Abstract
On-site experiences and reports have shown that the multiple outbreaks of Ebola virus disease (EVD) in the Democratic Republic of the Congo (DRC) resulted in pervasive experience of stigma against many people who have recovered from EVD as well as their families and close relatives. Three evidence-based protective factors which are supposed to mitigate the impact of enacted Ebola stigma on health-related quality of life (HRQoL) of individuals in this epidemic context were identified. We expected that positive religious coping, perceived social support, and general self-efficacy would mediate the relationship between enacted Ebola stigma and HRQoL. These hypotheses were tested through multiple mediation model using the structural equation modeling among a large sample of adult populations (N = 1614; 50% women) in the province of Equateur in the DRC, in the aftermath of the 9th Ebola outbreak. The mediation model yielded adequate fit statistics and the results provided strong evidence that higher levels of enacted Ebola stigma were associated with lower HRQoL. They confirmed the synergetic mediating effects of positive religious coping, perceived social support from family (but not from others sources) and general self-efficacy. Futher exploratory findings revealed that the perceived social support from family buffered the impact of enacted Ebola stigma on HRQoL. If replicated by a longitudinal study, our findings lay a solid foundation for empirical-based community mental health interventions for reducing enacted Ebola stigma and promoting HRQoL during epidemics, especially in the DRC.

Keywords Ebola epidemics · Stigma · Quality of life · Social support · General self-efficacy · Religious coping
Introduction

Infectious disease epidemics are linked to biopsychosocial dynamics of stigma, especially when considered contagious and potentially deadly (Brewis & Wutich, 2020; Brewis et al., 2020). Though stigma on its own acts as an adaptive response rooted in deep fear of contagion and uncertainty surrounding the disease, it can become a counterproductive process whereby some people perceive they are morally discredited, socially devalued, and disempowered on the basis of disease diagnosis or other related attributes (Brewis et al., 2020; Goffman, 1963). From 2018 to 2020, North Kivu and Ituri provinces of eastern Democratic Republic of the Congo (DRC) underwent the second-largest outbreak of Ebola virus disease (EVD) in history, both in terms of the number of cases and the number of deaths. A small but growing body of literature suggests that the high lethality of EVD resulted in prejudices, community rejection and intense stigma against people who have recovered from EVD as well as their families and close relatives (Davtyan et al., 2014 for review). Several on-site experiences and reports showed that individuals were denied of their rights to health care, employment and freedom of movement; that families with EVD patients were victims of verbal abuse or gossip, ostracism and even lynching situations; and that most affected communities or ethnic groups were negatively labeled (Gee & Skovdal, 2018; Nuriddin et al., 2018; Overholt et al., 2018; Shultz et al., 2016). Indeed, intractable armed conflicts, pre-existing political tensions between communities in eastern DRC and mass migration movements with neighboring countries were breeding grounds for the proliferation of the virus and stigmatization (Cénat et al. 2019).

Previous research has shown that people who reported experiencing EVD-related stigma (i.e., so-called enacted Ebola stigma) presented an increased likelihood of moderate and severe symptoms of PTSD and depression (Betancourt et al., 2016; Cénat et al. 2020; Denis-Ramirez et al., 2017; Keita et al., 2017). To address such issues, community mental health interventions are necessary (Cénat et al. 2020; Shultz et al., 2015) and should target not only mental health symptoms (emotional and behavioral) but the overall well-being of individuals, families and communities. Such interventions strategies should be coherent with family and community bonds as well as religious beliefs system in the DRC in particular, where group-solidarity is expressed through different sources of social support. For example, in a study conducted in Kinshasa, Maman et al. (2009) showed that HIV-positive women relied upon their religious practices and faith, and turned to church leaders as coping strategies to overcome negative experience linked to their status (e.g., disclosure of their status, stigmatization). The authors concluded that religious and spiritual resources should be considered as a key component of health belief systems in the DRC. With respect to these contextual factors, we anticipate that in addition to intrapersonal abilities, interpersonal resources such as social support and religious coping are key intervening variables capable of mitigating the impact of enacted Ebola stigma on individuals’ health-related quality of life (HRQoL).
Theoretical Framework and Mediating Resilience Resources

In keeping with the process of social stress theory (Pearlin, 2010; Pearlin et al., 1981) and, to some extent, cognitive theory of stress and coping (Folkman, 2013; Lazarus & Folkman, 1984), the enacted Ebola stigma can be conceptualized as a social stress generating psychological strains. People confront social stress-provoking conditions with a variety of cognitions, perceptions, and behaviors that are often capable of altering the difficult conditions or mitigating their impact. Among the mediating resources having a crucial role in the stress-health outcome process, are social support, general self-efficacy or resilience, and coping strategies (Haley et al., 1996; Tang et al., 2015). To elucidate the sequential pathways between these constructs, we draw from the work of Sippel et al. (2015) which argues that the high and adequate social support can moderate genetic and environmental vulnerabilities to confer resilience to stress, and foster more effective coping strategies when confronting challenging and stressful circumstances. These resources intervene in this process to effectively mediate the effects of stress on psychological outcomes by strengthening the capacity of control and the self-esteem of people undergoing stressful situations (Pearlin, 2010; Pearlin et al., 1981). In the current study, we were particularly interested in examining the roles religious coping strategies with respect to the sociocultural and religious context in the DRC, perceived social support from one’s relationship network (i.e., family, friends, and close relatives), and general self-efficacy as possible psychosocial and protective resources in predicting HRQoL. The Fig. 1 reflects the main conceptualized model.

