



Psychopathological states among Congolese health workers during the first wave of COVID-19 pandemic: links with emotion regulation and social support

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ABSTRACT

Background: The COVID-19 pandemic is an unprecedented stressor for frontline healthcare workers, notably increasing acute stress disorder and depression rates. Emotion regulation and social support could be major protective factors against such psychopathological states, but their role has not been explored outside Western contexts.

Objective: To assess the association between emotion regulation, social support, acute stress disorder, and depression among healthcare workers directly confronted with the first wave of COVID-19 pandemic in the eastern Democratic Republic of the Congo.

Method: A cross-sectional study assessed acute stress disorder, depression, adaptive (i.e. acceptance, positive refocusing, ...) and maladaptive (i.e. self-blame, rumination, catastrophizing, ...) emotion regulation strategies, social support (instrumental, emotional, and informational levels), as well as self-reported situations and feelings related to COVID-19, in a population of 252 frontline healthcare workers (121 women; 131 men; mean age: 39 ± 11 years old) at the Referral General Hospital of Bukavu. We also explored the relations between these variables through bivariate and multivariate logistic regression.

Results: Forty percent of participants presented symptoms of depression, and 16% presented acute stress disorder. In bivariate logistic regression, these psychiatric outcomes were associated with the availability of a COVID-19 protection kit [OR = 0.24 (0.12–0.98)], hostility toward health workers [OR = 3.21 (1.23–4.21)], putting into perspective [OR = 0.91 (0.43–0.98)], self-blame [OR = 1.44 (1.11–2.39)], catastrophizing [OR = 1.85 (1.01–4.28)], blaming others [OR = 1.77 (1.04–3.32)], emotional support [OR = 0.83 (0.49–0.98)], instrumental support [OR = 0.74 (0.28–0.94)], and informational support [OR = 0.73 (0.43–0.98)]. In multivariate logistic regression, hostility [OR = 2.21 (1.54–3.78)], self-blame [OR = 1.57 (1.02–2.11)], rumination [OR = 1.49 (1.11–3.13)] and emotional support [OR = 0.94 (0.65–0.98)] remained significantly associated with psychiatric outcomes.

Conclusion: Depression and acute stress disorder were highly prevalent among Congolese healthcare workers during the first wave of the COVID-19 health pandemic. Hostility, self-blame, rumination, and social support were associated with depression and/or acute stress disorder and should be targeted by interventions aiming to support health workers' wellbeing.

Estados psicopatológicos entre los trabajadores de la salud congoleños durante la primera ola de la pandemia de COVID-19: vínculos con la regulación emocional y el apoyo social

Antecedentes: La pandemia de COVID-19 es un factor estresante sin precedentes para los trabajadores de atención médica de primera línea, que aumenta notablemente las tasas de trastorno por estrés agudo y depresión. La regulación de las emociones y el apoyo social podrían ser factores protectores importantes contra tales estados psicopatológicos, pero su papel no ha sido explorado fuera de los contextos occidentales.

Objetivo: Evaluar la asociación entre la regulación de las emociones, el apoyo social, el trastorno de estrés agudo y la depresión entre los trabajadores de la salud que confrontaron directamente la primera ola de la pandemia de COVID-19 en el este de la República Democrática del Congo.

Método: Un estudio transversal evaluó el trastorno de estrés agudo, la depresión, estrategias de regulación emocional adaptativas (es decir, aceptación, refocalización positiva, ...) y

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关键词

急性应激障碍; 抑郁; 情绪调节; 社会支持; 照顾者; COVID-19

HIGHLIGHTS

- Frontline health workers presented high prevalence of acute stress disorder (16%) and depression (40%) during the first wave of COVID-19 pandemic in the Eastern Democratic Republic of the Congo, as they were working in hostile environment without enough protection kits.
- Acute stress disorder and depression were negatively associated with adaptive emotion regulation and social support; and positively with maladaptive emotion regulation.
- Intervention aiming to support health workers in pandemics should target emotion regulation and social support.

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desadaptativas (es decir, autculpabilización, rumiación, catastrofización, ...), apoyo social (niveles instrumental, emocional, e informacional), así como situaciones y sentimientos autoinformados relacionados con el COVID-19, en una población de 252 trabajadores de salud de primera línea (121 mujeres; 131 hombres; edad media: 39 ± 11 años) en el Hospital General de Referencia de Bukavu. También exploramos las relaciones entre estas variables mediante regresión logística bivariada y multivariada.

