

MENTAL HEALTH OF NURSES DURING COVID-19 PANDEMIC: PREDICTIVE EFFECT OF DEMOGRAPHICS

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Abstract

Objective: To explore psychological health of nurses in terms of depression, anxiety and stress with predictive effect of demographic characteristics. **Methods:** It was a cross sectional study in which 300 on duty male and female nurses were included from government and private Hospitals of Gujrat, Pakistan. A demographic sheet and Urdu version of Depression, Anxiety & Stress Scale (DASS-21) were used to collect data. Descriptive statistics, two steps cluster analysis and neural network modeling were carried out by using SPSS 21. **Result:** Two steps cluster analysis classified the data in two clusters. Cluster 1 revealed low (f = 43) and medium (f = 61) level of depression, moderate (f = 81) and severe (f = 23) level of nervousness and mild (f = 20) level of stress, respectively. Whereas, in cluster 2 all the participants showed normal level of depression, anxiety and stress. Furthermore, neural network modeling revealed significant predictive importance of demographic variables. The most important predictor of mental health of nurses was attended COVID-19 patient 0.460 (100% normalized importance) next was age 0.154 (33.6% normalized importance), duty timing 0.029 (28.2% normalized importance), education .126 (27.5% normalized importance), marital status .101 (21.9% normalized importance), gender .020 (4.4% normalized importance) and nature of job .010 (2.1% normalized importance) respectively. **Conclusion:** Nurses during COVID-19 were facing mild and moderate level of depression and moderate and severe level of anxiety. Certain demographics features (attended COVID-19, age, duty timing & marital status) showed important predictive association with mental health of nurses. Managing the importance of predictive factors can be helpful to diminish the level of depression and anxiety in nurses.

Keywords: COVID-19, Mental Health, Two Steps Cluster Analysis, Neural Network Modeling

INTRODUCTION

On December, 2019 a novel virus suddenly emerged and recognized in Wuhan, China and then rapidly spread all over the world. In this scenario World Health Organization announced sixth Public Health Emergency of International Concern under International Health Regulations on January 30, 2020, as this disease severely affecting billions of human beings. On February 11, 2020, World Health Organization officially named this novel virus as Corona Virus Disease 2019 (COVID-19). In Pakistan, on February, 2020 first case of COVID-19 reported in Karachi and then circumstances were getting worse and worse for entire country (Rana, Mukhtar & Mukhtar, 2020). The clinical characteristics of this disease are unpredictable as it varies from individual to individual. It differs from asymptomatic to mild symptoms and to severe cases like pneumonia (Mahalmani et al., 2020; Zhou et al., 2020).

Outbreaks of diseases particularly a pandemic outbreak triggers fear and anxiety related behaviors and become a severe threat for the physical and mental health of people (Leary, Jalloh & Neria, 2018). Despite the fact that the present crisis may provide prospect for personal growth and family affection, several negatives outweigh these advantages. Lack of peer contact, anxiety, and fewer opportunity to cope stress are all major glitches. Aside from these concerns and misgivings over the COVID-19, the worldwide economic situation has worsened, with rising and high unemployment rates. The current condition has a predominantly negative impact on children, adolescents, and their families. The kindergartens and schools have been closed, social interactions have been sternly restricted, and out-door leisure happenings have been cancelled because of producing significant mental health problems (Fegert, Vitiello, Plener & Clemens, 2020). Furthermore, healthcare workers such as doctors, paramedical staff and nurses, who are considered to perform their duties at front with COVID-19 patients, are more vulnerable to develop mental health issues than other segments of society. There are many reasons for this vulnerability such as increased stretch of this disease, risk of getting infected, fear of transmitting it to family members, increased in work pressure, shortage of resources and lack of self-protective equipment to tackle this terrifying situation (Ali et al. 2020; Pappa et al., 2020). These factors lead toward wide-ranging of mental health problems such as depression, anxiety, sleep problems, stress, panic attacks and helplessness (Rana et al., 2020). Researches on past outbreaks of infectious diseases such as Middle East respiratory syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS), consistently demonstrated that healthcare experts including nurses developed psychological issues such as anxiety and depression during and even after these diseases outbreak (Gomez-Duran, Martin-Fumado & Garcia-Forero, 2020). Additionally, a recent research from China indicates high prevalence of mental health problems (depression=50.4%, anxiety=44.6%, insomnia=34%) among nurses and other worker who are directly involved in treating COVID-19 patients (Lai et al., 2020).