Religious Context and Religious Coping Strategies

In Sub-Saharan Africa, as elsewhere, religion plays a prominent role in the day to day activities of the people. Specifically in challenging times such as deaths and illnesses (Kokou-Kpolou et al., 2017), traumatic events (Adedoyin et al., 2016) including tortures (Leaman & Gee, 2012) and natural disasters (Zeligman et al., 2020), people turn to rituals and other religious activities to find succor. For them, religion is experienced as a means of protection against adversity and provides meaning when adversity becomes inescapable. Through religious interpretations, such populations in distress make meanings of the distressing events and strengthen their sense of belonging to religious communities where they claim to draw resources to endure adversity and maintain their hope (Adansikou et al., 2017; Copeland-Linder, 2006; Kokou-Kpolou et al., 2017). In the DRC, for example, during the HIV/AIDS and Ebola epidemics, there has been an increase in the need for religious practices, such as prayers, masses, and seeking advice from religious leaders. These needs arose from and were reinforced by the idea that the cause of the Ebola virus was not only biological and medical, but was also perceived as spiritual, mystical and superstitious (Cénat et al., 2021; Muzembo et al., 2020). This perception of the disease justifies the growing research interest in the role religion may play as a coping strategy in response to the stress induced by diseases. It should be noted that in mobilizing local expertise to build a resilient system against the spread of the epidemic, formal health workers, traditional healers, and village social and religious leaders were all called
upon (Blevins et al., 2019; Grimes et al., 2020). This multi-component intervention approach reinforces the perception that religion and spirituality have an important role in the conception of and quest for health and well-being of populations.

This study was interested by the role played by the religious coping strategies. Religious coping refers to mobilizing religious resources to bear in one’s efforts to adjust to stressful situations (Pargament et al., 1998). Though religious coping is recognized as a multidimensional construct (Pargament et al., 2000), researchers have continued to highlight differences between the positive and the negative dimensions of religious coping. Positive religious coping relies on a confident and trusting connection with God or the sacred, and involves strategies such as making benevolent religious reappraisals and seeking support from religious community; negative religious coping, on the other hand, reflects a less secure relationship with God or the sacred, and includes strategies such as expressing religious discontent and making punitive religious reappraisals (Pargament et al., 1998).

Positive religious coping, regarded as adaptive coping responses, have generally been associated with reduced health problems and improved well-being (Ano & Vasconcelles, 2005 for review), as well as lower mortality (VanderWeele et al., 2017). In contrast, findings regarding the negative religious coping are contradictory. Some studies reported that negative religious coping methods mediated the relationship between perceived prejudice (e.g., discrimination, stigma consciousness) and psychological distress (McCleary-Gaddy & Miller, 2019; Szymanski & Obiri, 2011). Other studies reported however, the tendency that they may be beneficial for some people while going through “a religious struggle for significance” (Pargament et al., 1998). In general, researchers have postulated that religious coping responses may play mediating and moderating roles in stress-health relationship outcomes; however, much previous research did not demonstrate their moderating effects (Szymanski & Obiri, 2011; Zeligman et al., 2020).

Social Support

Previous research has consistently highlighted the important role played by social and community support in preventing mental health problems and managing stressful events (Fung & Webster, 2018; Manor & Eisenbach, 2017; Wang et al., 2003). In HIV/AIDS research across sub-Saharan African countries and among African Americans in particular, social support (i.e., from friends, family, and community members or organizations) is often reported to be associated with lower levels of psychological distress (Backe et al., 2018; Brener et al., 2020; Seffren et al., 2018). For example, greater family support was associated with fewer depression symptoms among rural Ugandan women living with HIV/AIDS (Seffren et al., 2018). Another study showed that social support mediated the relationship of HIV-related stigma and posttraumatic stress symptoms (Breet et al., 2014). In addition, the perceived social support, which refers to an individual’s evaluation of whether the social network is supportive enough to facilitate the individual’s coping with stress (Haber et al., 2007), was found to mediate between the impact of experienced discrimination on mental health (Kondrat et al., 2018). In a longitudinal study, Simoni et al. (2006) showed that the perceived social support was associated with less negative affect.
and, conversely, greater spirituality, was associated with self-efficacy to adhere to antiretroviral therapy.

**General Self-Efficacy**

The general self-efficacy refers to the optimistic sense and personal belief in one’s capabilities to cope with a broad range of stressful or challenging demands (Bandura, 1997; Schwarzer & Jerusalem, 1995). Within the scope of the cognitive theory of stress and coping (Folkman, 2013; Lazarus & Folkman, 1984), the general self-efficacy reflects the appraisal of one’s own ability to cope with stressor such that individuals who have a better-perceived ability to cope also have an enhanced response to stress. Thus, as developed by some scholars (Bandura et al., 1996; Lachman et al., 2011), the general self-efficacy is one component of the control beliefs that reflect how people evaluate themselves in coping with stress. Several studies have reported a significant positive association between general self-efficacy and social support (Sadri Damirchi & Samadifard, 2019; Li et al., 2018; Simoni et al., 2006; Yang et al., 2019), resilience (Lin et al., 2020), and intrinsic religiosity or spirituality (Fatima et al., 2018; Simoni et al., 2006). A recent meta-analysis (Banik et al., 2018) found a consistent positive relationship between general self-efficacy and HRQoL among people with cardiovascular diseases. High general self-efficacy is associated with higher levels of subjective well-being (Hajek & König, 2019) and lower levels of anxiety and depression (Tang et al., 2015).