Resultados: Cuarenta por ciento de los participantes presentó síntomas de depresión y el dieciséis por ciento presentó trastorno de estrés agudo. En regresión logística bivariada, estos resultados psiquiátricos se asociaron con la disponibilidad de un kit de protección COVID-19 [OR = 0.24 (0.12–0.98)], hostilidad hacia los trabajadores de la salud [OR = 3.21 (1.23–4.21)], postura en perspectiva [OR = 0.91 (0.43–0.98)], autculpabilización [OR = 1.44 (1.11–2.39)], catastrofización [OR = 1.85 (1.01–4.28)], heteroculpabilización [OR = 1.77 (1.04–3.32)], apoyo emocional [OR = 0.83 (0.49–0.98)], apoyo instrumental [OR = 0.74 (0.28–0.94)] y apoyo informativo [OR = 0.73 (0.43–0.98)]. En la regresión logística multivariada, hostilidad [OR = 2.21 (1.54–3.78)], autculpabilización [OR = 1.57 (1.02–2.11)], rumiación [OR = 1.49 (1.11–3.13)] y apoyo emocional [OR = 0.94 (0.65–0.98)] permanecieron significativamente asociados con los resultados psiquiátricos.

Conclusión: La depresión y el trastorno de estrés agudo fueron muy frecuentes entre los trabajadores de la salud congoleños durante la primera ola de la pandemia sanitaria de COVID-19. La hostilidad, la autculpabilización, la rumiación y el apoyo social se asociaron con depresión y/o trastorno de estrés agudo y deberían ser el objetivo de las intervenciones destinadas a apoyar el bienestar de los trabajadores de la salud.

在第一波 COVID-19 疫情期间刚果健康工作者的精神病状态：与情绪调节和社会支持的联系

背景: COVID-19 疫情对一线医护人员是前所未有的应激源，显著提高了急性应激障碍和抑郁障碍的发病率。情绪调节和社会支持可能是对抗这种精神病状态的主要保护因素，但它们的作用尚未在西方背景之外进行探索。

目的: 评估了在刚果民主共和国东部直接面对第一波 COVID-19 疫情医护人员中情绪调节、社会支持、急性应激障碍和抑郁之间的关系。

方法: 在转诊布卡武综合医院的 252 名一线医护人员（121 名女性；131 名男性；平均年龄： 39 ± 11 岁）人群中，由一项横断面研究评估了急性应激障碍、抑郁、适应性（即接受、积极重新聚焦）和适应不良（即自责、反刍、灾难化）情绪调节策略、社会支持（工具、情感和信息水平），以及自我报告的 COVID-19 相关情况和感受。我们还通过双变量和多变量逻辑回归探讨了这些变量之间的关系。

结果: 40% 的参与者出现抑郁症状，16% 出现急性应激障碍。在双变量逻辑回归中，这些精神病学结果与 COVID-19 保护装备的可用性 [OR = 0.24 (0.12–0.98)]、对健康工作者的敌意 [OR = 3.21 (1.23–4.21)]，正确看待 [OR = 0.91 (0.43–0.98)]、自责 [OR = 1.44 (1.11–2.39)]、灾难化 [OR = 1.85 (1.01–4.28)]、责备他人 [OR = 1.77 (1.04–3.32)]、情感支持 [OR = 0.83 (0.49–0.98)]、工具支持 [OR = 0.74 (0.28–0.94)] 和信息支持 [OR = 0.73 (0.43–0.98)] 相关。在多元逻辑回归中，敌意 [OR = 2.21 (1.54–3.78)]、自责 [OR = 1.57 (1.02–2.11)]、反刍 [OR = 1.49 (1.11–3.13)] 和情感支持 [OR = 0.94 (0.65–0.98)] 仍然与精神病学结果显著相关。

结论: 在第一波 COVID-19 健康疫情期间的刚果医护人员中，抑郁障碍和急性应激障碍非常普遍。敌意、自责、反刍和社会支持与抑郁障碍和/或急性应激障碍相关，应作为旨在支持健康工作者福祉的干预措施靶点。

Abbreviations: CERQ: emotion regulation was assessed by the cognitive emotional regulation questionnaire; COVID-19: Coronavirus Disease 2019; OR: odd ratio; PTSD: post-traumatic stress disorder; SARSQ: Stanford Acute Reaction Stress Questionnaire; SD: standard deviation;

1. Introduction

The COVID-19 pandemic crisis has overchallenged the health systems of all countries worldwide, notably putting pressure on the mental health of frontline health workers. Many studies in Western countries and in Asia have reported a high prevalence of mental health problems among health workers facing COVID-19 (Lai et al., 2020; Li et al., 2020; Liang, Chen, et al., 2020; Liang, Wu, et al., 2020; Liu et al., 2020). However, data from Sub-Saharan Africa are scarce (Quadri et al., 2021), while the pandemic has also dangerously spread over the African continent.

