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Review article

Psychological consequences among veterans during the COVID-19 pandemic: A scoping review

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ABSTRACT

Although there is an increasing number of studies reporting the psychological impact of COVID-19 on the general population and healthcare workers, relatively less attention has been paid to the veterans. This study aimed to review the existing literature regarding the psychological consequences of COVID-19 on veterans. A systematic search was conducted on PubMed, Embase, and the Cochrane Library from inception to December 3, 2022. A total of twenty-three studies were included with moderate-quality of evidence. Veterans experienced more mental health problems than civilians. The prevalence rates of alcohol use, anxiety, depression, post-traumatic stress disorder, stress, loneliness, and suicide ideation significantly increased during the pandemic, ranging from 9.6% to 47.4%, 9.4% to 53.5%, 8.6% to 55.1%, 4.1% to 58.0%, 4.3% to 39.4%, 15.9% to 28.4%, and 7.8% to 22.0%, respectively. The main risk factors of negative consequences included pandemic-related stress, poor family relationships, lack of social support, financial problems, and preexisting mental disorders. In contrast, higher household income and greater community interaction and support appeared to be resilience factors. In conclusion, the COVID-19 pandemic has increased adverse mental health consequences among veterans. Tackling mental health issues due to the COVID-19 pandemic among veterans should be a priority.

1. Introduction

In March 2020, World Health Organization declared the spread of COVID-19 as a global pandemic (Anand et al., 2020). Many countries closed public places, imposed national lockdowns, and enforced social distancing and restrictive measures to prevent social gatherings and control the spread of disease (Hale et al., 2021). As a result, the finance industry, tourism, agriculture, and aviation notably declined in both supply and demand sides. The mass lockdowns have significantly affected people's daily life. The fear and uncertainty associated with COVID-19 have precipitated mental health problems (Nicola et al., 2020). As a unique population, veterans lives in a closed system and environment before discharge. Previous studies have observed the association between military service experiences and an increased risk of mental disorders (Fikretoglu et al., 2022; Rusu et al., 2016). For

example, Osborne and his colleagues showed that military experience was related to the higher levels of alcohol use (Osborne et al., 2022). Moreover, a recent cross-sectional study reported that the currently serving public safety personnel with previous experience of military service had greater odds of post-traumatic stress disorder (PTSD), depression, anxiety, stress, and suicidal ideation (SI) (Groll et al., 2020).

Veterans were more likely to be exposed to traumatic events than the general population and had a higher prevalence of mental disorders even before the pandemic (Nicola et al., 2020). Pfefferbaum et al. found that preexisting mental disorders were a major risk factor for worsening mental health problems during the global outbreak (Pfefferbaum and North, 2020). Since veterans are susceptible to the negative psychological effects of the pandemic, and there is a calling for urgent attention to veterans. To date, accumulating studies have explored the psychological impact of the COVID-19 pandemic on the general population and

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healthcare workers (Gold, 2020; Gómez-Ochoa et al., 2021; Xiong et al., 2020), but relatively less attention has been paid to the veterans, and the extant studies demonstrated significant heterogeneity. Besides, several studies analyzed the data from the same sample population while focusing on different mental disorders or stages of the pandemic, which might affect the outcome of the study. In Peter's study, there was no significant difference in alcohol use before and after the global outbreak in the group from the National Health and Resilience in Veterans Study, which was conducted in the USA from November 18, 2019, to December 19, 2020 (Na et al., 2021a). However, decreased alcohol use in another group of veterans from the USA was observed in other previous studies (Davis et al., 2021; Fitzke et al., 2021), which was consistent with a study in UK (Sharp et al., 2021). In addition, several studies showed that the prevalence of anxiety has increased during the pandemic, while Iverson et al. found no difference in anxiety symptoms from the pre-pandemic to peri-pandemic periods (Iverson et al., 2022).

At present, only a few studies have focused on the impact of COVID-19 on mental disorders among veterans, which were conducted in different countries, and focused on different mental disorders with inconsistent conclusions. Herein, the current scoping review aims to summarize the extant literature regarding the psychological impacts of COVID-19 on veterans and further analyzes the risk and resilience factors associated with the mental health issues of veterans.

2. Methods

This present study was conducted under the guidance of Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (Liberati et al., 2009) and has been registered in the PROSPERO (ID: CRD42022314878). The literature search, decisions on inclusion, data extraction and quality control of this review were all performed independently by two of the authors (SLL and SH). If there was any disagreement, the discussion and decision were made by all authors.

2.1. Search strategy

Two independent researchers (SLL and SH) systematically searched PubMed, Embase, and the Cochrane Library from inception to December 3, 2022, without year or country restriction. We applied a combination of Medical Subject Headings and free-text terms, including their variants, for searching in PubMed and Cochrane Library (see Table 1). The keywords *COVID-19, veteran,* and *psychological impact* were used for Embase searching.

Table 1
Search strings in this study.

Item	Keywords
Population	(veterans) OR (veteran [Mesh])
Intervention	(COVID 19) OR (COVID-19 Virus Disease) OR (COVID 19 Virus Disease) OR (COVID-19 Virus Diseases) OR (Disease, COVID-19 Virus) OR (Virus Disease, COVID-19) OR (COVID-19 Virus Infection) OR (COVID 19 Virus Infection) OR (COVID-19 Virus Infections) OR (Infection, COVID-19 Virus) OR (Virus Infection, COVID-19) OR (2019-nCoV Infection) OR (2019 nCoV Infection) OR (2019-nCoV Infections) OR (Infection, 2019-nCoV) OR (Coronavirus Disease-19) OR (Coronavirus Disease 19) OR (2019 Novel Coronavirus Disease) OR (2019 Novel Coronavirus Infection) OR (2019-nCoV Disease) OR (2019 nCoV Disease) OR (2019-nCoV Diseases) OR (Disease, 2019-nCoV) OR (COVID19) OR (Coronavirus Disease 2019) OR (Disease 2019, Coronavirus) OR (SARS Coronavirus 2 Infection) OR (SARS-CoV-2 Infection) OR (Infection, SARS-CoV-2) OR (SARS CoV 2 Infection) OR (SARS-CoV-2 Infections) OR (COVID-19 Pandemic) OR (COVID 19 Pandemic) OR (COVID-19 Pandemics) OR (Pandemic, COVID-19) OR ("COVID-19"[Mesh])
Outcomes	(Health, Mental) OR (Mental Hygiene) OR (Hygiene, Mental) OR ("Mental Health"[Mesh])

