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Prevalence and Associated Risk Factors for Post-Traumatic Stress Disorder (PTSD) in COVID Survivors: A Cross-Sectional Study

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ABSTRACT

Background

The COVID-19 pandemic has caused widespread physical and psychological health challenges. In Nepal, research on the mental health consequences, especially post-traumatic stress disorder (PTSD), among COVID-19 survivors remains limited. This study aimed to find the prevalence and associated risk factors for Post-Traumatic Stress Disorder (PTSD) in COVID Survivors.

Methods

A cross-sectional study was conducted with 228 COVID-19 survivors in Damak COVID Hospital from April to October 2022. Ethical approval was taken from IRC of Institute of Science and Technology, Tribhuvan University (Ref. No. 46/079/080). After bivariate analysis, binary logistic regression was carried out among the significant variables. Model validity was confirmed through Pseudo R^2, Hosmer-Lemeshow, reliability, and multicollinearity tests. P-value<0.05 was considered as statistically significant.

Results

The prevalence of PTSD among survivors was 40.4% (with 95% CI as 34.03% to 46.76%). Significant predictors included gender, diabetes, and chronic obstructive pulmonary disease (COPD). Females were more likely to experience PTSD symptoms than males. Diabetes, whether present before or developed after COVID-19, increased PTSD risk. High blood pressure before infection and COPD developed post-COVID were also linked to higher PTSD likelihood. The logistic model explained 40.2% to 54.2% of the variance in PTSD symptoms.

Conclusions

The prevalence of PTSD was high among the COVID survivors in the Damak area of Jhapa Nepal. gender, diabetes, COPD, and high blood pressure were obsevred as key risk factors for PTSD. These findings emphasize the need for targeted mental health interventions to support vulnerable groups and address the psychological aftermath of COVID-19, ultimately improving survivor well-being.

Keywords: COVID survivors; PTSD; diabetes; high blood pressure; COPD; binary logistic regression.

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INTRODUCTION

In December 2019, pneumonia cases of unknown cause were reported in Wuhan, China, later identified as caused by the SARS-CoV-2 virus.[1] The World Health Organization declared COVID-19 a global Public Health Emergency on January 30, 2020.[2] Coronaviruses are RNA viruses found in birds and mammals, including humans, capable of causing respiratory diseases ranging from mild colds to severe illnesses like SARS and MERS.[3] Globally, COVID-19 has infected millions, with varying recovery rates.[4] Survivors often experience lasting physical and mental health effects.[5] Including symptoms that persist for weeks or months.[7,8] Psychological sequelae such as posttraumatic stress disorder (PTSD) are common after severe trauma, including disease outbreaks.[9] PTSD manifests as intrusive memories, avoidance, and hyperarousal, lasting long after the traumatic event.[10] Genetic and environmental factors influence susceptibility to PTSD.[11-14,19,21] COVID-19 survivors, especially those with severe disease, are at increased risk of PTSD symptoms.[15-18, 22] Despite its high impact, Nepal's mental health infrastructure is limited, with scarce professionals and facilities mainly in urban areas. This gap poses challenges for addressing PTSD in COVID survivors, necessitating focused research and interventions.

METHODS

An analytical cross-sectional study was conducted among discharged COVID-19 patients from Damak COVID Hospital, situated in the northern part of Damak Municipality near the Ratuwa River. The hospital serves a population across 75.42 square kilometers and neighboring areas including Urlabari, Lakhanpur, Gauradaha, and Chulachuli. This study was conducted after obtaining ethical approval from the Institutional Review Committee of the Institute of Science and Technology, Tribhuvan University (Ref. No. 46/079/080). Informed and written consent was taken from all the respondents before data collection. According to hospital records, between April 14, 2021, and October 16, 2021, a total of 589 COVID-19 positive patients were admitted. Of these, 338 were male and 251 female. Patients who were transferred to other facilities or deceased were excluded from the study. Additionally, 28 patients were referred elsewhere, of whom 4 passed away. The study was conducted in collaboration with the Damak Municipality Office. The study sample included 557 patients who had tested positive for COVID-19 and required supplemental oxygen during hospitalization for at least one day. From this population, a sample size of 228 was determined using Yamane's formula at a 95% confidence level, a 5% margin of error, and an assumed population proportion of 50%. Simple random sampling was used to select participants, and data collection was carried out from December 2022 to January 2023.