Since its breakout in December 2019, the COVID-19 pandemic has infected more than 511,479,320

persons and caused more than 6,238,832 deaths worldwide (WHO Coronavirus (COVID-19) Dashboard). The African continent, initially quite spared, presented worrying trends with the emergence of new variants that were more contagious and more mortal. As of 2nd May 2022, the continent accounted for 8,756,858 cases, including 171,477 deaths (WHO Coronavirus (COVID-19) Dashboard). However, these figures might have been underestimated in view of the low screening rates in many African countries (Massinga Loembé et al., 2020). Centrally, health systems in Africa were overwhelmed in their response compared to other parts of the world, with very low compliance to recommended measures in many populations, low vaccination rates, and limited

prevention and intervention resources (Chersich et al., 2020; Massinga Loembé et al., 2020). The health professionals' dramatic position to face the pandemic disaster with limited resources was thus particularly challenging for their mental health. The Democratic Republic of the Congo, and most specifically its Eastern part, was deeply affected by the COVID-19 pandemic, notably because the area was already largely affected by 25 years of still ongoing armed conflicts (Chersich et al., 2020) and their socio-economic aftermaths, including a deficient health system due to a long-lasting lack of financial investment (Centers for Disease Control and Prevention (CDC), 2003; Tran, et al., 2021). At the time the pandemic occurred, health workers were already working under considerable strain, in insecure environments and were quite often underpaid (Fox, Witter, Wylde, Mafuta, & Lievens, 2014). In general, as of April 2022, the country counted 86,767 cumulative cases and 1337 cumulative deaths (WHO Coronavirus (COVID-19) Dashboard). However, these figures appear largely underestimated in view of the low screening rate (Massinga Loembé et al., 2020). Finally, it is worth mentioning that many experts were predicting chaotic scenarios for African countries (Loembé et al., 2020), putting Africans, and most specifically health workers, in constant apprehension.

Mental health problems were unsurprisingly high and varied among health workers during pandemic outbreaks (Alsubaie et al., 2019; Bai et al., 2004; Bukhari et al., 2016; Chan et al., 2005; Chen, Wu, Yang, & Yen, 2005; Lai et al., 2020), from nonspecific symptoms (e.g. insomnia, stress) to psychopathological states (e.g. depression, burn-out). Acute post-traumatic stress disorder and depression are two of the most reported psychiatric disorders among health professionals in frontline of epidemic outbreaks (Preti et al., 2020). In Africa, studies have reported high rates of psychological disorders both in general populations (up to 45% for depression) (Chen et al., 2021) and among health care workers (up to 20% for depression) following the COVID-19 pandemic (Quadri et al., 2021). When not addressed, poor mental health among health workers can have devastating impacts on their psychological and physical health, hence having a global negative consequence on their personal and professional life (e.g. reduced job performance, lower self-efficacy feelings) (Buselli et al., 2020). Therefore, with the current crisis still ongoing and as others might appear in the following years, there is a need to identify protective factors that may help to design preventive and curative interventions enhancing the mental well-being of frontline workers. In this paper, we explored two resilience factors that we stipulated to have a determinant role in preventing mental health outcomes, namely, emotion regulation and social support.

First, emotion regulation encompasses all extrinsic and intrinsic processes responsible for monitoring, evaluating and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goals (Thompson, 1994). Classical views of emotional regulation have distinguished adaptive and maladaptive emotion regulation strategies (Marroquín, Tennen, & Stanton, 2017). Adaptive ones (including acceptance, positive refocusing, refocus on planning) are positively associated with mental well-being, while maladaptive ones (including self-blaming, rumination and catastrophizing) are conversely related to higher prevalence of psychological disorders, including anxiety and depression (Kraiss, Peter, Moskowitz, & Bohlmeijer, 2020; Nelis et al., 2016; Quidbach, Berry, Hansenne, & Mikolajczak, 2010). Among rescue workers, emotion regulation is associated with stress-related symptoms (Gärtner, Behnke, Conrad, Kolassa, & Rojas, 2018). Among health workers facing pandemic outbreaks, coping strategies influence mental health outcomes (Mauder et al., 2008). However, no study has assessed the role of emotion regulation during COVID-19 among African health workers.