Healthcare workers such as physicians, paramedical staff and nurses are the heroes who are fighting against this pandemic on frontline without considering about their own lives. It is very critical to take care of their physical and psychological health during this outbreak so that they can perform their duties efficiently. Due to uniqueness of this pandemic outbreak and weak infrastructure, there is a shortage of researches in developing countries like Pakistan about the impact of this Covid-19 pandemic on psychological health of health care workers. Current study intended to fill this gap. The primary objective of this study was to explore mental health issues among nurses who are working with COVID-19 patients. Furthermore, how different demographic features predict this relationship was the secondary objective of this study.

METHOD

Cross sectional research design was used in this study. Participants of study included 300 on duty male and female nurses staff from five public and private Hospitals of Gujrat, Pakistan.

A self-constructed demographic sheet was used to obtain information about gender, age, education, marital status, residential area, family system, duty timing and attend COVID-19 patient or not.

For the assessment of mental health of nurses DASS-21 Urdu version translated by Aslam (2007) was used. Scale entails 21 items, measures three dimensions of emotional distress (depression, anxiety & stress). Each subscale contains 7 items and scores of each dimension are characterized into five categories (normal, mild, moderate, severe and extremely severe). Present study labelled high internal consistency of scale with a cronbach's alpha .85.

Method and material applied in existing investigation were examined and approved by the Advanced Studies and Research Board, University of Gujrat, Pakistan. All recommendations of the board were incorporated in the present study. Permission was taken from the concerned authorities of Hospitals from where sample was to be drawn. Participants were informed about the purpose of research, its significance and volunteer basis of their participation in research. Confidentiality and privacy of data was insured to participant.

Descriptive statistics were used to summarize raw data, further, two steps cluster analysis and neural network analysis were applied to find out mental health (depression, anxiety & stress) of nurses and predictive effects afore said demographic variables.

RESULTS

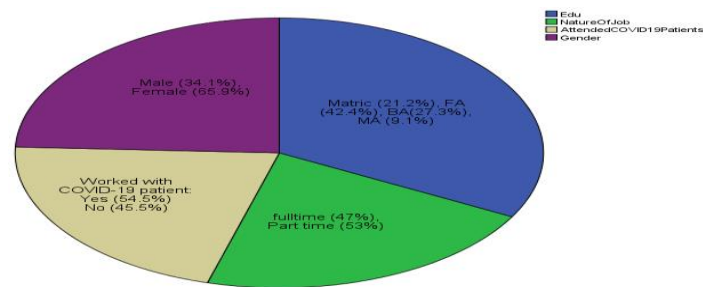


Figure 1: Graphical representation of percentage of demographic variables (N=300)

Above chart displays percentage of demographics features (i.e. gender, education, job status and worked with COVID-19 patient). There are 34.1 % male participants and 65.9% female participants it means majority of participants are female. Percentage of participant's education is 21.2% matriculation 42.4 % FA, 27.3% BA and 9.1 % MA, respectively. 47% participants are regular employees while 53% participants are part time or daily wages employees. 54.5 % participants have worked with COVID-19 patients, on the other side 45.5 % participants have not worked with COVID-19 patient.

