

## The psychological impact of COVID-19 on Frontline Healthcare Workers in the Northern Regions of Ghana

### Abstract

**Aims:** This study psychological impact of COVID-19 on Frontline Healthcare Workers (FHW) in the Northern Regions of Ghana in their pursuit of the frontline duties during the COVID-19 pandemic. The study also evaluated the determinants of psychological factors influencing the burden levels among FHW.

**Study design:** : Frontline healthcare workers (FHW) were recruited in this study through the online survey method of data collection.

**Place and Duration of Study:** The study was carried out in five Regions of Ghana, namely Northern, Savannah, North East, Upper East and Upper West region. Data collection spanned a period of four weeks.

**Methodology:** A total of 120 frontline health personnel working out in five Regions of Ghana (Northern, Savannah, North East, Upper East and Upper West region) participated in the study. The study was conducted with the diagnostic survey method, using Zarit burden interview scale and a questionnaire of our authorship.

**Results:** The results revealed that 85% of FHW experienced more than average amount of burden while 60% of them suffered severe burden of care levels in pursuit of their duties for COVID-19 patients. The results from chi-square test of association between caregivers' socio-demographic characteristics and severity of burden revealed that gender, marital status, educational qualification and caring for own children were significantly associated with caregiver burden level ( $P$  – value < 0.05). Factor analysis results identified seven psychological factors that underlies caregivers of COVID-19 and they were labeled as consequences of caregiving on the caregiver; exhaustion and uncertainty; patient's dependence; moral-guilt; helplessness; compensation and overwhelmed with caregiving, which are consistent with prior studies. A multiple regression model results further affirmed that these seven psychological factors were significantly ( $P$  – value < 0.05) influencing the burden levels of FHW.

**Conclusion:** The ability of policy makers to address these experiences of FHW will have positive consequences on the overall containment of the pandemic.

**Key words:** COVID-19, frontline health workers, psychological effects, Ghana, burden

### Introduction

Since the outbreak of the novel 2019 corona virus disease (COVID-19) in Wuhan in the Hubei Province of China in December 2019, the pandemic has spread rapidly across the globe with devastating psychological effects. Total confirmed cases globally, as of 21 March 2022, stood at 464,809,377 including 6, 062, 536 deaths. Whilst Africa accounts for 1.83% of the global cases with 170,757 deaths. Apart from the deficits of health care infrastructure, human resource and equipment the pandemic has placed on health systems, it has been amply demonstrated that COVID-19 and other infectious disease outbreaks underlie psychological consequences such as anxiety and depression that affects people's general health and well-being. Health workers are usually at the forefront in these pandemic crises and constitute a vulnerable population with an increased risk of infection, stress, depression, stigma and fear [1]. These psychological effects must be identified and addressed as they have the potential of impairing mental functioning and job output of affected individuals [1] and [2].

Although the Coronavirus Disease (COVID-19) pandemic is a physical health crisis, it has the potential of a major mental health crisis as well, if action is not taken. Good mental health is critical to the functioning of society, and the mental health and wellbeing of whole societies have been severely impacted by this crisis and it remains a priority to be addressed. Whilst healthcare workers may accept an increased risk of infection as part of their chosen career, they may have considerable anxiety about spreading the virus to their children, families and friends, especially those who are elderly or have chronic medical conditions [3] and [4].

In an effort to control the pandemic, some successes have been achieved through the introduction of vaccines all over the world. As of March 21, 2022, 13,047,826 vaccine doses have successfully been administered in Ghana. Despite this, Ghana continues to experience a surge in the cumulative total cases of COVID-19 from 56,981 cases as at early January 2021 to 160, 819 cases as at March 21, 2022 with 1,445 deaths [5]. Ghana is identified to be on the list of high risk COVID - 19 countries placing a lot of burden on travelers as a result of stiffer travel restrictions. Frontline healthcare Workers (FHW) and first responders have been exposed to numerous stressors and ensuring the mental health of healthcare workers is crucial. This is a critical factor in sustaining COVID-19 preparedness, response and recovery as this hinge on the health and mental wellbeing of FHW [6]. They (FHW) face exhaustion, difficult triage decisions, separation from families, stigma and the pain of losing patient's and colleagues, in addition to their own risks of infection [1], [2], [3], [7] ] and [8].