2.2. Study selection and eligibility criteria

Titles and abstracts of each study were firstly screened for relevance. Full-text articles were accessed for eligibility following the initial screening. The inclusion criteria were as follows: (1) conducted on veterans; (2) assessed the mental health status during the COVID-19 pandemic; (3) utilized standardized and validated scales for measurement. The exclusion criteria were as follows: (1) non-original articles (reviews, meta-analyses, commentaries, letters, conference abstracts, and editorials); (2) additional intervention to the individuals (Table 4).

2.3. Data extraction

A data extraction form was used to integrate the relevant data: (1) lead author/year; (2) country; (3) study design; (4) sample size; (5) sample source; (6) research period; (7) age; (8) gender; (9) education; (10) main assessment tool; (11) key findings.

2.4. Data synthesis

The results of the scoping review were narratively synthesized and summarized in tables with a special focus on the risk factors and psychological outcomes of veterans during the pandemic.

2.5. Quality appraisal

Newcastle-Ottawa Scale (NOS) adapted for cross-sectional studies (see Supplementary material) was applied to assess the quality of studies (Modesti et al., 2016). This scale has seven items, categorized into three dimensions: the selection of study groups, the comparability of groups, and the ascertainment of outcome (Nicola et al., 2020). With a maximum of ten scores, the studies with greater points indicated the higher quality of a research study. If there was any controversial opinion between the two authors, the final decision was based on a discussion with the whole team.

3. Results

3.1. Study characteristics

From 776 relevant studies, 23 studies were finally included in this scoping review (Fig. 1). Characteristics of the included studies were summarized in Table 2. The sample size of the 23 studies ranged from 95 to 153,848. All studies followed either a cross-sectional or longitudinal study design. The studies were conducted in four different countries, including the USA ($n = 16$), the UK ($n = 4$), Canada ($n = 2$), and Croatia ($n = 1$). While the research subjects of seven studies were obtained from the first and second waves of the National Health and Resilience in Veterans Study, the subjects from the other three studies were from a UK charity providing mental support to veterans. The participants from Air Force, Army, Marine Corps, and Navy were enrolled in the other three studies. The subjects of the remaining ten articles were recruited from different departments or hospitals in various countries. Male participants comprised more than 80% of the subjects. One study recruited only male veterans, similar to another study limiting only female participants (Harahap et al., 2021). The primary outcomes varied across the included studies (see Table 3).

3.2. Quality appraisal

Overall, the average stars achieved across the 23 studies were 7.7 (range=6–9), considered moderate quality. The domain of selection scored an average of 4.6 stars (range = 4–5). The comparability section obtained an average score of 1.0 stars (range=0–2). Lastly, the exposure and outcome category scored an average of 2.2 stars (range=1–3).
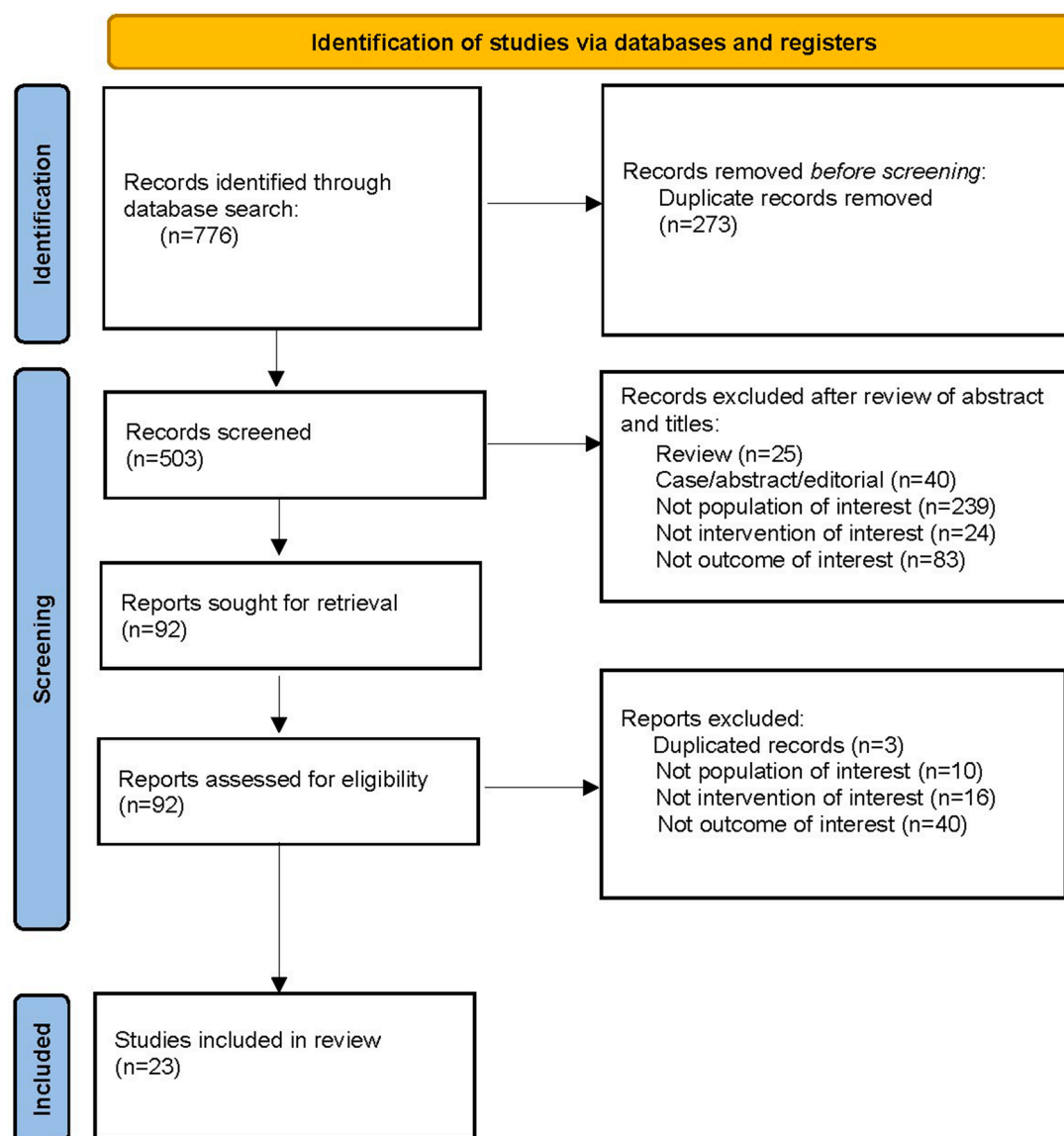
Identification of studies via databases and registers