Moreover, previous research based on samples across different cultures has shown that the relationship between stressful life events or daily stressors and overall mental health was mediated by general self-efficacy (Maciejewski et al., 2000; Schönfeld et al., 2016). Similarly, a study involving a sample of Chinese university students suffering from bullying victimization, Lin et al. (2020) has shown that general self-efficacy, social support and personal resilience, partially mediated the effect of victimization on overall mental health. Other studies also indicated the buffering effect of the general self-efficacy such that it weakened the direct effect of stress on burnout (Yao et al., 2018). Reflective of this evidence, we anticipate that general self-efficacy may influence HRQoL and, specifically, may play mediating and moderating roles in the pathway from enacted Ebola stigma to HRQoL.

**Rationale and Hypotheses of the Present Study**

As reviewed above, a number of studies showed that enacted Ebola stigma is prevailing stressor among communities exposed to Ebola outbreaks and was associated with adverse mental health outcomes. However, although perceived social support, general self-efficacy and religious coping strategies have been identified as evidence-based resources when facing adverse situations, there have been almost no empirical data examining their mediating and moderating effects on positive mental health. Thus, this study represents a significant step to advancing the theoretically and empirically driven knowledge on psychosocial mechanisms through which the harmful impact of enacted Ebola stigma can be reduced on mental health and qual-
ity of life of individuals. A better understanding of multiple pathways from enacted Ebola stigma to HRQoL appears warranted to design and implement effective community mental health interventions in epidemic contexts, especially in low and middle-income countries (LMICs) (Mukunzi et al., 2020). Research has shown that in LMICs, people turn to interpersonal resources such as social support and religiosity to cope with stressful situations (Hekmatpour, 2020). Building on the process of social stress theory (Pearlin, 2010; Pearlin et al., 1981) and cognitive theory of stress and coping (Folkman, 2013; Lazarus & Folkman, 1984) and previous empirical literature, we purposely tested the following hypotheses as diagramed through Fig. 1 (Hypotheses 1, 2, and 3): Hypothesis 1 High levels of enacted Ebola-related stigma will be strongly associated with lower scores of health-related quality of life.

Hypothesis 2 Positive religious coping strategies, perceived social support, and general self-efficacy will be strongly associated with higher scores of health-related quality of life.

Hypothesis 3 We expect that positive religious coping strategies perceived social support, and general self-efficacy will mediate the relationship between enacted Ebola-related stigma and health-related quality of life. The specific mediating effect of sources of the perceived social support (i.e., family, friends, and significant others) was examined exploratively.

Hypothesis 4 We also expect that positive religious coping strategies, perceived social support and general self-efficacy will buffer the relationship between enacted Ebola-related stigma and health-related quality of life. This hypothesis was tested exploratively given that many studies revealed inconclusive findings regarding the moderating effect of these variables.
Methods

Data Source and Collection

We used the data from the Ebola and mental health (EboMH) project, which were collected over a 6-week period from March to April, 2019, seven months after the declaration of the end of the 9th EVD outbreak in DRC. The study protocol was approved by the ethics boards of the University of Ottawa and the Institut National pour la Recherche Biomédicale (National Institute for Biomedical Research) of DRC, and the University of Kinshasa. Twenty-six Lingala-speakers and research assistants completed one and a half days of training on ethical practices and helped to read and fill in the questionnaire for participants.

The survey questionnaires were translated in Lingala, one of the four popular national languages in the DRC and the commonest in the Equateur province in the DRC. Backtranslation methods were used. After the translation was completed, research assistants recruited participants door-to-door in the three “health zones” affected by the 9th EVD outbreak in the province of Equateur in the DRC (Bikoro, Iboko, and Wangata). Using information by the Institut National de Statistiques—INS (National Statistics Institute) of the country, the stratified demographic weight of the affected rural and urban areas, and the proportion of women and men were estimated to compose the study sample. All participants signed an informed consent form. Of the 1637 people solicited, 23 people refused participation (12 men and 11 women; response rate = 98.6%), leading the final sample up to 1,614 participants (50% women), aged 18–85 years old (M =34.05, SD = 12.55). Table 1 presents sociodemographic characteristics of participants in detail.

Measures

Enacted Ebola Stigma

The enacted Ebola stigma was assessed using an in-lab-developed questionnaire listing 20 possible types of stigmatization that were based on the WHO reports and the Social science and behavioral data compilation (Bardosh et al., 2019; WHO, 2019). Examples of items are: “Because of the Ebola Virus… Neighbors and other people prevented you from returning to your home? … You have been subjected to mockeries or other similar attitudes?”). Items are scored on a 5-point scale ranging from ‘Never’ (0) to ‘Always’ (4). A panel of 9 external experts reviewed this measure and validated its adaptation in the context of Ebola virus disease. A total score was computed, with a higher score indicating more enacted Ebola stigma. Cronbach’s alpha (α) in this study sample was 0.970.