Second, social support, defined as psychological help accessible to an individual through social ties to other individuals, groups, and larger communities (Lin, Simeone, Ensel, & Kuo, 1979), constitutes a potentially protective factor for the mental well-being of health workers facing the COVID-19 pandemic. It is associated with mental well-being (Ali, Merlo, Rosvall, Lithman, & Lindström, 2006; Brooks, Dunn, Amlôt, Rubin, & Greenberg, 2017; Reblin & Uchino, 2008; Tomaka, Thompson, & Palacios, 2006; Zhang, Norris, Gregg, & Beckles, 2007) and protects health workers against stressors related to their duties (Xiao, Zhang, Kong, Li, & Yang, 2020). In the COVID-19 crisis, medical health workers were sometimes stigmatized, isolated, attacked, or victims of hostility from adepts of conspiracy theories (McKay, Heisler, Mishori, Catton, & Kloiber, 2020). More specifically, in the Democratic Republic of the Congo, during the last Ebola epidemic, health workers were attacked by hostile populations and armed groups (Maxmen, 2019). Hence, assessing the association between social support and mental health outcomes appears pertinent in this population.

This study thus aimed at assessing the prevalence of mental health outcomes (acute stress disorder and depression) and their association with protective factors (emotion regulation and social support) and with contextual factors (perceived availability of protective kits, information, hostility, psychological support...) among health workers in frontline against COVID-19 at the referral general hospital of Bukavu, a tertiary hospital in Bukavu, eastern Democratic Republic of the Congo. Such findings might shed the

light on psychosocial interventions necessary to prevent and to treat mental health problems facing COVID-19 and other epidemics, as no provision has been made so far in this regard.

2. Methods

2.1. Study design and settings

We conducted a cross-sectional survey at the referral general hospital of Bukavu, which is the main public hospital in South-Kivu (eastern Democratic Republic of the Congo), a region hosting more than 6 million people with an average age of 19 years old ([World Population Review](#)). This referral, tertiary hospital constituted a referral point for all severe cases of COVID-19. During the first wave of the COVID-19 pandemic (1st May to 30th August 2020), the general hospital hosted 157 patients with COVID-19, among which 50 patients died.

2.2. Participants recruitment

We recruited health workers who responded to our questionnaires. Eligible participants were medical doctors and nurses working at the referral general hospital of Bukavu. We excluded health professionals who were not on duty during the pandemic crisis. We recruited participants between 30 June and 22 August 2020 during the first wave of the COVID-19 pandemic in Bukavu (1st May to 30th August 2020).

2.3. Ethical approval

Ethical approval was obtained from the Catholic University of Bukavu Ethics committee. We obtained written informed consent from participants, and we ensured their privacy and confidentiality. Participants were then offered debriefing sessions with the main investigator where needed, and those with psychological disturbances were advised counselling sessions in the psychiatric clinic of the hospital.

2.4. Data collection and measures

We collected data with self-reported questionnaires (in French) distributed to all the health workers of the hospital meeting our inclusion criteria. The questionnaires were distributed along with consent forms. Both questionnaires and consent forms were provided to participants in a paper-pencil version. The main investigator then collected both questionnaires and consent forms either directly from participants or at a predetermined collecting point in the hospital. We first collected sociodemographic data (age, sex, marital status, profession). We designed a 9-question survey inquiring about COVID-19 contextual factors (e.g.

information on the disease, access to personal protective equipment, availability of psychological support, hostility from the communities, experience of direct management of COVID-19 patients, fear of being infected and of transmitting the virus). We assessed the following:

- Peri-traumatic acute stress disorder by the Stanford Acute Reaction Stress Questionnaire (SARSQ) (Cardena, Koopman, Classen, Waelde, & Spiegel, 2000). It comprises 30 items grouped into five symptoms: dissociative derealization, depersonalization or amnesia (10 items), reexperiencing of trauma (6 items), avoidance (6 items), anxiety and hyperarousal (6 items) and impairment in functioning (2 items). We scored items according to a Likert-type scale (0–5). The presence of the acute stress disorder is defined by a score greater than 90.
- Depression by Beck's inventory for depression version II. It is a validated psychometric tool for assessing affective, cognitive, somatic, and vegetative symptoms reflecting the DSM5 criteria of major depressive disorder (Jackson-Koku, 2016; Richter, Werner, Heerlein, Kraus, & Sauer, 1998). This questionnaire was validated in several populations worldwide, including South Africa (Ward, Flisher, Zisis, Muller, & Lombard, 2003). Beck's inventory consists of 21 questions, the sum of which gives a score that is then staggered to give the diagnosis and severity of depression. For the diagnosis of moderate to severe depression, we considered a threshold of 20 and above.
- Emotion regulation by the Cognitive Emotional Regulation Questionnaire (CERQ), a 36-item validated questionnaire capturing nine stable-dispositional cognitive emotion regulation strategies (Garnefski, Kraaij, & Spinhoven, 2001; Jermann, Van der Linden, d'Acremont, & Zermatten, 2006; McKinnon et al., 2020), namely, five adaptive [acceptance (accepting and not changing a negative situation or the emotions caused), positive refocusing (keeping attention on pleasant thoughts after the occurrence of negative events), refocus on planning (thinking about what steps to take and how to handle the negative event), positive reappraisal (finding the silver lining by creating a positive meaning to negative events), putting into perspective (relativizing a negative event by considering the impact over time)] and four maladaptive [self-blame (the causal attribution of negative events to oneself), rumination (overthinking emotions and thoughts associated with negative events), catastrophizing (explicitly emphasizing the consequences of negative events) and blaming others (the causal attribution of adverse events to others)]. The nine cognitive emotion regulation strategies are rated on a 5-point Likert scale ranging from 1 to 5,

with scores being obtained by calculating the mean scores of each of them.