Fig. 1. Flow diagram of literature search.

3.3. Main outcomes

The most common outcome variables in the included studies were alcohol use ($n = 13$, 56.5%), anxiety ($n = 11$, 47.8%), depression ($n = 11$, 47.8%), and PTSD symptoms ($n = 10$, 43.5%). Five studies evaluated the symptoms of stress and loneliness, while four studies focused on SI. Additionally, the sleep disorders measurement was assessed in two studies.

3.3.1. Prevalence of alcohol use and risk factors

The prevalence of probable alcohol use during the pandemic ranged from 9.6% to 47.4%, and the veterans infected with COVID-19 had a remarkably higher rate of alcohol use than those uninfected (Hendrikx et al., 2022; Kelly et al., 2022; Murphy et al., 2022a, 2022b; Na et al., 2022a, 2021a, 2022b; Richardson et al., 2022; Sharp et al., 2021). Nonetheless, the impact of COVID-19 on alcohol use in veterans was inconsistent across studies. Compared with pre-pandemic, Dominic et al. reported that 30% of veterans increased alcohol use during the pandemic (Murphy et al., 2022b), while three studies showed a reduced rate of alcohol use among veterans (Davis et al., 2021; Fitzke et al., 2021; Sharp et al., 2021). In Peter's study, however, there was no

significant difference in alcohol use before and during the global outbreak (Na et al., 2021a).

Increasing severity of alcohol use was positively associated with young age, pre-pandemic alcohol use intensity, non-prescription drug use, combat experience, lifetime history of a substance use disorder, lower dispositional optimism, poor social and family relationships, financial problems, boredom, lower levels of psychological flexibility, and COVID-19-related stress. In addition, veterans with preexisting mental disorders, i.e., loneliness, depression, and anxiety, reported more severe alcohol use during the pandemic. Of note, higher pre-pandemic household income was correlated with a lower risk of alcohol use.

3.3.2. Symptoms of common mental disorders (anxiety, depression, PTSD) and risk factors

The rate of anxiety among veterans was between 9.4% and 53.5% during the pandemic (Hill et al., 2021; Kelly et al., 2022; Mahar et al., 2022; Na et al., 2022a; Richardson et al., 2022; Tran et al., 2022; Umucu et al., 2022). Three studies demonstrated that veterans had a higher rate of anxiety during the global outbreak compared to the pre-pandemic (Hill et al., 2021; Na et al., 2022a; Wynn et al., 2021), while Katherine et al. found no difference in anxiety symptoms during the COVID-19

Table 2

Extracted key characteristic of participants in the included studies.