Perceived Social Support

The Multidimensional Scale of Perceived Social Support (MSPSS) was used to assess the perceived social support (Zimet et al., 1988). The MSPSS consists of three main subscales: family, friends, and significant other. In this scale, the participants respond
to each question using a seven-point Likert scale (from 1 = very strongly disagree to 7 = very strongly agree). The MSPSS was translated and validated in more than 20 languages across many countries and cultures (Dambi et al., 2018). In this study, the Cronbach’s α of MSPSS was 0.951 (family → α=0.856, friends → α=0.850, and significant other → α=0.896), which indicates the high reliability of this scale.

**General Self-Efficacy**

This was measured by the general self-efficacy scale (Schwarzer & Jerusalem, 1995), which consists of ten Likert items measuring positive self-beliefs of being able to cope with a variety of difficult demands in life (e.g., “Thanks to my resourcefulness, I know how to handle unforeseen situations,”). Items are rated on 4-point scale from 1 (“completely wrong”) to 4 (“completely right”). The final composite score ranges from 10 to 40, with higher scores refer to higher levels of general self-efficacy. Two cross-national investigations across at least 25 countries have shown that the general self-efficacy is a “universal” construct (Barahona et al., 2018; Scholz et al., 2002). In the present study, the internal reliability was satisfactory (α=0.889).
Religious Coping Strategies

The religious coping strategies was measured by the Brief RCOPE (Pargament et al., 1998), which consists of 14 items describing positive and negative religious coping responses. Participants were asked to indicate how they use each coping response when faced with stressful events. The scale was previously found as a reliable measure in sub-Saharan African context with acceptable internal reliability (Kokou-Kpolou et al., 2017). Items are scored on a 5-point Likert scale (1 = not at all, 5 = a great deal). Each of the two subscales consists of 7 items. Given that this paper focused on resilience resources, we only used the subscale measuring the positive religious coping strategies reflecting benevolent religious reappraisals, collaborative religious coping, and seeking spiritual support. A typical item is “tried to see how God or a higher power might be trying to strengthen you in a situation.” Responses were summed to create a composite score for positive religious coping strategies and the internal reliability was 0.873.

Health-Related Quality of Life (HRQoL)

The HRQoL was evaluated using the World Health Organization Quality of Life-Brief version (WHOQOL-BREF). This version contains a total of 26 questions and is a cross-culturally valid and reliable assessment of HRQoL (The WHOQOL Group, 1998). It produces a profile with four domains of HRQoL: physical, psychological, social relationship, and environment. Two generic items assess an individual’s overall perception of QoL and health. Items of the scale range from 1 to 5 with higher scores denoting higher HRQoL. In this study, the raw scores were used for the study’s purpose. The Cronbach’s α of the scale was 0.922 (physical → α=0.768, psychological → α=0.675, social relationship → α=0.869, and environment → α=0.847) in our sample.

Covariates

Sex, age, education level, employment status, residency area (rural vs. urban), and marital status were included as covariates in this study.

Data Analysis

Data were analyzed using R-program packages, version 3.5.2 (R Core Team, 2014). The data set includes less than 4% of missing data on continuous variables, which were imputed using the mean of each item. In general, four stages were followed. First, descriptive statistics (frequencies, mean, standard deviation) served to summarize data. Second, Pearson product-moment correlation was carried out to verify the association and directionality of the main continuous variables. Third, we performed a mediation analysis using the structural equation modeling (SEM) framework. The indirect effects were examined following the bootstrapping methods. We used 10,000 bootstrap resamples from the original dataset (N = 1614) to calculate the bias-corrected 95% confidence interval (95% BCa CI). The adequacy and the
robustness of the mediation model was evaluated using multiple fit indices were used including normed chi-square ($\chi^2$/df) (Bentler, 1990; Kline, 2016), Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA) (Hu & Bentler, 1999; Kline, 2016). Finally, we conducted moderation analysis through three multiple linear regressions. All continuous variables were mean-centered. Assumptions of regression analysis regarding normality and multicollinearity based on the variance inflation factor were not violated (Field, 2009). All statistical tests were two-tailed and $p$-values set at $\leq 0.05$.