While cases and fatalities of the pandemic is comparatively lower in Africa as compared to North and South America and Europe, the number of cases in Africa is rapidly escalating. Incidence varies significantly between countries in Africa possibly reflecting variations in coverage of COVID-19 testing [9]. While many countries in Africa are stepping up their preparedness for COVID-19 [6], assessments by WHO point to substantial gaps in response capacity [10]. In particular, there are considerable shortages of human resources, critical care beds and laboratory capacity. In Ghana, only a handful of nurses are delivering patient care, and the current national nurse-to-patient ratio is 1:22 [3]. This implies that, only one nurse can offer the healthcare provider responsibility to 22 patients at any time in a healthcare facility in Ghana. Additionally, the nursing and midwifery personnel density per 1000 population as of September 2018 for the country stood at 0.926 [3]. The numbers of nurses or midwives to 10,000 populations was about 6.0 in Côte d'Ivoire and Mozambique, around 11 in the Democratic Republic of the Congo and Kenya [5]. Corresponding figures for the United Kingdom were 81.7 and 132.4 in Germany. Many countries in Africa have fewer than 30 critical care beds to cover the entire population [11]. These estimates fall short of WHO recommendations for nursing care.

Given this alarming situation, health care workers on the front line who are directly involved in the diagnosis, treatment, and care of patients with COVID-19 are at risk of developing psychological distress and other mental health conditions [1], [2] and [3]. The ever-increasing number of confirmed and suspected cases, overwhelming workload, depletion of personal protection equipment (PPEs), widespread media coverage, lack of specific drugs, and feelings of being inadequately supported may all contribute to the mental burden of these health care workers. Previous studies have reported adverse psychological reactions to the 2003 SARS

epidemic among health care workers ([1], [2],[3] [12], [13], [14] and [15]). Research findings showed that those health care workers feared contagion and infection of their family, friends, and colleagues [9], felt uncertainty and stigmatization [9], [10]) and reported experiencing high levels of stress, anxiety, and depressive symptoms [1], [2], [3] and [14], which could have long-term psychological implications. Similar concerns about the mental health, psychological adjustment, and the burden of caregiving on healthcare providers treating and caring for patients with COVID-19 are now trending, and it is in this vein that this study aims to evaluate the mental health burden of frontline healthcare workers in the Northern regions of Ghana, which can serve as important evidence to direct the promotion of mental wellbeing among health care workers in Ghana. This is because protecting healthcare worker is an important component of public health promotion for addressing the COVID-19 pandemic.

The COVID-19 pandemic has put healthcare workers and the healthcare systems across the globe in an unparalleled situation that the world has not witnessed before, and the burdens and mental torture of having to make such difficult decisions whilst working under extreme pressures may deplete their mental and physical resources beyond recovery. This is because how to apportion skimpy resources to equally needy patients, how to balance their own physiological and mental healthcare needs with those of patients, how to navigate their own desires and duty to patients with those of family and friends, and how to provide care for all severely unwell patients with meager resources, while contending with their own fears of becoming infected and spreading the infection to family and community, and also witnessing deaths of patients. This may cause healthcare workers to experience moral injury or mental health problems [16].

## **1.1 Psychological Impact of Pandemics**

When crises affect communities and people's lives, high levels of stress and burden are expected. Psychological distress is a well-established risk factor for short and long-term mental health problems [17] and research on past epidemics has demonstrated the negative impact of infectious disease outbreaks on people's mental health [1], [2], [3] and [18]. According to the Lancet Commission on global mental health and sustainable development, [19], mental health problems exist along a continuum from mild, time-limited distress to severe mental health conditions. The COVID-19 pandemic may influence where people are situated on that continuum. Many people who previously coped well, are now less able to cope because of the multiple stressors generated by the pandemic. Those who previously had few experiences of anxiety and distress, may experience an increase in number and intensity of these and some have developed a mental health condition. And those who previously had a mental health condition, may experience a worsening of their condition and reduced functioning”.