- Social support by the questionnaire of the frequency of and satisfaction with social support (QFSS), which measures the frequency and degree of satisfaction with perceived emotional, instrumental and informational support received from four different sources (partners, family, friends and community) (García-Martín & Hombrados-Mendieta, 2016). Frequency of support is measured on a 5-point Likert scale (from rarely to always), and the degree of satisfaction is measured on a 5-point Likert scale (from unsatisfied to very satisfied).

2.5. Statistical analyses

We analysed the data using Stata Version 13 to perform descriptive and inferential analyses. We described qualitative variables in terms of frequencies and percentages and continuous variables in terms of means \pm standard deviation. We used Pearson Chi² and Student's *t*-tests to compare the characteristics of patients for categorical and continuous variables, respectively. We used bivariate and multiple logistic regression to determine the association between predictor variables (sociodemographic factors, COVID-19 contextual factors, emotion regulation strategies, and social support) and outcome variables, regrouped in psychiatric outcome (moderate to severe depression and/or acute stress disorder). We used individual odds ratios (95% confidence intervals). The associations were deemed significant with a *p*-value lower than or equal to .05. Variables were included in multiple regression when associated with psychiatric outcomes at a *p*-value \leq .05.

3. Results

3.1. Demographic parameters among participants (Table 1)

Our sample included 252 health workers (59% men; mean age: 39 \pm 11 years old). There was no significant difference between men and women in the different demographic parameters.

3.2. COVID-19 contextual factors (Table 2)

Most participants reported having received enough information about COVID-19 (100% from 'enough' to 'a lot'), whereas the vast majority reported having neither a protective kit nor psychological support (97% from 'not at all' to 'quite a bit'). Strikingly, most participants reported having experienced hostility from their community because they belonged to COVID-19 response teams (91% from 'enough' to 'a

lot'). Almost all participants took part directly in the management of suspected cases of COVID-19 (100% from 'sufficiently' to 'a lot') and feared being infected and transmitting COVID-19 to their loved ones (100% from 'enough' to 'a lot').

3.3. Psychopathological measures (Table 3)

Sixty percent of participants reported no depression, 20% mild depression, 14% moderate depression and 6% severe depression. Sixteen percent of participants presented with acute stress disorder, the most frequent symptoms being avoidance (21%), dissociation (10%), reexperiencing of trauma (14%), anxiety and hyperarousal (17%), and dissociation (10%). We observed no gender differences related to these measures.

3.4. Univariate and multiple regression of factors associated with psychopathological outcomes (Table 4)

We performed bivariate and multivariate logistic regression to identify factors associated with psychiatric outcomes. In bivariate logistic regression, psychopathological outcomes were significantly and positively associated with hostility toward health workers [OR = 3.21 (1.23–4.21)] and maladaptive emotion regulation strategies (self-blame [OR = 1.44 (1.11–2.39)], catastrophizing [OR = 1.85 (1.01–4.28)], blaming others [OR = 1.77 (1.04–3.32)]). They were also negatively associated with reported protection kit availability [OR = 0.24 (0.12–0.98)], adaptive emotion regulation (putting into perspective [OR = 0.91 (0.43–0.98)]), and social support (emotional [OR = 0.83 (0.49–0.98)], instrumental [OR = 0.74 (0.28–0.94)], informational [OR = 0.73 (0.43–0.98)]). Still, in bivariate logistic regression, hostility was negatively associated with emotional social support [OR = 0.63 (0.45–0.87)] and positively associated with self-blame [OR = 2.21 (1.13–3.41)]. In multivariate logistic regression, hostility [OR = 2.21 (1.54–3.78)], self-blame [OR = 1.57 (1.02–2.11)], rumination [OR = 1.49 (1.11–3.13)], and emotional support [OR = 0.94 (0.65–0.98)] remained significantly associated with psychiatric outcomes.

4. Discussion

Our study is the first to simultaneously explore COVID-19 contextual factors, emotion regulation strategies, social support, and psychological outcomes among health workers in sub-Saharan Africa.