Table 1: Auto clustering table representing probable number of clusters in data (N=300)

Number of Clusters	Schwarz's Bayesian Criterion (BIC)	BIC Change ^a	Ratio of BIC Changes ^b	Ratio of Distance Measures ^c
1	1950.339			
2	1683.875	-266.465	1.000	2.176
3	1603.619	-80.256	.301	1.851
4	1596.185	-7.434	.028	1.131
5	1598.689	2.504	-.009	1.262
6	1616.895	18.206	-.068	1.024
7	1636.477	19.582	-.073	1.107
8	1661.702	25.225	-.095	1.062
9	1690.034	28.333	-.106	1.100
10	1722.878	32.844	-.123	1.122
11	1760.632	37.754	-.142	1.197
12	1805.040	44.409	-.167	1.041
13	1850.781	45.741	-.172	1.045
14	1897.916	47.135	-.177	1.021
15	1945.695	47.775	-.179	1.016

Auto clustering table represents possible classification of data by computing best cluster solution. Table no 1 showing the values of Schwarz's Bayesian Criterion (BIS) which are greater than ten which represent good evidence related to cluster distribution. Moreover, greatest value of Proportion of BIC change and Ratio of Distance measure display possible number of clusters in dataset. Proportion of BIC Variations lies in the cluster 2 and the large Ratio of Distance Measures also lies in the cluster 2, hence, it is clear that we choose two clusters for this data.

Table 2: Number of participants in each cluster (N=300)

	N	% of Combined	% of Total
Cluster	1	104	78.8%
	2	28	21.2%
	Combine	400	100.0%
Total	400		100.0%

Table 2 shows the total number of participants in each cluster. Of whole 132 participants that are allocated into two clusters. There is a big difference among rate of recurrence of participants in each cluster. 104 cases are allocated to the first cluster and 28 cases to the second cluster. Findings show that most of participants fall in cluster one

Table 3: Levels of Depression (N=300)

		Normal		Mild		Moderate	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster	1	0	.0%	43	100.0%	61	100.0%
	2	28	100.0%	0	.0%	0	.0%
	Combined	28	100.0%	43	100.0%	61	100.0%

Above table specifies level of depression in cluster 1 and cluster 2. Overall participants lies into three categories of depression (Normal, Mild & Moderate). In cluster 1, 43 participants exposed mild level of depression and 61 participants displayed moderate level of depression. On the other hand, in cluster 2, 28 participants showed normal level of depression. Result indicated that participants from cluster one with moderate level of depression need further clinical attention.

Table 4: Level of anxiety (N=300)

		Normal		Mild		Moderate		Severe	
		Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent
Cluster	1	0	.0%	0	.0%	81	100.0%	23	100.0%
	2	25	100.0%	3	100.0%	0	.0%	0	.0%
	Combined	25	100.0%	3	100.0%	81	100.0%	23	100.0%

In above table participants represented four level of anxiety (normal, mild, moderate & severe). In cluster 1, 81 participants lie in moderate and 23 in severe level of anxiety. Which represented urgent medical attention. While in cluster 2, 25 participants showed normal level of anxiety and 3 participants indicated mild level of anxiety.

Table 5: Level of stress (N=300)

		Normal		Mild	
		Frequency	Percent	Frequency	Percent
Cluster	1	84	75.0%	20	100.0%
	2	28	25.0%	0	.0%
	Combined	112	100.0%	20	100.0%

Above table represented that participants in both clusters showed normal (84, 28 participants) and (20 participants) mild level of stress.

Table 6: Model Summary (N=300)

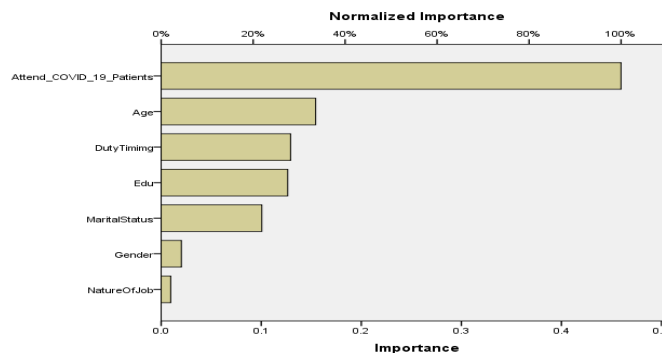
Cross Entropy Error		Percent Incorrect Predictions	
Training	Testing	Training	Testing
32.738	20.144	.753%	.721%

As depicted in the above table training for the cross entropy error was equal to 32.738 (a sample size at 88 with 67.2% sample size) and in testing cross entropy error was 20.144 with (a sample size at 43 with 32.8% sample size). The percent incorrect prediction of training set were .753% whereas in testing the percentage was .721%. If the percent incorrect prediction is constant in the training and testing it gives the confidence about the model as correct. In current findings, the difference is very small for training and testing.

