belgium assessed the differences in mental health in physicians and nurses working in COVID and non-COVID units. Of the 647 participants of the study, 28.8% had moderate to extremely severe symptoms of depression, 41.8% had moderate to extremely severe symptoms of anxiety, and 25.1% had moderate to extremely severe symptoms of stress. In this study, nurses and females reported anxiety more frequently than physicians and male participants. In addition, nurses who were younger, had a heavy workload, and lacked social support had more symptoms of depression, anxiety, and stress.[10]

A large study conducted in Australia determined the level of depression, anxiety, and stress on critical care healthcare workers. Of the 3,770 healthcare workers who participated in the study, 21.6% reported moderate to extremely severe depression, 28.6% reported moderate to extremely severe anxiety, and 28% reported moderate to extremely severe stress scores. The study found many clinical concerns that were associated with higher scores in all three domains included not

being clinically prepared, having inadequate workers, having to triage patients, fear of transmitting virus to friends and family, contracting the COVID-19 virus, being responsible for other staff members, or being asked to work in an area outside of expertise.[11]

A study conducted in the Philippines examined the effects of the pandemic on nurses. This study included nurses from 75 different units from a total of twenty different facilities. Greater than 90% of nurses identified they were not prepared to manage COVID-19 patients. The results from the COVID-19 Anxiety Scale found that 37.8% of nurses had dysfunctional levels of anxiety with symptoms including tonic immobility, dizziness, appetite loss, abdominal distress, and sleep disturbances. The results of this study found that nurses were impacted mentally as well as physically when caring for COVID-19 patients.[12]

1.2 Significance of problem in United States

The National Nurses Union conducted a survey on more than 9,200 registered nurses who worked in the United States. Overall, the participants reported having more mental health and emotional issues since the pandemic. The results of the survey found that 61% reported feeling more stressed, 57% reported an increase in anxiety, and over half felt more sad or depressed. Nurses reported they faced issues ranging from unsafe staffing levels to lack of basic infection control and prevention measures including having to reusing PPE. In addition, nurses were concerned about being exposed to coronavirus and infecting family members coupled with the delay in contact from their employers when they may have been exposed to a COVID-19 positive patient. All these issues were reported by the nurses in the survey as reasons for increased anxiety and stress during the pandemic.[13]

A study conducted in the United States, found that nursing staff in a large, California Medical Center during the COVID-19 pandemic had increased levels of depression and anxiety. Over 79% of the nurses reported feeling anxious and 77.9% reported feeling depressed during this time. This study noted that female nurses were two times more likely to be distressed compared to male nurses. Also, the study found that student nurses, licensed practical nurses, and clinical assistants had higher levels of depression and anxiety than registered nurses and nurse practitioners.[14]

A qualitative study conducted on nurses in Michigan identified themes related to stress experienced during the pandemic. The first theme identified in the study was that 29% of the participants were fearful of being exposed to COVID-19 and becoming ill, as well as passing the virus onto others, such family members, or patients. The next theme identified

was related to illness/death at 38.9%. This included nurses having to care for rapidly deteriorating patients, witnessing patients dying, and caring for ventilated or extremely ill patients. The next theme was work-related issues such as relationships, administration failures, and lack of supplies and training which was identified by 51.2% of the participants. Additional themes identified were stressors related to lack of PPE and supplies and dealing with the consistent unknowns during the pandemic.[15]

1.3 Aim of study
Several research studies identified in the literature review provided evidence that healthcare workers throughout the world and the US have been impacted by the COVID-19 pandemic. Yet, the researchers could not find any studies that focused on the impact of the pandemic on nurses working in the Appalachian region. Therefore, the aim of this study was to assess the psychological impact of the pandemic on rural Appalachian nurses working directly with patients having COVID-19 in the acute care hospital setting.

2. METHODS
2.1 Study design and sample
A cross-sectional design was utilized for this study. The study was conducted from March 12, 2021, to May 17, 2021. A convenience sampling method was utilized to select participants. A total of 84 nurses completed the survey from two hospitals in the Appalachian region. Seven surveys were found to have incomplete data; therefore, they were removed from the study leaving a total of 77 participants. The response rate was estimated at 30% based on the number of eligible participants. The survey included general demographic characteristics (age, educational level, and years of experience as a nurse), work-related information (hospital, unit, and shift), and the DASS-21 instrument to measure depression, anxiety, and stress.