Data were collected using a self-administered PTSD questionnaire, specifically the Posttraumatic Stress Disorder Checklist-Civilian Version (PCL-C).[23] The PCL-C has been validated in Nepal, demonstrating strong psychometric properties such as internal consistency, test-retest reliability, and both convergent and discriminant validity. Participants also provided self-reported health and lifestyle information, categorized into socio-demographic, health-related, and lifestyle variables. Socio-demographic variables included age, gender, ethnicity, employment status, and marital status. Health-related variables encompassed the presence of diabetes, hypertension, chronic obstructive pulmonary disease (COPD), cardiovascular disorders, kidney disease, and psychological disorders. Lifestyle variables included smoking status, alcohol consumption, yoga practice, and vegetarianism. These variables were classified based on whether the condition or habit was present prior to COVID-19 infection, developed only after infection, or was absent.

PTSD status was assessed using the PCL-C scale, a standardized 17-item self-report instrument aligned with DSM criteria for PTSD symptom clusters: re-experiencing ("B" items), avoidance ("C" items), and hyperarousal ("D" items). Responses rated moderately or above (scores 3–5) were considered symptomatic, whereas lower ratings (1–2) were considered non-symptomatic. PTSD diagnosis required symptomatic responses to at least one "B" item, three "C" items, and two "D" items.[25] The reliability of the PCL-C scale was

confirmed with a Cronbach's alpha of 0.88, indicating good internal consistency reliability, as per established benchmarks.[26]

Collected data were first checked for missing information. Then, it was coded with serial numbers and entered into SPSS version 16 for analysis. Both descriptive and inferential statistical tools were used. In descriptive statistics, frequencies and percentages were calculated for categorical variables, while means and standard deviations were calculated for continuous variables. In inferential statistics, bivariate analysis was first conducted using the Chi-square test. Variables found to be significant in the bivariate analysis were further examined through binary logistic regression after checking for multicollinearity among independent variables. Pseudo R-square values were used to assess the strength of the logistic regression model. While correlation measures alone are insufficient for evaluating model accuracy in binary logistic regression, this study employed Cox and Snell R-square and Nagelkerke R-square to quantify how well the independent variables explained variation in the dependent variable. Additionally, the Hosmer-Lemeshow test was conducted to assess the model's goodness-of-fit. A smaller difference between observed and predicted classifications, or a large p-value (greater than 0.05), indicates a better model fit.

Binary logistic regression analysis was used to identify factors associated with PTSD, with PTSD presence as the dichotomous dependent variable (0 = no PTSD, 1 = PTSD). Independent variables included socio-demographic, health-related, and lifestyle factors. The logistic regression model is

$$Y=\beta_0+\beta_1X_1+\beta_2X_2+.....+\beta_kX_k$$

Its specific form is

$$\pi(x)=\frac{e^{\beta_0+\beta_1x_1+\beta_2x_2+.....+\beta_kx_k}}{1+e^{\beta_0+\beta_1x_1+\beta_2x_2+.....+\beta_kx_k}}$$

The logit transformation in terms of g(x) is

$$g(x)=In\left(\frac{\pi(x)}{1-\pi(x)}\right)=\beta_0+\beta_1X_1+\beta_2X_2+.....+\beta_kX_k$$

Where, π(x) is the probability that the event occurs i.e π (y=1).

Here, $\frac{\pi(x)}{1-\pi(x)}$ is the odds ratio,

$In\left(\frac{\pi(x)}{1-\pi(x)}\right)$ is the log odds ratio or logit.

RESULTS

Out of 228 respondents, the prevalence of PTSD was 40.4% (with 95% CI as 34.03% to 46.76%) (Figure 1).

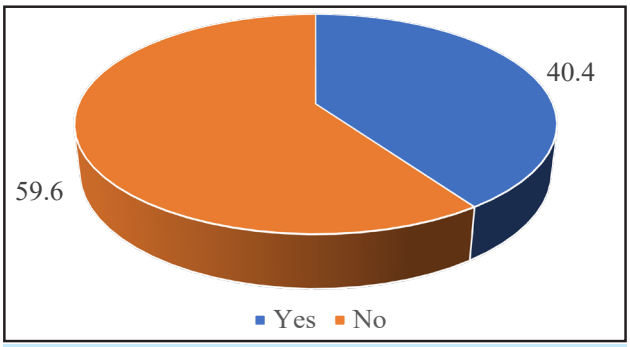

Figure 1. Prevalence of post traumatic stress disorder (PTSD).

Regarding age, the highest prevalence of PTSD (25%) was observed in the 30–40 and 40–50-year age groups, while the lowest prevalence was among individuals over 60 years of age. However, this relationship was not statistically significant (p-value > 0.05). In terms of sex, 57.61% of females had high PTSD compared to males, indicating a statistically significant association (p-value= 0.003). Marital status was also significantly associated with PTSD (p-value = 0.031), with the majority of cases found among unmarried individuals (76.09%). Among ethnic groups, the highest prevalence was observed in the Dalit community (38.04%). Regarding education, individuals with a secondary-level education had the highest proportion of PTSD (29.35%). PTSD was more common among the unemployed (53.26%), a difference that was statistically significant (p-value = 0.021).