Table 7: Predictive Importance of Independent Factors (N=300)

Sr#	Variables	Importance	Normalized Importance
1	Gender	.020	4.4%
2	Age	.154	33.6%
3	Education	.126	27.5%
4	Marital Status	.101	21.9%
5	Nature of Job	.010	2.1%
6	Duty Timing	.029	28.2%
7	Attended COVID-19 Patient	.460	100.0%

The neural network model gives information about the importance of prediction of demographic factors for mental health of nurses. The result indicated that the most important predictor of mental health of nurses was attended COVID-19 patient 0.460 (100% normalized importance) next was age 0.154 (33.6% normalized importance), duty timing 0.029 (28.2% normalized importance), education .126 (27.5% normalized importance), marital status .101 (21.9% normalized importance), gender .020 (4.4% normalized importance) and nature of job .010 (2.1% normalized importance). All the seven variables were contributing related to mental health of nurses. The importance can be seen in the Figure 1



In result, a comprehensible neural network model appeared that elucidated the importance of independent variables for mental health of nurses. The chart of importance shows that the results were dominated by attended COVID-19 patient, followed by age, duty timing, education, marital status, gender and nature of job.

DISCUSSION

Covid-19 has become a serious issue of mental anguish in the healthcare workers especially in nurses. They are suffering from depression, stress, and anxiety due to the Covid-19 pandemic (Spoorthy, Pratapa, Mahant, 2020). Mental health issues in health care providers during covid-19 are spreading all over the world including Pakistan. Different studies have stated that mental health issues typically arise in similar pandemics or some other traumatic life experiences (Li et al., 2015). Therefore, the first objective of

current study was to explore mental health (depression, anxiety & stress) problems of nurses during COVID-19 outbreak.

Finding revealed that 43 and 61 participants were facing mild and moderate level of depression respectively, while, 81 participants were with moderate anxiety and 23 participants were experiencing severe level of anxiety. This high prevalence of psychological issues might be due to the fact that Covid-19 pandemic stuck the normal flow and functioning of health care sectors as there is a high level of demand to provide health services despite of being insufficient in facilities, particularly in lower middle income countries and especially in Pakistan. Further, wearing safety equipment all the time, concern of getting infected and transmitting the disease to family, training regarding Covid-19 pandemic, no rapid access to testing, no feedback from health care professionals, no support for emotional needs, no provision for child care needs and problems of lodging for individual on a rapid cycle shift. Further, Health care provider working with Covid-19 patients, despite they have worn protective instruments, they should go to quarantine which puts them through psychological issues like depression, stress and anxiety (Rehman et al., 2021; Sil et al., 2020; Saraswathi et al., 2020).

These consequences are in lined with various studies conducted during covid-19. A very recent study by Shekhar at al. (2021) confirmed existing study findings by indicating the overall prevalence of Depression, Anxiety and Stress among health care workers using DASS-21 instrument was found to be 60.2%, 50.4% and 13% respectively. Another study done by Gonzalo et al (2020) found health care workers has gone through on 43.7% fear, 37.9% insomnia, 37.8% psychological distress, 34.4% burnout, 29.0% anxiety, 26.3% depression. In another study by An Ying et al. (2020) the overall prevalence of depression among 1103 Nurses in COVID-19 pandemic using 9 item patient health questionnaire was 43.61 percent. Similarly, a recent systematic review and meta-analysis carried out a by Abdulla, Velladath, Varghese and Anju (2021) in India revealed pooled prevalence of anxiety as 42.87% in 10 studies and pooled prevalence of depression as 41.9% in 12 studies among health care professionals. So, it can be concluded that the health care providers who have been working tirelessly during this pandemic are suffering from high magnitude of mental health morbidities.