A first striking result is the self-reported lack of material and psychological support offered to health workers during the COVID-19 pandemic: although participants reported being informed about the COVID-19 pandemic, most declared not having

enough protective personal equipment. That lack of personal equipment has been reported not only among other African countries (Quadri et al., 2021) but also in many other countries (Delgado et al., 2020; Hakim et al., 2021; Martin-Delgado et al., 2020; Savoia et al., 2020; Tabah et al., 2020). Participants also reported not having enough opportunities to benefit from psychological support. Although there is a global recommendation of supporting health workers in this over-challenging pandemic (Gonzalez et al., 2020; Ruiz & Gibson, 2020), there is more than ever a shortage of resources, interventions, and organizations to support the mental health of caregivers during the COVID-19 pandemic (Vizheh et al., 2020; Yan, Ding, & Guo, 2021). That shortage of mental health resources, which has been observed in Western countries during the crisis, is even more obvious in Africa, where the mental health resources were already limited and mobilized by severe cases in the communities and in mental health institutions (Jaguga & Kwobah, 2020; Semo & Frissa, 2020). More strikingly, most participants reported hostility from their communities. Such aggressiveness against healthcare professionals has been reported during the COVID-19 pandemic (Devi, 2020; Larkin, 2021; McKay et al., 2020) and constitutes an independent predictor of poor mental health and psychiatric outcomes among health workers during this pandemic. Our data show that most of our participants experienced fear of being infected and transmitting the virus to their loved one, which appears justified as health workers constitute a significant proportion of all COVID-19 patients (Sahu et al., 2020). This fear was exacerbated by limited access to protective equipment and diagnosis tests. Overall, health workers experienced contextual challenges that might have impacted their job performance and their mental health.

A second important result is the high proportion of health workers presenting psychopathological states, as 40% presented depressive symptoms and 16% acute stress disorder. These numbers corroborate other studies worldwide that report a high prevalence of mental health problems among health workers during the COVID-19 pandemic (Alsubaie et al., 2019; Bai et al., 2004; Bukhari et al., 2016; Chan et al., 2005; Chen et al., 2005; Lai et al., 2020). In

African countries, the only study that assessed the mental health of health professionals reported a prevalence of 20% for depressive symptoms (Quadri et al., 2021). The higher rates observed here may be explained by the fact that our study systematically assessed the presence of depressive symptoms with a validated instrument, whereas the previous one only measured the self-reported sensation of 'feeling depressed'. The high prevalence of psychiatric disorders among health care workers may be explained by many factors, including trauma of witnessing death, fear of being infected, increase in work responsibilities, lack of political and social support. In the Democratic Republic of the Congo, as in several Sub-Saharan countries, COVID-19 has been an additional stressor on other preexisting factors, such as underpayment, unsafety, and lack of resources (Naicker, Plange-Rhule, Tutt, & Eastwood, 2009). The high prevalence observed in this study advocates for implementing interventions aiming to prevent and treat psychological states among health workers during the COVID-19 pandemic.

Our study also offers key insights regarding the emotional and social predictors of psychopathological states. First, regarding emotion regulation strategies, self-blame and rumination were positively associated with mental health outcomes, whereas putting into perspective was negatively associated with psychiatric outcomes in bivariate analysis. Many studies have shown that emotion regulation is associated with psychiatric outcomes in both directions: emotion regulation impacts mental health, but psychiatric outcomes also influence emotion regulation (Kraiss et al., 2020; Nelis et al., 2016; Quoidbach et al., 2010). Similar to health frontline workers, among rescue workers, rumination was associated with posttraumatic stress symptoms and with depressive symptoms (Gärtner et al., 2018). Second, regarding social support, our results corroborate a consistent literature that identified social support as an essential protective factor in coping with stressful events and preventing psychological troubles (Ali et al., 2006; Brooks et al., 2017; Reblin & Uchino, 2008; Tomaka et al., 2006; Zhang et al., 2007). However, the role of social support has rarely been explored in the occurrence of psychiatric outcomes among health workers (Xiao et al., 2020).

Overall, our data show that contextual factors such as hostility against mental health workers, intrapersonal factors such as emotion regulation, and interpersonal factors such as social support are associated with mental health outcomes among participants. Our study is the first in sub-Saharan Africa to assess factors associated with mental health outcomes. Therefore, it might be helpful to implement interventions impacting those factors, some of which have previously been shown to be effective among health workers,

Table 1. Sociodemographic characteristics of participants.