**Results**

**Correlational Analyses**

Table 2 reports Pearson product-moment correlations between the primary variables. The results indicated that the enacted Ebola stigma levels were consistently associated with lower scores of HRQoL ($r = -0.436, p < 0.001$) and its all domains ($rs = -0.260$ to $-0.400$, all $ps < 0.001$). Also, despite with small effect size, the enacted Ebola stigma levels significantly correlated with less perceived social support from family members ($r = -0.051, p = 0.04$), but neither were correlated with other sources of perceived social support nor with the total scores of perceived social support. Again, the enacted Ebola stigma levels significantly correlated with less general self-efficacy ($r = -0.060, p = 0.016$). However, as anticipated due to the cross-sectional design of the present study, the enacted Ebola stigma levels were positively related to positive religious coping strategies ($r = 0.080, ps < 0.001$), suggesting that individuals who experienced Ebola-related stigma tended to endorse strategies such as seeking religious support and making benevolent religious reappraisals. We found a pattern of significant and positive correlations between the primary mediators such that the scores of the global perceived social support and each subcomponent of the perceived social support were correlated with general self-efficacy ($rs = 0.088$ to $0.123$, all $ps < 0.001$) and positive religious coping strategies ($rs = 0.082$ to $0.119$, all $ps < 0.001$). Scores measuring general self-efficacy and positive religious coping strategies were also intercorrelated ($r = 0.365, p < 0.001$). As expected, all hypothesized mediators were significantly and positively associated with the HRQoL ($rs = 0.185$ to $0.421$, all $ps < 0.001$) and its all domains ($rs = 0.110$ to $0.390$, all $ps < 0.001$).

**Tests for Multiple Mediation Model**

Table 3 displays the parameter estimates for the mediating effects of the proposed mediators. The model controlled for six covariates as mentioned previously. Following the recommended cut-off of fit indices (Bentler, 1990; Hu & Bentler, 1999; Kline, 2016), the model yielded adequate fit statistics: ($\chi^2$/ df = 3.55, CFI = 0.940, TLI = 0.930, RMSEA = 0.070) and all factor loadings for the indicators on latent variables were significant (all $ps < 0.001$). The results showed that the relationship between enacted Ebola stigma levels and HRQoL score yielded significant direct effect. The direct effect accounts for 20.3% of the total variance in HRQoL. Perceived social
|   | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. |
|---|---|---|---|---|---|---|---|---|---|----|----|
| 1. | EES | 1 |   |   |   |   |   |   |   |    |    |
| 2. | PSS-Others | -0.008 | 1 |   |   |   |   |   |   |    |    |
| 3. | PSS-Family | -0.051* | 0.859** | 1 |   |   |   |   |   |    |    |
| 4. | PSS-Friends | -0.025 | 0.804** | 0.869** | 1 |   |   |   |   |    |    |
| 5. | GSE | -0.060* | 0.123** | 0.116** | 0.088** | 1 |   |   |   |    |    |
| 6. | PRCS | 0.088** | 0.118** | 0.119** | 0.082** | 0.365** | 1 |   |   |    |    |
| 7. | HRQoL-Physical | -0.400** | 0.212** | 0.220** | 0.184** | 0.357** | 0.129** | 1 |   |    |    |
| 8. | HRQoL-Psychological | -0.351** | 0.196** | 0.204** | 0.159** | 0.390** | 0.213** | 1 |   |    |    |
| 9. | HRQoL-Social | -0.260** | 0.130** | 0.152** | 0.136** | 0.354** | 0.110** | 0.595** | 0.568** | 1 |    |
| 10. | HRQoL-Environmental | -0.383** | 0.202** | 0.199** | 0.157** | 0.361** | 0.231** | 0.712** | 0.709** | 0.650** | 1 |
| 11. | HRQoL-Total | -0.436** | 0.218** | 0.227** | 0.185** | 0.421** | 0.205** | 0.880** | 0.863** | 0.751** | 0.907** | 1 |

EES = enacted Ebola stigma; PSS = perceived social support; GSE = general self-efficacy; PRCS = positive religious coping strategies; HRQoL = health related quality of life

*p < 0.05; **p < 0.01
support from significant others and friends were not included in the mediation model as Pearson correlations results showed that they were not significantly associated with the predictor variable, the enacted Ebola stigma levels. Therefore, positive religious coping strategies, general self-efficacy and only the perceived social support from family were tested as three potential mediators.

After adjusting for covariates, the results of bootstrapping test for indirect effect showed significant indirect effect of enacted Ebola stigma levels on HRQoL score through perceived social support from family and general self-efficacy but not through positive religious coping strategies. Also significant was the sequential indirect effect of enacted Ebola stigma levels on HRQoL through positive religious coping strategies and perceived social support from family, perceived social support from family and general self-efficacy, positive religious coping strategies and general self-efficacy, and through the chain of the three mediators. Together, the three proposed mediators accounted for nearly 37% of the relationship between enacted Ebola stigma and HRQoL. The results are depicted through the Fig. 2.

Tests for Moderation Models

In line with the fourth hypothesis, we computed three multiple linear regression analyses where PRCS, PSS from family, and GSE were tested respectively, as moderators of the relation between EES and HRQoL. The results are presented in Table 4. After controlling for covariates, the whole Model 1 and Model 3 were statistically significant. However, the interaction terms EES*PRCS and EES*GSE were not statistically significant. The whole Model 1 was also statistically significant as well as the interaction term EES*PSS ($b = -0.75, t = -12.51, p < 0.001$), indicating that higher levels