2.2 Ethical consideration
The study was approved by the institutional review board (IRB) at a mid-size University in Eastern US. Participants were invited to complete the survey via flyer and/or email on a voluntary basis. Prior to starting the survey, each participant was provided with information that explained the purpose, potential benefits/risks, and procedure for the study. Once participants consented to the study, they were provided with the survey questions. At any time, the participants were able to withdraw from the study by simply not completing the survey questions. No identifiable data was collected on participants and the survey results were keep in a secure location with the researchers being the only individuals to have access to the results.

2.3 Procedure

The researchers utilized Qualtrics®, an online survey software tool, to upload the survey questions and create a survey link with a Quick Response (QR) code. The researchers contacted several nurse administrators at local rural hospitals and requested their participation in the study. Two hospitals agreed to participate in the study. The researchers send the administrators the QR code for the survey link to distribute to 282 participants that met the study criteria. The study criteria included any nurse who worked directly with COVID-19 patients prior to and during the study period. The administrators posted flyers on the nursing units and sent emails with the QR code to all participants who met the study criteria. Participation in the study was voluntary and the identity of the participants remained anonymous. The QR code for the survey remained active for three months. A reminder was sent to the nurses via email two weeks prior to the close of the survey.

2.4 Instrument to measurement depression, anxiety, and stress

The DASS-21 is a self-reported 21-item survey was used to measure depression, anxiety, and stress. Each of the three DASS subscales (depression, anxiety, and stress) contained 7-item to measure these concepts. Within the depression subscale, the concepts of dysphoria, hopelessness, no self-worth, self-deprecation, lack of interest, inability to change, and lack of pleasure were assessed. Within the anxiety subscale the concepts of autonomic arousal (sweating, trembling), skeletal muscle activity, situational anxiety, and subjective experience of anxious (panic, scared) affect were assessed. Within the stress subscale the concepts of inability to relax, nervousness, being easily upset/agitated, irritable/over-reactive, and impatient were assessed. Scores for each subscale for depression, anxiety, and stress were then calculated by summing the scores for each subscale and then multiplying by two.[16] Based on the scores derived from each subscale on the survey, the participants were divided into five categories: normal (lacking depression, anxiety, or stress), mild, moderate, severe, or extremely severe. Depression levels were categorized based on the following scores: less than 9 normal, 10-13 mild, 14-20 moderate, 21-27 severe, and 28 or higher extremely severe. Anxiety levels were categorized based on following scores: less than 7 normal, 8-9 mild, 10-14 moderate, 15-19 severe, and 20 or higher extremely severe. Stress levels were categorized based on the following scores: less than 14 normal, 15-18 mild, 19-25 moderate, 26-33 severe, and 34 or greater extremely severe.[16]

Several researchers have utilized the DASS-21 instrument to measure depression, anxiety, and stress in various population

with high reliability. A study that utilized the DASS-21 instrument on hospital clinical staff had a Cronbach's alpha of 0.901, 0.754, and 0.886 for the depression, anxiety, and stress subscales.[17] A study that utilized the DASS-21 survey on medical students had a Cronbach's alpha value of 0.81, 0.89 and 0.78 for the subscales of depressive, anxiety and stress respectively.[18] Finally, a study that utilized the DASS-21 survey on critical care workers had a Cronbach's alpha for depression, anxiety, and stress subscales at 0.88, 0.89, and 0.90, respectively.[18]

2.5 Statistical analysis

Descriptive statistics were calculated for the demographic characteristics, work-related information, and the DASS-21 survey scores. The nonparametric statistical tests, Mann-Whitney U and Kruskal-Wallis H, were used to evaluate the level of depression, anxiety, and stress scores among the work-related and the demographic variables, respectively. Data analysis was performed using IBM SPSS® Statistics for Windows (Version 26) and a two-sided p value < .05 was considered statistically significant.

3. RESULTS

3.1 Participant demographic characteristics

Almost half of participants were between the ages of 32-37 (26%) and 26-31 (20.8%). Fifty-seven percent of nurses had a Bachelor of Science in Nursing (BSN) degree with approximately 30% had an Associate Degree in Nursing (ADN) degree. Approximately, 9% of the nurses had a Master of Science in Nursing (MSN) degree or higher. Nurses with eight or more years of experience made up 48% of the participants with only 14% having less than one year of experience as a nurse (see Table 1).

3.2 Work-related information

The majority (80.5%) of participants worked in the intensive care unit (ICU) with the other participants working on medical-surgical units caring for patients with COVID-19. Participants completing the survey predominately worked day shift at 63.6% with approximately 1% working rotating shifts. Surveys were completed by nurses from two different rural Appalachian hospitals (see Table 2).