Lead Author (year)	Country	Study design	Sample size	Sample source	Age (mean ± SD; range)	Gender (M%)	Education	Other characteristics
Brandon et al. (2021) [#]	USA	longitudinal	3078	the first and second wave of the National Health and Resilience in Veterans Study	63.2 ± 14.7	91.6%	/	/
Peter et al. (2021a) [#]	USA	longitudinal	661	the first and second wave of the National Health and Resilience in Veterans Study	57.5 ± 14.8	84.7%	/	/
Peter et al. (2021b) [#]	USA	longitudinal	3078	the first and second wave of the National Health and Resilience in Veterans Study	62.2 ± 15.7	90.2%	/	/
Elissa et al. (2021) [#]	USA	longitudinal	3078	the first and second wave of the National Health and Resilience in Veterans Study	62.2 ± 15.7	90.2%	/	/
Melanie et al. (2021) [#]	USA	longitudinal	3078	the first and second wave of the National Health and Resilience in Veterans Study	63.2 ± 14.7	91.6%	/	/
Peter et al. (2021c) [#]	USA	longitudinal	3078	the first and second wave of the National Health and Resilience in Veterans Study	62.2 ± 15.7	90.2%	College graduate or higher education:1395 (45.3%)	/
Peter et al. (2022) [#]	USA	longitudinal	3078	the first and second wave of the National Health and Resilience in Veterans Study	62.2 ± 15.7	90.2%	/	/
Dominic et al. (2020) [*]	UK	Cross-sectional	275	From a UK charity providing mental health services to veterans.	47.8 ± 11.1	94.9%	/	Relationship: in a relationship:181 (67.0%) Not in a relationship: 89 (33.0%)
Laura et al. (2021) [*]	UK	longitudinal	95	From a UK charity providing mental support to veterans	18–40: 20% 41–50: 24.2% 51–60: 31.6% ≥61: 24.2%	94.7%	/	Relationship: in a relationship: 60 (63.2%); single: 35 (36.8%)
Dominic et al. (2022) [*]	UK	longitudinal	121	From a UK charity providing mental health	49.9 ± 10.3	96.7%		Relationship: in a relationship: 74 (61.2%) Single: 45(37.8%) Employment: working 76(67.9%) Not working: 36 (31.1%)
Emre et al. (2021)	USA	cross-sectional	816	Amazon Mechanical Turk	56.64 ±18.05	74.1%	Some college or below:140 (27.6%) Associated/Bachelors:373 (43.4%) Advanced degree:203 (29.0%)	/
Marie-Louise et al. (2021)	UK	longitudinal	1562	From phase 3 of the King's centre for Military Health Research health and well-being study (2014–2016)	/	89.3%	No qualifications/O-levels/GCSEs: 385 (27.23%) level: 506 (33.86%) Degree: 671 (38.86%)	Rank: officer: 478 (26.11%) NCO: 954 (61.45%) Other: 130 (12.44%) In a relationship:86.76%; Single:5.67% Ex-relationship (separated, divorced, widowed): 7.57%
Alyson et al. (2022)	Canada	cross-sectional	210	social media platforms, targeted emailing of organizations serving older adults,	71.5 ± 8.9	71.3%	High school/less than high school: 23.3%; Some university: 4.8%; Trade or college diploma/certificate: 28.6%; Bachelor degree: 19.1% Graduate degree: 24.3%	Current relationship: single: 25.8% Married or in a relationship: 74.2% Employment status: employed: 13.8% Retired: 83.8% Unemployed: 2.4%
Katherine et al. (2022)	USA	cross-sectional	142	KnowledgePanel®	58.75 ±13.16	0%	<Bachelor's degree: 69 (48.6%) Bachelor's degree or more: 73 (51.4%)	Marital status: Married/cohabitating: 96(67.6%); Non-married/cohabitating: 46(32.4%); Employment status: employed: 67 (47.2%); Unemployed/out of workforce: 75 (52.8%)

Table 2 (*continued*)

Lead Author (year)	Country	Study design	Sample size	Sample source	Age (mean ± SD; range)	Gender (M%)	Education	Other characteristics
Marina et al. (2021)	Croatia	longitudinal	176	Referral Center of the Ministry of Health of the Republic of Croatia at the Clinical Hospital Center Rijeka.	52.75 ±6.04	100%	Elementary school: 22 (12.2%) High school: 139 (76.8%) Higher education: 19 (10.6%)	Marital status: married/cohabitating:129 (71.3%): Single: 26 (14.4%); Divorced: 18 (9.9%): Other: 8 (4.4%); Working status: employed: 48(26.5%); Unemployed: 28 (15.5%); Retired: 105(58.4%)
Jason et al. (2022)	USA	cross-sectional	3518	Veterans Health Administration hospitals	64.33 ±14.78	92.5%	/	Marital status: Married: 1409 (40.1%); Single/ other: 2108 (59.9%)
Yan et al. (2022)	USA	cross-sectional	153,848	US Department of Veterans Affairs	63.06 ±16.18	89.2%	/	/
Richardson et al. (2022)	Canada	longitudinal	1136	A survey-hosting platform, Research Electronic Data	55.3 ± 13.1	75.9%	Highest level of education: Secondary or lower: 315 (27.7%): Post-secondary or higher: 805 (70.9%); Missing: 16 (1.4%)	Marital status: Married/ in a relationship:871 (76.7%); Single: 243 (21.4%); Prefer not to answer: 8 (0.7%); Missing: 14 (1.2%)
Jordan et al. (2021) [^]	USA	longitudinal	1230	Air Force, Army, Marine Corps, and Navy	36.5 ± 3.67	88.7%	/	/
Reagan et al. (2021) [^]	USA	longitudinal	1025	Air Force, Army, Marine Corps, or Navy.	34.6 ± 3.5	89.5%		Marital status: unmarried: 80 (7.8%) Married: 945 (92.2%)
Denise et al. (2022) [^]	USA	longitudinal	1230	Air Force, Army, Marine Corps, Navy	34.5 ± 3,7	85.9%	/	/
Megan et al. (2022)	USA	cross-sectional	409	Large survey battery	54.85 ±16.44	76.5%	/	Relationship: married: 273(66.7%) Divorced: 47(11.5%) Single, never married: 39 (9.5%) In a relationship, not married: 24 (5.9%) Widowed: 15 (3.7%) Separated: 11 (2.7%)
Jonathan et al. (2021)	USA	longitudinal	231	from the VA Informatics and Computing Infrastructure platform; and Veterans who have participated in prior studies in author's lab	54.1 ± 10.8	87.0%	/	/

Note: SD, standard deviation; NCO, Non-Commissioned Officer; GCSE, General Certificate of Secondary Education.

[#] : These studies were from the same veteran population in the USA.

[*] : These studies were from the same population in a charity in the UK.

[^] : These studies were from the same population based on an online survey in the USA.

pandemic (Iverson et al., 2022). Veterans infected with COVID-19 experienced more anxiety than those uninfected (Na et al., 2022a). One study showed that 28% of hospitalized veterans with COVID-19 infection had been newly diagnosed with anxiety (Chen et al., 2022). The risk factors for anxiety development included age between 45 and 64 years old, greater severity of the pre-pandemic psychiatric symptoms, lack of social support, non-prescription drug use, financial and social restriction-induced stress, job loss, adverse childhood experiences, and COVID-19-related worries/stress (Hill et al., 2021; Na et al., 2022a; Umucu et al., 2022).