| Path | Point estimate | boot SE | Bootstrapping 95% CI |
|------|----------------|--------|----------------------|
| $EES \rightarrow PRCS \rightarrow HRQoL$ | $a_1b_1$ | $-0.006$ | $0.003$ | $-0.002$ | $-0.010$ |
| $EES \rightarrow PSS Family \rightarrow HRQoL$ | $a_2b_2$ | $-0.032^{**}$ | $0.007$ | $-0.039$ | $-0.010$ |
| $EES \rightarrow GSE \rightarrow HRQoL$ | $a_3b_3$ | $-0.027^*$ | $0.010$ | $-0.038$ | $-0.001$ |
| $EES \rightarrow PRCS \rightarrow PSS Family \rightarrow HRQoL$ | $a_4d_{21}b_2$ | $-0.004^*$ | $0.003$ | $-0.009$ | $-0.002$ |
| $EES \rightarrow PRCS \rightarrow GSE \rightarrow HRQoL$ | $a_5d_{31}b_3$ | $-0.011^*$ | $0.004$ | $-0.018$ | $0.003$ |
| $EES \rightarrow PSS Family \rightarrow GSE \rightarrow HRQoL$ | $a_6d_{32}b_3$ | $-0.013^*$ | $0.005$ | $-0.023$ | $0.005$ |
| $EES \rightarrow PRCS \rightarrow PSS Family \rightarrow GSE \rightarrow HRQoL$ | $a_7d_{21}d_{31}b_3$ | $-0.008^*$ | $0.004$ | $-0.012$ | $0.002$ |

Table 3 Bootstrapped point estimates with standard errors and 95% confidence intervals for all indirect effects between EES and HRQoL

$EES = \text{enacted Ebola stigma}; PSS = \text{perceived social support}; GSE = \text{general self-efficacy}; PRCS = \text{positive religious coping strategies}; HRQoL = \text{health related quality of life}$

* $p < 0.05$; ** $p < 0.01$
of social support received from family members reduced the impact of enacted Ebola stigma levels on HRQoL.

**Discussion**

**Summary of Key Findings**

The purpose of the present study was to examine the main effect of enacted Ebola stigma on health-related quality of life as well as the potential mediators for this relationship among a large sample of adult populations exposed to the second-largest and deadliest EVD outbreak in the DRC. As expected, the study’s findings provided strong evidence that higher levels of enacted Ebola stigma were associated with lower HRQoL. Also, positive religious coping strategies, perceived social support from family and general self-efficacy were found as strong predictors of HQoL. In multiple mediation models, to a modest but significant extent, the mediating roles of these variables in the enacted Ebola stigma and HRQoL relationship were demonstrated. Of particular interest was the synergetic effect of these mediators which were observed. However, a full mediation model was not supported, suggesting that other psychosocial resources are involved. With regard to our fourth hypothesis, it has been shown that only perceived social support from family, but not positive religious coping strategies and general self-efficacy, buffered the relationship between enacted Ebola stigma and HRQoL.

**Significance and Comparison of the Findings**

The current findings added to the growing, but largely theoretically underdeveloped research on stigma related to epidemic diseases and positive mental health issues. Firstly, findings drew our attention on the severe risk of enacted Ebola stigma for HRQoL. The lack of effective treatments as well as the recurrent EVD outbreaks exacerbated by pre-existing political tensions in eastern DRC, have caused a social
Table 4 Summary of multiple linear regression models predicting health related quality of life (including moderation analyses)

| Variables       | Model 1       | Model 2       | Model 3       |
|-----------------|---------------|---------------|---------------|
|                 | b          | SE       | β          | p-value | b          | SE       | β          | p-value | b          | SE       | β          | p-value |
| (Constant)      | 61.832     | 2.880    | <0.001     |          | 47.945    | 2.761    | <0.001     |          | 51.177    | 2.654    | <0.001     |
| EES             | -0.537     | 0.065    | -0.540     | <0.001   | 0.246     | 0.059    | 0.247      | <0.001   | -0.417     | 0.064    | -0.419     | <0.001   |
| Moderator<sup>a</sup> | 0.911     | 0.119    | 0.215      | <0.001   | 1.686     | 0.105    | 0.455      | <0.001   | 1.123     | 0.076    | 0.378      | <0.001   |
| Interaction<sup>b</sup> | 0.006     | 0.004    | 0.096      | 0.161    | -0.040    | 0.003    | -0.749      | <0.001   | 0.000     | 0.003    | 0.009      | 0.891    |
| Age             | 0.161      | 0.042    | 0.090      | <0.001   | 0.180     | 0.040    | 0.100      | <0.001   | 0.092     | 0.039    | 0.051      | 0.019    |
| Gender          | -1.905     | 0.926    | -0.044     | 0.040    | -2.936    | 0.894    | -0.068      | <0.001   | -1.491    | 0.872    | -0.035      | 0.087    |
| Residence area  | 1.975      | 1.101    | 0.045      | 0.073    | 2.298     | 1.055    | 0.053      | 0.029    | 1.307     | 1.025    | 0.030      | 0.202    |
| Education       | -1.021     | 0.468    | -0.051     | 0.029    | -1.555    | 0.446    | -0.077      | 0.001    | -0.948    | 0.437    | -0.047      | 0.030    |
| Employment status| 1.131     | 1.060    | 0.025      | 0.286    | 1.171     | 1.015    | 0.026      | 0.249    | 0.521     | 0.994    | 0.012      | 0.600    |
| Marital status  | -1.797     | 0.354    | -0.114     | <0.001   | -1.707    | 0.340    | -0.108      | <0.001   | -1.408    | 0.334    | -0.089      | <0.001   |
| F(9 ; 1336)     | 66.15      |          | 85.99      |          | 98.29     |          |           |          |
| p-value         | <0.001     |          | <0.001     |          | <0.001    |          |           |          |
| R²              | 26.7%      |          | 32.5%      |          | 35.2%     |          |           |          |