Among lifestyle factors, practicing yoga was significantly associated with lower levels of PTSD (p-value= 0.0001). Regarding comorbid conditions, high blood pressure (p-value= 0.0001), diabetes (p-value= 0.0001), COPD (p-value= 0.0001), and cardiovascular problems (p-value= 0.0001)

Table 1. Bivariate analysis of various lifestyle-related variables with PTSD. (n=228)				
Characteristics	**Total**	**PTSD**		**χ^2 (p-value)**
		No	**Yes**	
Age (years)				
20-30	34(14.9)	17(12.50)	17(18.48)	9.140(0.057)
30-40	63(27.6)	40(29.41)	23(25.00)	
40-50	64(28.1)	41(30.15)	23(25.00)	
50-60	39(17.1)	17(12.50)	22(23.91)	
> 60	28(12.3)	21(15.44)	7(7.61)	
Sex				
Male	124(54.4)	85(62.50)	39(42.39)	8.945 (0.003)
Female	104(45.6)	51(37.50)	53(57.61)	
Marital status				
Married	188(82.5)	9(6.62)	15(16.30)	9.05 (0.031)
Unmarried	24(10.5)	118(86.76)	70(76.09)	
Separated	2(0.9)	0(0.00)	2(2.17)	
Divorce	2(0.9)	2(1.47)	0(0.00)	
Widow	12(5.3)	7(5.15)	4(4.35)	
Ethnicity				
Brahmin	68(29.8)	43(31.62)	25(27.17)	8.432 (0.117)
Chhetri	35(15.4)	17(12.50)	18(19.57)	
Janajati	100(43.9)	0(0.00)	3(3.26)	
Dalit	15(6.6)	65(47.79)	35(38.04)	
Tharu	3(1.3)	8(5.88)	7(7.61)	
Others	7(3.1)	3(2.21)	4(4.35)	
Education level				
Illiterate	26(11.4)	12(8.82)	13(14.13)	5.105 (0.53)
Literate	50(21.9)	31(22.79)	19(20.65)	
Primary	6(2.6)	3(2.21)	3(3.26)	
Lower Secondary	14(6.1)	7(5.15)	7(7.61)	
Secondary	61(26.8)	34(25.00)	27(29.35)	
Higher Secondary	48(21.1)	31(22.79)	17(18.48)	
Bachelors and above	23(10.1)	17(12.50)	6(6.52)	
Employment status				
Employed	127(55.7)	84(61.76)	43(46.74)	5.322(0.021)
Unemployed	101(44.3)	51(37.50)	49(53.26)	
Personal factors				
Vegetarian	10(4.39)	19(13.97)	16(17.39)	0.875(0.872)
Smoking	21(9.21)	9(6.62)	12(13.04)	4.761 (0.152)
Drinking alcohol	36(15.79)	23(16.91)	13(14.13)	5.862(0.089)
Yoga (No)	69(30.26)	38(27.94)	31(33.70)	14.701(0.001)
Meditation	23(10.09)	13(9.56)	10(10.87)	1.252(0.768)
Co-morbidities (Yes)				
High BP	56(24.6)	20(14.71)	36(39.13)	17.722 (0.0001)
Diabetes	51(22.4)	14(10.29)	37(40.22)	28.787 (0.0001)
COPD	43(18.9)	12(8.82)	30(32.61)	19.544 (0.0001)
Cardiovascular problem	14(6.1)		1(1.09)	23.351(0.0001)
Kidney problem	11(4.8)	1(0.74)	10(10.87)	13.555(0.0001)
Obesity	2(0.9)	1(0.74)	1(1.09)	2.155(0.340)
Psychological Disorder	1(0.4)	1(0.74)	-	0.679 (1.00)

all showed strong and statistically significant associations with PTSD (Table 1).

The logistic regression analysis identified several significant predictors of PTSD. Males were 2.71 (with 95% CI as 1.307-5.636) times more likely to experience PTSD compared to females and it was found to be statistically significant (p-value = 0.007). Individuals with diabetes both before and after COVID-19 had significantly higher odds of PTSD (OR = 3.46 (With 95% CI as 1.416-8.472), p-value = 0.008) compared to those without diabetes. Similarly, participants who developed COPD after COVID-19 were 4.25 (95% CI as 1.731-10.424) as times more likely to have PTSD (p-value = 0.001). High blood pressure, present both before and after COVID-19, was also a significant predictor, with affected individuals being 2.69 (with 95% CI as 1.134-6.408) times more likely to have PTSD than those without hypertension (p-value = 0.025). These findings highlight the strong association between certain comorbid conditions and increased risk of PTSD (Table 2).