Eleven studies analyzed the depressive symptoms of veterans, and the prevalence of depression ranged from 8.6% to 55.1%. The impact of COVID-19 on depressive symptoms varied in different studies. While two studies observed no difference in depressive symptoms between the pre- and during the pandemic (Hill et al., 2021; Iverson et al., 2022), Jonathan et al. reported that veterans had worsening depressive symptoms due to COVID-19. In Emre's study, the rate of depression in veterans was over 50%, which was much higher than that of civilians (29.7%) (Umucu et al., 2022). Nevertheless, another study found no substantial difference between the two populations (Mahar et al., 2022). Interestingly, the rate of newly diagnosed depression reached 28% among hospitalized veterans with COVID-19 infection (Chen et al., 2022), and the outcomes of Yan's study supported that the COVID-19-infected group tended to increase the risk of incident depression (Xie et al., 2022). However, one study showed no remarkable difference in depressive symptoms between patients infected with COVID-19 and those uninfected (Na et al., 2022a). An increased risk of reporting depressive symptoms was correlated with pandemic-intimate partner violence, pandemic-related stress, preexisting mental disorders, and recently homelessness experience (Iverson et al., 2022; Wynn et al., 2021).

The incidence of PTSD ranged from 4.1% to 58%, with one study showing over 50% of the veterans experienced worsening symptoms during the pandemic (Murphy et al., 2022b). Nevertheless, Marina et al. suggested that the severity of the overall PTSD symptoms notably decreased during the global outbreak compared to the pre-pandemic period (Letica-Crepulja et al., 2021). On the contrary, the other two studies observed no difference in PTSD symptoms between periods (Hill et al., 2021; Iverson et al., 2022). Patients with more pandemic-intimate partner violence, pandemic-related stress, and lower social support had a higher risk of PTSD (Hendrikx et al., 2022; Murphy et al., 2022b).

3.3.3. Symptoms of stress/loneliness/sleep disorder/suicide ideation and risk factors

Four studies reported veterans' stress of during the pandemic. While three of them focused on COVID-19-related stress, the remaining study focused on psychological stress. One study demonstrated that 4.3% of veterans experienced pandemic-related stress (Na et al., 2022a).

Table 3 (*continued*)

Lead Author (year)	Main assessment tool	Time point	Key findings
			more likely to experience increased distress. Concerns about pandemic-related social losses, mental health COVID-19 effects, and housing stability during the pandemic were associated with increased distress, and over-and-above pre-pandemic factors.
Peter et al. (2021c)	Modified MINI; PHQ; PLC-5; ACEQ; LEC-5; UCLA Loneliness Scale; the Assessment of Exposure to COVID-19 Scale	Pre-pandemic: 2019.12–2020.3 Peri-pandemic: 2020.11–2020.12	The pre- and 1-year peri-pandemic prevalence of probable AUD remained stable. Nearly 10% of veterans screened positive for alcohol use disorder 1-year into the pandemic. Younger age, combat experience, greater drug use severity, lower dispositional optimism, more COVID-19 related stressors, and fewer socioeconomic resources were associated with higher risk of chronic AUD. Higher household income was associated with lower risk of AUD.
Peter et al. (2022)	Adapted UCLA Loneliness Scale	Pre-pandemic: 2019.12–2020.3 Peri-pandemic: 2020.11–2020.12	The prevalence of loneliness decreased over the study period—17.3% pre-pandemic to 15.9% peri-pandemic, and 5.4% veterans reported increased loneliness. Not being married/partnered, and scoring lower on pre-pandemic measures of purpose in life and cognitive functioning were most strongly associated with

Table 3 (*continued*)

Lead Author (year)	Main assessment tool	Time point	Key findings
Dominic et al. (2020)	GHQ-12; PCL-5; DAR-5; AUDIT	Peri-pandemic:2020.6–2020.7	increased loneliness. Being married/partnered was strongly associated with no loneliness and decreased loneliness during the pandemic. Veterans who had pre-existing mental health difficulties before the outbreak of COVID-19 may be at increased risk of experiencing CMDs as a result of the pandemic. The symptoms of CMDs and PTSD were the most commonly reported to have been exacerbated by the pandemic. Lack of social support and reporting increasing numbers of stressors related to COVID-19 were consistently associated with increasing severity of a range of mental health difficulties.
Laura et al. (2021)	GHQ-12; PCL-5; DAR-5; AUDIT	Peri-pandemic: wave 1 (at the end of the first lockdown): 2020.6–2020.7 wave 2 (during the second lockdown): 2020.11	There were no significant changes in symptoms of PTSD, CMDs, anger, or alcohol use during the lockdown. However, veterans who experienced more COVID-19-related stressors were more likely to experience PTSD. More COVID-related stressors and lower levels of social support may be associated with the exacerbation of mental symptoms, while higher levels of social support may be associated with decreased mental symptoms.