Variables	Men	Women	Total	<i>p</i> Value
Age (SD)	39 (10)	38 (11)	39 (11)	.72
<i>Marital status N (%)</i>				
Married	94 (75)	65 (67)	159 (72)	.53
Non-married	55 (25)	38 (33)	93 (28)	
<i>Profession N (%)</i>				
Medical doctors	53 (40)	37 (33)	90 (36)	.47
Nurses	57 (45)	52 (57)	109 (43)	
Others ^a	39 (15)	22 (10)	14 (21)	

^aOthers (pharmacists, hygienists, dentists, psychologists, medical secretaries, ...).

Table 2. Contextual factors among participants.

Variable	Item	Not at all N (%)	A little N (%)	Quite a bit N (%)	Enough N (%)	Sufficiently N (%)	A lot N (%)
Information	Do you feel that you have received enough information about the COVID-19 disease?	0 (0)	0 (0)	0 (0)	57 (23)	123 (49)	72 (28)
Personal protective equipment	Do you feel that you had the means to protect yourself from transmission to COVID-19 during your service hours?	3 (1)	56 (22)	187 (74)	5 (1)	6 (2)	0 (0)
Psychological support	Did you have the opportunity for psychological support in relation to the COVID-19 pandemic?	82 (33)	121 (48)	44 (17)	5 (2)	0 (0)	0 (0)
hostility	Have you been criticized, insulted, or harassed by community members, patients, or their family because you are a caregiver contributing to the response?	0 (0)	0 (0)	24 (9)	100 (40)	122 (48)	8 (3)
COVID-19 direct management	Did you personally have to treat patients in whom COVID-19 has been suspected or confirmed?	0 (0)	0 (0)	0 (0)	86 (34)	123 (49)	43 (17)
Fear of infection	Did you fear being infected with COVID-19 while doing your job?	0 (0)	0 (0)	0 (0)	0 (0)	21 (8)	231 (92)
Fear of transmitting COVID-19	Have you been worried about transmitting the COVID-19 virus to your loved ones?	0 (0)	0 (0)	0 (0)	21 (8)	108 (43)	123 (49)

Table 3. Psychosocial parameters among participants.

Parameters	Total	Male	Female	P value
<i>CERQ</i>				
Acceptance Mean (SD)	11.84 (2.84)	11.88 (2.88)	11.78 (2.91)	0.840
Positive refocusing Mean (SD)	12.16 (3.23)	12.37 (3.42)	11.83 (2.90)	0.319
Refocus on planning Mean (SD)	14.42 (3.28)	14.76 (3.36)	13.90 (3.81)	0.114
Positive reappraisal Mean (SD)	13.84 (3.39)	14.19 (3.16)	13.30 (3.69)	0.112
Putting into perspective Mean (SD)	22.56 (5.09)	22.84 (5.09)	22.13 (5.041)	0.407
Self-blame Mean (SD)	10.89 (4.01)	11.11 (4.37)	10.57 (5.52)	0.417
Rumination Mean (SD)	12.68 (4.48)	12.87 (4.57)	12.43 (4.38)	0.579
Catastrophizing Mean (SD)	12.08 (4.55)	12.17 (4.61)	11.93 (4.49)	0.751
Blaming others Mean (SD)	10.20 (3.21)	10.31 (3.24)	10.02 (3.19)	0.599
<i>QFSSS</i>				
Emotional support Mean (SD)	23.69 (7.55)	24.34 (7.40)	22.68 (7.74)	0.185
Instrumental support Mean (SD)	17.50 (5.79)	17.97 (5.68)	16.78 (5.93)	0.219
Informational support Mean (SD)	23.02 (7.42)	23.31 (7.20)	22.57 (7.79)	0.545
Beck scale for depression				
Beck scale for depression score Mean (SD)	4.65 (6.59)	4.51 (6.59)	4.87 (7.27)	0.75
No depression N (%)	115 (60)	68 (60)	47 (58)	0.27
Mild depression N (%)	56 (20)	30 (20)	26 (22)	
Medium depression N (%)	47 (14)	27 (15)	20 (13)	
Severe depression N (%)	34 (6)	17 (5)	17 (7)	
Stanford acute stress reaction				
Dissociation N (%)	25 (10)	13 (9)	12 (12)	0.53
Reactivation N (%)	35 (14)	14 (15)	7 (12)	0.54
Avoidance N (%)	32 (21)	24 (18)	22 (25)	0.33
Anxiety and sleep N (%)	43 (17)	24 (16)	19 (18)	0.75
Depreciation N (%)	60 (24)	32 (22)	28 (27)	0.48
Acute stress disorder N (%)	40 (16)	19 (14)	21 (20)	0.34

Table 4. Univariate and multiple regression of factors associated with psychiatric outcomes (depression and/or acute stress disorder).