3.3 Psychological characteristics

Results from the DASS-21 survey revealed that nurses self-reported various levels of depression ranging from extremely severe at 20.8%, severe at 20.8%, moderate at 24.7% and mild at 10.4%. Various levels of anxiety were reported from 36.4% extremely severe, 14.3% severe, 22.1% moderate, and 5.2% mild. Levels of stress range from 13% extremely severe, 20.8% severe, 26% moderate, and 13% mild (see Table

3).

Table 1. Participant description

Characteristic	Number (N)	Percentage (%)
Age Group		
20-25	14	18.0
26-31	16	20.8
32-37	20	26.0
38-43	7	9.1
44-49	14	18.2
50-55	4	5.2
56-61	1	1.3
62+	1	1.3
Total	77	100.0
Level of Education		
LPN	3	3.9
ADN	23	29.9
BSN	44	27.1
Other	7	9.1
Total	77	100.0
Years of experience as nurse		
Less than 1 year	11	14.3
1 to 3 years	16	20.8
4 to 7 years	13	16.9
8 to 12 years	13	16.9
13 years or more	24	31.2
Total	77	100.0

Note. LPN = Licensed Practical Nurse, *ADN* = Associate Degree Nursing, *BSN* = Bachelor of Science in Nursing.

Table 2. Work-related information

Characteristics	Number (N)	Percentage (%)
Hospital Employed		
Hospital #1	57	74.0
Hospital #2	20	26.0
Total	77	100.0
Nursing Unit		
Critical Care Unit (ICU)	62	80.5
Medical-Surgical Unit	15	19.5
Total	77	100.0
Shift Primarily Worked		
Days	49	63.6
Nights	27	35.1
Rotating (Both shifts)	1	1.3
Total	77	100.0

3.4 Comparison of variables

The Mann-Whitney U test was calculated to compare work-related variables (hospital, unit, shift) had on depression, anxiety, and stress scores. The Kruskal-Wallis H test was calculated to compare the impact of age, level of education, and years of experience had on depression, anxiety, and stress scores. The Mann-Whitney U test revealed no significant differences in the work-related variables and the level of depression, anxiety, or stress. The Kruskal-Wallis H test

revealed a statistically significant difference in depression based on level of education (Gp1, n = 3: LPN, Gp2, n = 23: ADN, Gp3, n = 44: BSN, Gp4, n = 7: other [MSN]), χ^2 (3, n = 77) = 10.47, p = .015. Nurses with a higher level of education (MSN or higher) recorded lower levels of depression compared to nurses prepared at the ADN and BSN levels. The test also revealed a statistically significant difference in anxiety based on the level of education (Gp1, n = 3: LPN, Gp2, n = 23: ADN, Gp3, n = 44: BSN, Gp4, n = 7: other [MSN]), χ^2 (3, n = 77) = 8.85, p = .031. Nurses with a higher level of education (MSN or higher) recorded lower levels of anxiety compared to nurses prepared at the LPN, ADN, and BSN levels. The effect size using Cohen criteria ranged from 0.36 to 0.68 for all groups compared, indicating a medium to large effect. No other variable measured was found to be statistically significant.

Table 3. DASS-21 results

Characteristic	Number (N)	Percentage (%)
Depression		
Normal	18	23.4
Mild	8	10.4
Moderate	19	24.7
Severe	16	20.8
Extremely severe	16	20.8
Total	77	100.0
Anxiety		
Normal	17	22.1
Mild	4	5.2
Moderate	17	22.1
Severe	11	14.3
Extremely severe	28	36.4
Total	77	100.0
Stress		
Normal	21	28.3
Mild	10	13.0
Moderate	20	26.0
Severe	16	20.8
Extremely severe	10	13.0
Total	77	100.0

4. DISCUSSION

This study has demonstrated the negative psychological impact of the COVID-19 pandemic on nurses working in the rural Appalachian region of West Virginia and Kentucky. In this study it was found that 66.3% of the nurses self-reported their level of depression between a moderate to extremely severe level, 72.8% of participants reported their anxiety level between moderate to extremely severe, and 58.5% reported their stress levels between moderate to extremely severe when caring for COVID-19 patients. Compared to healthcare providers and nurses who practiced outside the

US, the results of this study found that nurses in the rural Appalachian region report having more than twice the level of depression, anxiety, and stress during the COVID-19 pandemic.[6–11] A study conducted in California did have similar results to this study with over 75% of nurses reporting depression and anxiety.[14] In addition, this study found that nurses with a higher level of education (MSN or higher) reported less depression and anxiety than nurses with lower levels of education. Another study conducted in the US, also found that nursing students, licensed practical nurses (LPN), and clinical assistants had higher levels of depression and anxiety than registered nurses and nurse practitioners.[14]