Table 3 (*continued*)

Lead Author (year)	Main assessment tool	Time point	Key findings
Dominic et al. (2022)	PCL-5; AUDIT	Peri-pandemic: the first lockdown: 2020.6 1-year follow-up: 2021.6	Severity of post-traumatic stress disorder (PTSD) and alcohol use remained similar between the first UK lockdown and 1-year follow-up.
Emre et al. (2021)	PHQ; PLC-5; UCLA Loneliness Scale	Peri-pandemic: 2020.3–2020.6	Veterans had higher rates of probable anxiety, depression, COVID-19 era-related stress, and higher loneliness scores (all $P < 0.01$) compared to civilians during the pandemic.
Marie-Louise et al. (2021)	GHQ; AUDIT; UCLA Loneliness Scale	Peri-pandemic: 2020.6–2020.9	Veterans reported a significant decrease in hazardous drinking while CMDs remained stable. 27.4% of veterans reported a feeling of loneliness. The COVID-19 stressors of reporting difficulties with family/social relationships, boredom, and difficulties with health were statistically significantly associated with CMDs, hazardous drinking, and loneliness.
Alyson et al. (2022)	CES-D; BAI; three-item Loneliness Scale	Peri-pandemic: 2020.3–2020.6	The odds of reporting elevated symptoms of depression, anxiety, and loneliness were similar for veteran and non-veteran respondents after adjusting for confounders.
Katherine et al. (2022)	PLC-5; CESD; DASS-A	Pre-pandemic: 2016.6–2016.12 Peri-pandemic: 2020.3–2020.12	Compared with the pre-pandemic, none of the healthy variables (PTSD, depression, anxiety) changed significantly during the pandemic.
Marina et al. (2021)	PCL-5	Pre-pandemic: 2018.11–2019. 2 Peri-pandemic: 2020.3–2020.6	The severity of PTSD symptoms decreased during the lockdown.
Jason et al. (2022)	Not mentioned	Peri-pandemic: 2020.3–2021.3	A subpopulation of patients hospitalized for COVID-19 developed new mental health diagnoses. Seventeen percent of patients had a new diagnosis of PTSD, and 28% patients had a new diagnosis of anxiety, which was the same as depression. People with unique demographics predictors including rurality and younger age were more likely to developed new mental health diagnoses. Women and those with more comorbidities were less likely to develop new diagnoses.
Yan et al. (2022)	Not mentioned	Peri-pandemic: 2020.3–2021.1	Compared with the control group, the covid-19 group showed an increased risk of incident anxiety, depression, stress, and sleep disorder.
Richardson et al. (2022)	PCL-5; PHQ-9; GAD-7; AUDIT	Peri-pandemic: 2020.7–2021.2	The frequency of probable posttraumatic stress disorder, major depressive disorder, generalized anxiety disorder, alcohol use disorder, and suicidal ideation were 34.2%, 35.3%, 26.8%, 13.0%, and 22.0%, respectively.
Jordan et al. (2021)	UCLA Loneliness Scale; daily drinking questionnaire	Peri-pandemic: 2020.3–2021.2	Veterans reported a significant decrease in alcohol use. Women, racial/ethnic minority veterans, and those with pre-existing PTSD exhibited smaller decreases in alcohol use and binge drinking and overall higher rates of use compared to men, white

Table 3 (*continued*)

Lead Author (year)	Main assessment tool	Time point	Key findings
			veterans, and those without PTSD. Both economic hardship and negative reactions to COVID-19 were associated with greater alcohol and binge drinking whereas loneliness showed a negative association with alcohol use and binge drinking.
Reagan et al. (2021)	Daily drinking questionnaire; PHQ-8; UCLA Loneliness Scale	Pre-pandemic: 2020.2 Peri-pandemic: 2020.8	There was a decrease in alcohol use among the overall sample, veterans who screened for depression prior to the pandemic exhibited higher levels of substance use after the pandemic's onset. Loneliness compounded the effects of depression on rates of alcohol use. The prevalence of depression was 31.9%. Social support was not protective for the effects of depression on either alcohol or cannabis use.
Denise et al. (2022)	GAD-7; daily drinking questionnaire	Pre-pandemic: 2020.2 Peri-pandemic: 2020.8	The prevalence of anxiety was 35.7%. The risk factors for increasing alcohol use included financial stress and previous anxiety.
Megan et al. (2022)	UCLA Loneliness Scale; CAGE-AID; Short-Form Health Survey-12	Peri-pandemic: 2020.11–2021.2	The prevalence of alcohol use disorder, anxiety, depression, and PTSD were 27.6%, 36.4%, 20.3%, and 27.4% respectively. Loneliness was associated with an increase in the frequency of alcohol use.
Jonathan et al. (2021)	Revised UCLA Loneliness Scale	Peri-pandemic: 2020.5–2020.8	The prevalence of alcohol use disorder was 16.9% and the

Table 3 (*continued*)

Lead Author (year)	Main assessment tool	Time point	Key findings
			PTSD was 34.2% during the pandemic. Patients with persisting mental health problems and recently homeless experience had higher loneliness compared with the control group. Veterans showed worsened depressive/anxiety symptoms and loneliness due to the COVID-19. Housing and financial support, medical and mental health services may help to mitigate the impact of the pandemic on veterans.

Note: STAI-S: State-Trait Anxiety Inventory-State; STAI-T: State-Trait Anxiety Inventory- Trait; CMDs: common mental disorders; SI: suicide ideation; PHQ: Patient Health Questionnaire; PCL-5: the PTSD Checklist for DSM-5; GHQ: General Health Questionnaire; AUDIT: Alcohol Use Disorder Identification Test; MINI: Mini International Neuropsychiatric Interview; ACEQ: Adverse Childhood Experiences Questionnaire; LEC-5: Life Events Checklist for DSM-5; AUD: alcohol use disorder; SBQ-R: Suicide Behaviors Questionnaire-Revised; BIS: Barratt Impulsiveness Scale-Brief; DAR-5: 5-Item Dimensions of Anger Reactions-Revised; PSQI: Pittsburgh Sleep Quality Index; GAD-7: Generalized Anxiety Disorder-7; IES-R: Impact of Event Scale-Revised.

Likewise, the stress among veterans in Emre's study accounted for 39.4%, significantly higher than the general population (Umucu et al., 2022), and 98.6% of the participants in Katherine's study have experienced COVID-19 stressors (Iverson et al., 2022). Besides, veterans infected with COVID-19 seemed to suffer more stress than uninfected veterans (Na et al., 2022a; Xie et al., 2022).