Note: <sup>a</sup>Moderator in Model 1 = PRCS and Interaction in Model 1 = EES*PRCS; Moderator in Model 2 = PSS from family and Interaction in Model 2 = EES*PSS from family; Moderator in Model 3 = GSE and Interaction in Model 3 = EES*GSE

EES = enacted Ebola stigma; PRCS = positive religious coping strategies; PSS = perceived social support; GSE = general self-efficacy
environment marked by disproportional fear of contagion and anxiety of death, blame, stigmatization and discrimination (Davtyan et al., 2014; Gee & Skovdal, 2018; Nuriddin et al., 2018; Overholt et al., 2018; Shultz et al., 2016). This study made novel contribution into the current literature on the amount of negative health consequences of enacted stigma in epidemic contexts. What is novel is that the current study focused on overall mental health outcomes whereby most of previous studies focused on the occurrences of psychopathology. Both epistemic approaches are different as well as their practical implications for mental health (Lee Duckworth et al., 2005; Land et al., 2012; Lau et al., 2006). Our results are consistent with the extant literature averting that enacted and internalized stigma have deleterious consequences on mental health (Mak et al., 2007; Świtaj et al., 2017). However, the current study extends this literature to the general population, as evidence revealed that not only the survivors of an epidemic disease, but also their family and relatives, enacted social stigma and discrimination. Our results showed that experiencing such ‘associative’ stigma (Bagcchi, 2020) and the harm it brings can hamper individuals’ HRQoL.

Secondly, although the literature on negative health consequences of stigma is abundant, the protective resources that may attenuate such consequences were less documented, especially during epidemics. Here is the important contribution of this study that showed that higher levels of positive religious coping strategies, perceived social support from and general self-efficacy were associated with higher scores of HRQoL. In addition, it has been shown that the three mediators were positively intercorrelated and they exerted synergic effect on the enacted Ebola stigma and HRQoL relationship. These findings provide strong support for the process of social stress theory (Pearlin, 2010; Pearlin et al., 1981) and cognitive theory of stress and coping (Folkman, 2013; Lazarus & Folkman, 1984) in that the pathway from enacted Ebola stigma to HRQoL is influenced by various psychosocial factors. A number of modifiable psychosocial factors including perceived social support and general self-efficacy interve ne to mediate the impacts of enacted Ebola stigma and inducing psychological strains on health outcomes by strengthening the capacity of control and the self-esteem of individuals. Further, our results provided insightful details on the dimensions of perceived social support that account for the relationship between enacted Ebola stigma and HRQoL. While previous research has reported inverse correlation between stigma and social support (Smith et al., 2008), our study showed that enacted Ebola stigma and perceived social support from family members in particular were inversely correlated. The one-time point assessment of our study did not allow full understandings of this finding. Future longitudinal research can help to deepen the causal relationship between stigma and the dimensions of perceived social support. However, based on findings from meta-analysis indicating negative correlation between stigma and social support among seropositive HIV persons (Smith et al., 2008), we argue that the (recurrent) Ebola epidemic crises might have affected intra-familial relationship dynamics such that stigmatizing and discriminatory attitudes were rampant among family members. This may alter the subjective appraisal of the help received by individuals; thus, the supportive value of this might not fit and satisfy their actual needs. Besides, similar to studies in the relevant literature (Burke et al., 2019; Jahn et al., 2020; Schnyder et al., 2017; Tang et al., 2015), our results
showed that higher levels enacted Ebola stigma were associated with less general self-efficacy. The psychological strains caused by the enacted Ebola stigma could alter appraisal of self-beliefs in managing the everyday interactions with the environment of individuals at risk of stigmatization (Bandura, 1997).

Moreover, in our mediation model on one hand, the synergetic effects of PRCS, perceived social support, and general self-efficacy, and on the other hand the buffering effect of perceived social support have important implications. These findings showed that the HRQoL can be enhanced in many ways. In line with Sippel et al. (2015) literature review, they suggest that family supportive relationships can strengthen general self-efficacy and foster more effective coping strategies in response to stigmatization and discriminatory acts. It is worth noting that the significant effect of the sequential chaining of the three mediators was found with all domains of HRQoL. A large number of studies have shown that while dealing with adversities, African people, especially those with low-income and low-health literacy, were more likely to engage in spiritual practices and utilize spiritual resources (e.g., prayers) and religious help-seeking (e.g., support from religious advisor), rather than in the help of health professionals (Ellison & Taylor, 1996; Figueroa et al., 2006; Lukachko et al., 2015). Our results seem to suggest that greater use of positive religious coping strategies was less helpful in reducing the impacts of enacted Ebola stigma on HRQoL. Evidence has also demonstrated that religious coping responses were associated with non-significant changes in any of the health behaviors over time (Holt et al., 2017) and even with underutilization of or attrition from professional health services (Maura & Weisman de Mamani, 2017). In the situation of the precarious healthcare system, we argue that greater adaptive religious coping may lead to minimizing the perception of the negative consequences of enacted Ebola stigma on HRQoL and the professional health-seeking behaviours.