A study conducted in China during COVID-19 established that people are facing moderate and severe mental health problems during this pandemic. Moreover, in China, more than half of the participants showed considerable effects on mental health of COVID-19 outbreak (Wang et al., 2020). Likewise, an investigation carried out by American Psychiatric Association in United States also specified that approximately half of the respondents have psychological problems like anxiety during covid-19 (American Psychiatric Association, 2020).

The second objective of present study was to identify prognostic importance of demographic features in psychological health of nurses. Outcome of this study specified certain demographics features (attended COVID-19, age, duty timing & marital status) showed important predictive association with mental health of nurses. Prior studies

approve the outcome of present study, for instance, Authors and Wang (2020) investigated a significant predictive relation of demographic variables (age and education) with anxiety and depression among 600 female and male participants from China. Outcomes of their study demonstrated a significant predictive effect of gender and education on mental health problems. Furthermore, higher effect on female mental health was found than male. Another study by Gupta et al. (2020) reported anxiety, stress and depression to be associated with age, gender, duration of service, and education. Similarly, Wilson et al. (2020) in their study reported high stress is linked with female gender, depression and anxiety to be associated with staying at hostel and female gender. Chan et al. (2021) reported a similar association of anxiety with increased workload and respiratory symptoms. According to a recent study, gender, age, profession, place of work, department of work are associated with the increased stress, anxiety, and insomnia in health care providers at the time of Covid-19 is an independent risk factor for creating stress among them (Spoorthy et al., 2020).

Naturally, these conclusions are subject to certain limitations. First, our data is cross-sectional, which limits the magnitude to which causal claims are not possible as causality of association cannot be checked. Further, non-response from few nurses was found which may disturb the actual representation of the sample. The strength of the research lies in its robust methodology and validated instruments converted into local language. The study was conducted when the pandemic was on its peak and creating infectivity in the region.

CONCLUSION

The study highlights great psychological comorbidities among health care professionals such as nurses working in Covid-19 pandemic. Outcome of the present study exposed mild, moderate and severe level of depression, anxiety and stress in nurses. Furthermore, demographic features (attended COVID-19 patient, age, education, and marital status) are significant predictor of nurse's mental health.

There should be a better strategy to mitigate the influence of Covid-19 on health care workers and appropriate counselling should be delivered to overcome psychological issues among them. Appropriate interventions need to be designed which can significantly deal with mental health problems among this population. The government should provide psychological assistance, hire more people, and cut working hours, as well as give free medical care if necessary. All of these steps can help health-care employees to tackle their mental health issues properly and then serve the nation.

Declarations

Ethical Approval and Consent to participate

Enlisted ethics were considered to complete the study.

- The research proposal got approval by the Departmental Doctoral Research Program committee and by the University's Directorate of Advance Studies and Research Board University of Gujrat,

Hafiz Hayat Campus, Gujrat.

- Permission was sought from the authors of relevant research protocols for to use in the study.
- Informed consent was taken from the respondents after explaining the nature, purpose and procedure of research
- Privacy was assured, research protocols were marked by the initials, generated by the researcher.

Consent for publication

Consent was taken from all the authors for publication of this study. So all the authors of this study are agree to publish this article.

Availability of supporting data

The raw SPSS data related to the findings of this study can be provided by corresponding author on request. Furthermore, all the tables of key findings are included in outcome section of the script.

Competing interests

No competing interest is declared by any author.

Funding

Not applicable

Authors' contributions

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, goes to Mueen Abid.
- Drafting the work or revising it critically for important intellectual content made my Maryam Riaz

Acknowledgements

We acknowledge to the research participants and all other people who cooperated in the throughout process of this study

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