The rate of loneliness ranged from 15.9% to 28.4%. Comparable to stress, one study reported that the rate of loneliness in veterans was higher than in the general population (Umucu et al., 2022). On the other hand, there was no significant difference between the two groups in Alyson's study (Mahar et al., 2022). Severe symptoms of loneliness were related to health and social care workers, poor social and family relationships (e.g., not being married or partnered/living alone, being responsible for one or more children, having caring responsibilities, difficulties with health, and experiencing boredom), having psychotic disorders, recent homelessness experience, and COVID-19-related stress (Na et al., 2022b; Sharp et al., 2021; Wynn et al., 2021).

Two articles focused on the sleep disorders of veterans. Elissa et al. found that nearly one-fifth of veterans experienced new or aggravated insomnia symptoms during the pandemic (McCarthy et al., 2022). In Yan's study, the COVID-19 group showed an increased risk of sleep disorders (Xie et al., 2022). Unhealthy family relationships, lack of social support, pre-pandemic chest pain, PTSD, weakness, COVID-19-related stress, financial difficulties, and isolation restrictions were independent risk factors for sleep disorders (McCarthy et al., 2022; Xie et al., 2022).

The prevalence of SI ranged from 7.8% to 22.0% during the global outbreak (Na et al., 2022a, 2021b; Nichter et al., 2021; Richardson et al.,

Table 4

Results of quality appraisal of the 23 included studies.

Study	Design	Sample-representativeness	Sample size	Non-response rate	Exposure definition	Adjustment for confounders	Assessment of the outcome	Statistical test	Score (0–10)
Brandon et al. (2021)	Longitudinal	1	1	1	2	2	1	1	9
Peter et al. (2021a)	Longitudinal	1	1	1	2	1	1	1	8
Peter et al. (2021b)	Longitudinal	0	1	1	2	1	1	1	7
Elissa et al. (2021)	Longitudinal	1	1	1	2	0	2	1	8
Melanie et al. (2021)	Longitudinal	1	1	1	2	1	2	1	9
Peter et al. (2021c)	Longitudinal	1	1	1	2	1	1	1	8
Peter et al. (2022)	longitudinal	1	1	1	2	1	1	1	8
Dominic et al. (2020)	Cross sectional	0	1	1	2	2	1	1	8
Laura et al. (2021)	Longitudinal	1	1	1	2	0	1	1	7
Dominic et al. (2022)	longitudinal	0	1	1	2	1	1	1	7
Emre et al. (2021)	Cross sectional	1	1	1	2	1	1	1	8
Marie-Louise et al. (2021)	Longitudinal	1	1	1	2	1	1	1	8
Alyson et al. (2022)	Cross sectional	1	1	1	1	0	1	1	6
Katherine et al. (2022)	Cross sectional	0	1	1	2	2	1	1	8
Marina et al. (2021)	longitudinal	1	1	1	2	0	1	1	7
Jason et al. (2022)	Cross sectional	1	1	1	1	1	2	1	8
Yan et al. (2022)	Cross sectional	1	1	1	2	1	2	1	9
Richardson et al. (2022)	longitudinal	1	1	1	1	1	2	1	8
Jordan et al. (2021)	longitudinal	1	1	1	1	1	1	1	7
Reagan et al. (2021)	longitudinal	1	1	1	1	1	2	1	8
Denise et al. (2022)	longitudinal	1	1	1	1	0	1	1	6
Megan et al. (2022)	Cross sectional	1	1	1	2	1	1	1	8
Jonathan et al. (2021)	Longitudinal	0	1	1	2	1	2	1	8

2022). Interestingly, one study observed a substantial reduction in SI from 10.6% before the pandemic to 7.8% during the pandemic (Nichter et al., 2021). Old age, low social support, lifetime history of suicide attempt, PTSD and/or depression, loneliness, impulsivity, COVID-19-related worsening social relationships, COVID-19 infection or having a household member infected with COVID-19, greater severity of past-year alcohol use, experiencing more psychiatric symptoms, and psychosocial difficulties were independent risk factors for SI during the pandemic (Na et al., 2022a, 2021b; Nichter et al., 2021).

3.3.4. Resilience factors of psychological impact on veterans

Nine studies mentioned the resilience factors of psychological impact on veterans during the pandemic (Chen et al., 2022; Davis et al., 2021; Fitzke et al., 2021; Hendrikx et al., 2022; Na et al., 2022a, 2021a, 2022b; Na et al., 2021b; Wynn et al., 2021). The results suggested that higher household income and greater community interaction were correlated with a lower risk of mental disorders (Na et al., 2022a, 2021a; Nichter et al., 2021). Noteworthy, Laura et al. reported that a higher level of social support might decrease the risk of mental disorders, including PTSD and alcohol use (Hendrikx et al., 2022). Additionally, one study showed that women, racial/ethnic minority veterans, and those with

pre-existing PTSD exhibited relatively reduced alcohol use (Davis et al., 2021). Furthermore, being married or partnered was linked to alleviated loneliness (Na et al., 2022b). For individuals, having a purpose in life was a potential protective factor for SI (Nichter et al., 2021).