**Strengths and Limitations**

From the present state of the literature, this study represents the first of its kind for examining the impacts of enacted Ebola stigma on HRQoL following the Ebola epidemic outbreak in the DRC. Further, and of utmost importance, it tested theoretically and empirically derived mediators of the association between enacted Ebola stigma and HRQoL by using a very large Ebola-exposed community participants from DRC. To test our hypotheses, we used the first wave of data from the ongoing EboMH project. That is, the cross-sectional nature of the data used made impossible to unravel the causal relationships between some primary variables, especially between predictor and mediator variables. For example, it is certain that the general self-efficacy influences the appraisal of enacted Ebola stigma and vice versa. To unravel these causal relationships and temporal changes among variables over time, longitudinal data would be more suitable. Though some scholars recommend longitudinal data for mediational models, other advocate that that cross-sectional data provide preliminary knowledge that can inform follow-up investigation. To address these shortcomings and overcome speculations, our hypotheses were deductively built on well-established theoretical frameworks that helped to assign the status of the study variables.
Another limitation was that the subsample of EVD survivors included in the current study was too small and we were unable to perform comparative analyses that would have allowed to test for differential mediating pathways explaining the impacts of enacted Ebola stigma on HRQoL and related domains across different participants in terms of their Ebola-related health status. We are aware about this potential bias which restricts the generalizability of our findings. Future studies should also focus on other aspects of stigma such as the internalized stigma (Earnshaw & Chaudoir, 2009; Mashiach-Eizenberg et al., 2013; Pantelic et al., 2017), which was found to be more severe than enacted Ebola stigma and highly reported by survivors of epidemic infectious diseases. Finally, although we confirmed the indirect effects of perceived social support and general self-efficacy in our sample, it should be noted that a full mediation model nevertheless was not obtained. Hence, there are likely other mechanisms that intervene in the association between enacted Ebola stigma and HRQoL. The magnitudes of indirect effects were also small, likely due to the cross-sectional nature of the data (Walters, 2019) and the contribution of other mediators that were not part of this study.

**Conclusion and Implications**

The present study showed that HRQoL was lower among people reporting higher levels of enacted Ebola stigma in the DRC. It was also shown that the pathway from enacted Ebola stigma and HRQoL was partially mediated through perceived social support from family and general self-efficacy, all associated with increased HRQoL. Interestingly, the synergetic effects of our hypothesized mediators were demonstrated. If replicated by future follow-up research, these findings lay a solid foundation for mental-health and public health interventions for reducing stigmatization and discriminatory acts and promoting HRQoL during epidemics, especially in LMICs. Evidence from a longitudinal study has shown that changes in experiences of stigma were correlated with changes in self-esteem (Yanos et al., 2012). Thus, we encourage local-adapted psychoeducational interventions that aim to reduce enacted Ebola stigma among populations. With respect to our findings indicating the large effect size of the indirect effect of perceived social support from family, these interventions should strengthen supportive family relationships, especially when a family member contracts the virus. At the family and community levels, constant efforts must be made to demystify EVD and its modes of transmission. We argue that efforts for demystifying EVD combine to give rise to a cognitive restructuring approach, which was found to significantly reduce internalized stigma and enhance self-esteem among people with severe mental illness (Morgan et al., 2018; Yanos et al., 2012).

The study’s findings also showed that the mediating effect of positive religious coping strategies in the combination with the mediating effects of perceived social support and general self-efficacy. This supposes the importance to include positive aspects of religious resources in psychoeducational interventions, as evidence showed that religious coping methods are an alternative resource that helps people to deal with adversities particularly in under-resourced contexts. However, local populations should be, with no censoring messages, informed of the marginal beneficial
effects of religious coping methods in increasing HRQoL. Specific modules can be developed to enhance their health literacy especially among those who have obtained less education, those who lived in rural areas and those who are unemployed.

As a final commentary, we anticipate that longitudinal studies will confirm these promising findings and provide valuable guidance in implementing adapted psychological interventions to improve individuals’ HRQoL through social support, self-efficacy and positive religious coping methods. We also anticipated that the findings will have significant implications for mental and public-health intervention strategies in managing HRQoL during the current CoViD-19 pandemic (Afolabi et al., 2020; Khanali et al., 2021), especially in LMICs.

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**Availability of Data and Material** The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

**Declarations**

**CRediT Author Statement** Conceptualization: CKKK, JMC; Methodology, Software and Formal analysis: CKKK, MG; Validation: CR, DD, JMC; Investigation: OBM, JB, JPB; Data Curation: MG, JMC; Writing—Original Draft Preparation: CKKK; Writing—Review & Editing: SH, CR, JMC; Visualization: JPB, CR, DD, JMC; Supervision & Funding acquisition: JMC.

**Conflicts of Interest/Competing Interests** The authors declare they have no financial interests.

**Ethics Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. In addition, the study protocol was approved by the ethics boards of the University of Ottawa and the Institut National pour la Recherche Biomédicale-INRB (National Institute for Biomedical Research) of the DRC.

**Consent to Participate** Informed consent was obtained from all individual participants included in the study.

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