Factors associated to psychiatric outcome	Unadj OR (95% CI)	p-Value	Adj OR (95% CI)	p-Value
Age	3.62 (0.69–7.94)	.09	1.01 (0.96–1.15)	.71
Protection kit	0.24 (0.12–0.98)	<.001	0.58 (0.21–0.88)	.02
Psychological support	0.94 (0.41–1.84)	.11	–	–
Hostility	3.21 (1.23–4.21)	<.001	2.21 (1.54–3.78)	.01
COVID19 direct management	1.13 (0.82–2.23)	.07	–	–
<i>CERQ</i>				
Acceptance	1.02 (0.89–2.18)	.679	–	–
Positive refocusing	0.96 (0.84–2.89)	.537	–	–
Refocus on planning	0.95 (0.84–1.67)	.388	–	–
Positive reappraisal	0.89 (0.49–1.41)	.069	0.97 (0.96–1.057)	.82
Putting into perspective	0.91 (0.43–0.98)	.019	0.98 (0.80–1.19)	.86
Self-blame	1.44 (1.11–2.39)	<.001	1.57 (1.02–2.11)	.05
Rumination	1.57 (1.07–3.31)	.001	1.49 (1.11–3.13)	.04
Catastrophizing	1.85 (1.01–4.28)	<.001	0.97 (0.84–1.13)	.76
Blaming others	1.77 (1.04–3.32)	.008	1.12 (0.94–1.34)	.189
<i>QFSSS</i>				
Emotional support	0.83 (0.49–0.98)	.010	0.94 (0.65–0.98)	.04
Instrumental support	0.74 (0.28–0.94)	.048	0.99 (0.86–1.13)	.81
Informational support	0.73 (0.43–0.98)	.012	0.98 (0.86–1.12)	.80

such as cognitive processing therapy (Naidu, Giblin, Burke, & Madan, 2016), relaxation (Zhang, Murphy, Cabanilla, & Yidi, 2021), mindfulness training (Chmielewski, Łoś, & Łuczyński, 2021), emotional debriefings (Harder, Lemoine, & Harwood, 2020) and peer supporting groups (Miotto, Sanford, Brymer, Bursch, & Pynoos, 2020).

5. Limitations

The cross-sectional design hampered the exploration of the causal relations between independent variables and psychiatric outcomes. Moreover, non-response bias, with unknown differences between health workers who responded and those who did not (e.g. staff who did not participate in the study because they were ill or had left their job following the stress and fear generated by the pandemic), as well as social desirability bias, as health workers are supposed to be efficient even under high pressure, constitute a significant limit of the study. Furthermore, the fact that the study was carried out in a post-conflict region, with low mean socio-economic status might have impacted our results. Finally, as our results were exclusively related to the first wave of the pandemic, their transferability to more recent periods of the COVID-19 pandemic or to other contexts is subject to caution. Although the questionnaires used in this study proved to have good psychometric proprieties and have been used in a large range of populations and cultures, they had not been validated in the specific population of the Democratic Republic of the Congo.

6. Conclusion

Overall, our results confirm that the prevalence of depression and post-traumatic acute stress disorder is relatively high among healthcare workers in African populations. Moreover, they are working in challenging contexts with lower access to personal protective equipment and psychological support, experiencing hostility from their communities, fearing being infected and infecting their loved ones. Our data also suggest that perception of hostility, self-blame, rumination, and emotional social support are associated with psychiatric outcomes. Further studies are needed to replicate our findings in other countries or with a longitudinal design. Psychosocial intervention to support health workers should target emotion regulation, social support and contextual factors such as work environment and appropriate equipment.

Ethics approval and consent to participate

We sought ethical approval from the Catholic University of Bukavu Ethics committee. We obtained informed consent from the participants.

Authors' contributions

AB designed the study, carried out data collection, data analysis, and preparation of the first and revised drafts of the manuscript. PD contributed to the study design and contributed to the preparation and editing of the manuscript. RB contributed to the study design, data collection and editing of the manuscript. HT contributed to the study design and contributed to the preparation and editing of the manuscript. MB contributed to the study design and contributed to the preparation and editing of the manuscript. CC contributed to the study design and contributed to the preparation and editing of the manuscript. GM contributed to the study design and contributed to the preparation and editing of the manuscript. GB contributed to the study design and contributed to the preparation and editing of the manuscript. GP contributed to the design of the study and the preparation and editing of the manuscript. contributed to the study design and contributed to the preparation and editing of the manuscript. PM contributed to the study design and contributed to the preparation and editing of the manuscript. All authors have read and have approved the manuscript.

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Data availability statement

The data that support the findings of this study are available on request from the corresponding author, AB. The data are not publicly available since they contain information that could compromise the privacy of research participants.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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