Table 2. Summary of the logistic regression model. (n=228)

Variable	Category	Coefficient	Standard Error	Odds Ratio (OR)	95% CI for OR	p-value
Gender	Male	0.9979	0.373	2.71	1.307-5.636	0.007
	Female	®				
Diabetes	Before and After COVID	1.2416	0.4665	3.46	1.416-8.472	0.008
	No Diabetes	®				
COPD	After COVID only	1.4467	0.4424	4.246	1.731-10.424	0.001
	No COPD	®				
High Blood Pressure	Before and After COVID	0.9917	0.4413	2.694	1.134-6.408	0.025
	No High Blood pressure	®				

® denotes the reference category

DISCUSSION

The study conducted at Damak COVID Hospital aimed to identify PTSD among COVID-19 survivors and found significant symptoms in the target population. Among the participants, the prevalence of PTSD was 40.4% (with 95% CI as 34.03% to 46.76%). Our finding is contrast with the study conducted by Bo et al., in 2021 reported PTSD prevalence as high as 96.2% in COVID-19 patients.[27] Another study by Xueyuan Li and colleagues found that 31.6% of Chinese adults experienced PTSD following COVID-19 infection.[28] These differences suggest that the occurrence of PTSD after COVID-19 can vary depending on geography, social structure, environment, and lifestyle.

In a study conducted in Nepal by the Ministry of Health and Population (MoHP) and the Nepal Health Research Council (NHRC), it was found that 14% of respondents had anxiety, 7% had depression, and 5% experienced stress.[29] These findings were much lower than those found in the present study. This difference may be due to variations in the study population: the Nepal study included all COVID-19 patients who visited fever clinics, while the current study focused on survivors who required oxygen support during hospitalization. It is clear that patients with more severe illness face greater psychological stress and are therefore at higher risk of developing mental health issues. Gender-wise, male COVID-19 survivors were more likely to show PTSD symptoms than females.

A study by Lei et al., in 2021 also found that males had higher odds of developing PTSD than females (OR = 1.484, 95% CI: 1.147 to 1.920). However, contrasting results were reported by Wang et al., in 2020, who found that the psychological impact of the pandemic was more significant for females than for males.[30] Similarly, Martinez et al., study on 2022 observed a higher prevalence of PTSD in female survivors compared to males (OR = 1.13, 95% CI: 0.50-1.76).[31] These differences may be due to the social and cultural behaviors of the populations

studied. The study also found that individuals with pre-existing diabetes, or those who developed diabetes after COVID-19, were more likely to experience PTSD symptoms compared to those without diabetes. Likewise, those with pre-existing high blood pressure (BP) or who developed COPD after infection had a higher likelihood of PTSD than those without these conditions. However, high BP that developed after infection and pre-existing COPD were not significantly associated with PTSD. These findings suggest that both existing and newly developed conditions like diabetes and COPD significantly increase the risk of PTSD. This result supports earlier studies showing that COVID-19 patients with comorbidities such as diabetes, psychological disorders, hypertension, obesity, and COPD are more vulnerable to PTSD than those without such conditions. Research by González-Sanguino et al., in 2020 identified chronic pulmonary disease as a significant risk factor for PTSD (OR = 6.03, 95% CI: 1.0-37.1, p = 0.053).[32] Additionally, a web-based survey conducted via WhatsApp found a higher rate of psychological disorders, particularly depression, in COVID-19 patients with diabetes mellitus (37.8%), suggesting that diabetic individuals are more susceptible to PTSD than non-diabetic patients.[33] This aligns with previous findings that diabetic patients have a 24% higher risk of developing depressive symptoms even without a COVID-19 infection.[34]

CONCLUSIONS

Nearly half of the COVID-19 survivors in the study experienced post-traumatic stress disorder (PTSD), highlighting a substantial mental health burden in this population. The analysis identified gender, diabetes, COPD, and high blood pressure as statistically significant factors associated with PTSD. These findings underscore the need for targeted mental health screening and support, particularly for individuals with pre-existing or COVID-related comorbid conditions. Early intervention for high-risk groups could be critical in mitigating the long-term psychological impact of the pandemic.

Limitations: This study had some limitations. First, medical information was based solely on patient self-reports, as no healthcare professionals were involved to verify diagnoses. Second, the study was limited to patients admitted during a specific period (late 2022 to early 2023) due to resource constraints. The effects of trauma may have lessened over time, potentially influencing responses.

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