Nurses caring for patients in the Appalachian region have had additional challenges to face besides those mentioned in the research. The supply of primary care physicians in the Appalachian Region is 12% lower than the national average.[3] By having less physicians, this can limit patients' access to quality healthcare. In addition, many individuals in the Appalachian region live in rural areas where public transportation is unavailable. Both issues can cause patients to delay seeking medical treatment. Also, obesity, smoking, and inactivity are higher in the Appalachian region than in the nation, placing this population at increased risk for heart disease, cancer, chronic obstructive pulmonary disease (COPD), stroke, and diabetes.[3] In addition, nearly 20% of those in rural counties are aged 65 and older. Older individuals with obesity and health concerns such as heart disease, cancer, diabetes, and COPD are more likely to be seriously ill with COVID-19.[1] Therefore, nurses caring for patients in the Appalachian region have been challenged with limited resources and caring for seriously ill patient with the COVID-19 disease.

During past epidemics, nurses who cared for infectious patients were found to experience greater distress than other healthcare providers due to their direct, intense, and sustained contact with patients.[17] Therefore, it is no surprise that nurses working directly with COVID-19 patients would have higher levels of anxiety and stress considering the lack of information known about the COVID-19 disease. In several studies, the concerns reported by nurses were fear of the unknown, feeling vulnerable, worrying about getting infected, or transmitting the disease to family members or loved ones.[8, 9, 11, 13] In addition, physical signs of stress such as insomnia, dizziness, lack of appetite, and abdominal distress have been reported by nurses when caring for COVID-19 patients during the pandemic.[7, 12]

A literature review of sixteen studies focused on the impact stress had on nurses working in hospitals related to job satisfaction, job performance, and quality of nursing care.

The results of this review found that high levels of stress in nursing staff can result in poor performance, increased turnover, and may adversely affect patient care.[19] This review also found stress increased attrition, reduced retention, and lessened recruitment among nurses. Throughout the US, hospitals continue to report nursing shortages in many departments. Based on the results of this study, hospitals should focus on strategies that will reduce stress in nursing staff to improve retention and job performance.

Healthcare facilities can address the negative impact of the pandemic on nurses by focusing on organizational support, psychological and mental support services, self-care strategies, resilience building and stress management interventions, and promoting social support.[12] Organizational support would focus on clear and timely communication, providing a safe work environment with adequate staffing and PPE, and additional training for caring for COVID-19 patients.[9] Healthcare providers and nurses involved in direct care of COVID-19 patients should have their mental health screened at regular intervals. They should be provided with mental health resource and support when needed.[9, 23] Organizations should promote self-care in nurses by offering flexible or shorter work hours, provide adequate breaks and more personal or vacation paid time off (PTO).[12] In one study, the building of resilience in healthcare workers during the COVID-19 was found to preserve their mental and psychological health and well-being.[21] Resilience is the ability to face adverse situations, remain focused, and continue to be optimistic for the future. Resilience can be built through formal education, social support, and meaningful recognition.[22] Finally, social support is essential when facing anxiety-provoking events. Social support can occur between colleagues, friends, and families though phone calls, social media, video conferences, or face-to-face conversations. Nurses' mental health and psychological well-being should be supported through sharing of work experiences, listening to nurses' concerns and offering empathetic support.[12]

Limitations

There were a few limitations identified within the study. The first, was the use of cross-sectional nature of the study which did not allow for interpretation of cause. Additional research would need to be conducted to determine the underlying causes for the high levels of depression, anxiety, and stress reported by the nurses in the study. In addition, there was no baseline mental health history collected on the participants prior to the study being conducted to compare to the results. Therefore, there was no way of knowing if participations had pre-existing mental health issues such as depression, anxiety, or stress before the pandemic. The study was self-

administered, and symptoms reported by the participants were not verified which may have led to response bias. This study only provided a snapshot of the participants' experience, with no information on the long-term impact of the pandemic on the participants. Furthermore, the study utilized a convenience sampling technique and a small number of participants (n=77) completed the survey making generalization of results different to apply to a larger diverse populations.

5. CONCLUSION

The impact of the COVID-19 pandemic has not been isolated to one region, group, or nationality, but is worldwide prob-

lem that continues to affect many lives. To our knowledge, this is the first study to assess the psychological impact of the COVID-19 pandemic on rural Appalachian nurses. In this study, nurses working directly with COVID-19 patients reported high levels of depression, anxiety, and stress. The results of this study were concerning to the authors with the hope for future research to develop strategies and interventions to improve nurses' physical and mental health during times of outbreaks of disease or adverse events.

CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

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