3.3.5. Country differences regarding the psychological impact of COVID-19 on veterans

The included studies were conducted in five different countries including the USA ($n = 16$), the UK ($n = 4$), Canada ($n = 2$), and Croatia ($n = 1$). In the USA, the prevalence of PTSD increased from 4.1% to 34.2% during the pandemic (Chen et al., 2022; Hill et al., 2021; Kelly et al., 2022; Wynn et al., 2021), while more than half of veterans suffered from PTSD in the UK (Hendrikx et al., 2022; Murphy et al., 2022a, 2022b). There was no change of PTSD symptoms during the global outbreak in the above studies. However, another study conducted in Croatia demonstrated that the severity of the overall PTSD symptoms significantly decreased during the pandemic (Letica-Crepulja et al., 2021). The rate of alcohol use differed between countries, ranging from 9.6% to 27.6% in the USA, and 13.0% in Canada (Kelly et al., 2022; Na et al., 2022a, 2021a; Richardson et al., 2022; Wynn et al., 2021). Nonetheless, the rate of alcohol use in the UK ranged from 27.6% to

47.4% (Hendrikx et al., 2022; Murphy et al., 2022a, 2022b; Sharp et al., 2021), which was much higher than in the USA and Canada. In addition, the prevalence of depression in the USA was 8.6%−55.1% (Chen et al., 2022; Fitzke et al., 2021; Hill et al., 2021; Kelly et al., 2022; Na et al., 2022a; Umucu et al., 2022), while it ranged from 22.7% to 35.3% in Canada (Mahar et al., 2022; Richardson et al., 2022). Moreover, almost a quarter of the veterans reported loneliness in Canada (Mahar et al., 2022), which was larger than in the USA (15.9%) (Na et al., 2022b). Similar to the psychological impact of COVID-19, the incidence of mental disorders among veterans varied from country to country during the global outbreak. These findings might be related to different socio-economic statuses, cultures, and responses to the pandemic in each country.

4. Discussion

To our knowledge, this is the first scoping review evaluating the psychological consequences of the COVID-19 pandemic among veterans. Generally, most studies showed that the prevalence of anxiety and sleep disorder symptoms in veterans was higher during the pandemic compared to the pre-pandemic condition. We also noticed a lower incidence of SI in young veterans, and one of the potential explanations was that younger veterans might be more adept at using virtual technologies to seek social support during the global outbreak (Nichter et al., 2021). Additionally, the prevalence rates of psychiatric symptoms across studies were inconsistent, which might be due to the differences in culture, research subjects, reporting patterns, and assessment methods. For example, one of the included studies focused on the veterans with preexisting mental disorders. Moreover, the inconsistency across different regions might be influenced by the social environment, e.g., the severity of the pandemic, the level of medical care, the country's economic status, and the government's response to the outbreak.

In the included studies, known cases of mental disorders, greater severity of pre-pandemic alcohol use, lack of social support, unhealthy family/other relationships, boredom, and COVID-related stressors were associated with the lower mental well-being of veterans. Compared to the general population, veterans had higher risks of mental disorders (e. g. anxiety, depression, and PTSD) before the outbreak (Nicola et al., 2020), which might aggravate during the pandemic. Hence, there is a priority to pay more attention to veterans and offer them adequate psychosocial support.

The identified risk factors shed light on policy enactment to alleviate the negative psychological impact of COVID-19 on veterans. First, it is recommended to dedicate more resources to mental health issues in this population, especially individuals with related risk factors, such as preexisting mental disorders and family economic burdens. Second, it is important to establish a complete, precise, and timely information system about COVID-19 for active-duty service veterans, and regularly organize the relevant activities (such as lectures and promotional videos), ensuring that the veterans are able to access accurate information in time, in order to prevent unwanted psychological effects (Tran et al., 2020a). Third, lockdown measures should be adjusted to avoid aggravating the mental problems of veterans due to excessive control. In addition, since in-person health services are limited and delayed as a consequence of the pandemic, it is beneficial to offer accessible healthcare services to veterans. Therefore, it would be better for the government to promote online mental health counseling services, especially for those in remote areas (Liu et al., 2020; Pisciotta et al., 2019; Tran et al., 2020b). Last but not least, providing new employment opportunities and monetary support yielded benefits for those who lost jobs or experienced financial hardship (Xiong et al., 2020). It has been shown that government intervention in financial provisions and house support effectively alleviated suicide cases during the economic recession in Japan (Matsubayashi et al., 2020).

Furthermore, it is essential for individuals to clearly understand the COVID-19 situation in order to ameliorate mental disorder symptoms.

Having a good knowledge of relevant preventive measures can reduce the fear of the pandemic. Besides, a proper distraction from COVID-19 can ease anxiety. During the pandemic, it would be better for veterans to communicate with friends or families more frequently, improving their social and family support (Hwang et al., 2020). Likewise, it is recommended to seek help in time. When having negative emotions or other mental problems, the best way is to communicate with others and seek professional help actively.

There are some limitations in this scoping review. First, this scoping review used qualitative and descriptive analysis rather than meta-analysis because of the overlapping in participants and a high heterogeneity across studies in the assessment tools and primary outcomes. Of note, the included studies were conducted in different countries at different time points of the COVID-19 pandemic. Hence, the impact of COVID-19 on veterans was different, which may affect the interpretation of results. Second, most studies were conducted online and did not include people with poor accessibility, thus creating a selection bias in the sampling. The evaluation of psychiatric symptoms was mainly based on the individual's self-report and thus lack of objective diagnosis. Third, the included studies were limited to several countries. As a result, the generalizability of the findings among veterans globally should be cautious. Moreover, due to the cross-sectional design of some studies, it was challenging to explore the longitudinal changes in mental health status among veterans.

In conclusion, this scoping review revealed that the COVID-19 pandemic has increased adverse psychological problems in veterans, especially those with poor family/social relationships, financial problems, and preexisting mental disorders. It is recommended to provide adequate support to maintain the mental well-being of veterans. Additionally, continuous monitoring of their psychological status is essential, and a further strategy should be explored to alleviate the negative impact of COVID-19.

Author contributions

Author SHH and JBL conceived and designed the study. SLL and SH conducted the literature search and wrote the first draft of the manuscript. SLL conducted the data extraction and quality assessment. Statistical analyses were conducted by SLL and SH under the supervision of JBL. All authors contributed to and have approved the final manuscript.

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Declaration of Competing Interest

The authors confirm that there are no conflicts of interest.

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Supplementary materials

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