Widespread outbreak of infectious diseases, such as COVID-19, are associated with psychological distress and condition of mental illness [1], [2], [3] and [20]. In any biological disaster, fear and stigmatization are heightened, and healthcare workers may be particularly vulnerable to the latter. Many healthcare workers in the recent Ebola and SARS epidemics experienced overwhelming stigmatization, loneliness and even loss of trust within their own communities ([21] [22]). During the SARS epidemic in Singapore in early 2000 for example, one nurse in a lift was told that her presence in the lift was spreading the virus to others; and another was scolded by fellow passengers for making trains “dirty”. These factors are of critical

importance and healthcare workers need to feel socially accepted, for this may affect their self-efficacy, sleep quality and anxiety levels [23].

A study of the early experience of a university teaching hospital in responding to the psychological and occupational impact of the SARS outbreak on hospital workers indicated that they were adversely affected by fear of contagion and of infecting family, friends and colleagues immediately after outbreak [12]. Maunder [12] intimated that the psychological impact may have appeared in the medical staff before the experience of caring for the infected patients. They also found that nurses had higher levels of stress compared to physicians. This may be due to the facts that nurses are relatively younger and mostly female [24]. Another study of an outbreak of vancomycin-resistant enterococci (VRE) in a hospital found a severe burden on nursing staff. In addition, nurses are responsible for the collection of sputum for virus detection, which is a very risky job [25].

In yet another study among healthcare workers in emergency departments during the SARS outbreak, found that nurses were more likely to develop distress and use behavioral disengagement than physicians [26].

Frontline nurses treating patients with SARS were physically and psychologically challenged when committing themselves to providing high-quality nursing care for patients ([27], [28]; [29], [30]). In a study by [15], during the SARS outbreak, 89% of health care workers who were in high-risk situations reported psychological symptoms. The psychological response of health care workers to an epidemic of infectious diseases is complicated and sources of distress may include feelings of vulnerability or loss of control and concerns about health of self, spread of virus, health of family and others, changes in work, and being isolated [25]. The fact that COVID-19 is human-to-human transmissible ([31]; [32]), associated with high morbidity, and potentially fatal [33] may intensify the perception of personal danger. Furthermore, shortage of supplies and the overwhelming increase of suspected and actual cases of COVID-19 contribute to the pressures and concerns of health care workers.

### **1.3 Caregiver Burden of COVID-19**

Healthcare workers are at a considerable risk of adverse mental health outcomes during the COVID-19 outbreak. Reasons for this include long working hours, risk of infection, shortages of protective equipment, loneliness, physical fatigue, and separation from families ([34]; [1], [2], and [3]). Healthcare personnel working in the frontline during COVID-19 are confronted with several challenges and occasional distress, as the role of caregiving affects every facet of the caregivers' life with this consequence formally known as caregiver burden [35]. Caregiver burden is complex and has been found to include several areas such as activities of daily living, worry and social strain [36]. The concept of burden of care was defined by Zarit in 1980, and over time interest has increased in the study of burden of care and the development of various scales used in its measurement ([37]; [38]; [40]). Most studies in the area of caregiver burden have focused on caring for elderly patients with brain degenerating conditions like dementia [41]. However recent researches have examined the burden experienced among caregivers of persons with severe mental disorders, like Schizophrenia [42] Alzheimer's disease [43], Cancer [44] and HIV-AIDS [45].

Caregiver burden has been described as the overall physical, psychological, emotional, social and financial costs of caring for someone suffering from a medical health condition and therefore includes embarrassment, overload, feelings of entrapment, resentment, isolation from society, loss of control, poor communication, and work pressure [46]. And several studies have demonstrated that the caregiving burden is a robust predictor of psychological distress ([47]; [48]). The physical and mental health impact of COVID-19 on FHW resonates well with the caregiver burden model proposed by [36], as it has the measuring ingredients of the Zarit Burden Interview Scale (ZBI). Therefore, the Zarit Burden Interview Scale (ZBI) will be adopted to evaluate the perceived burden levels of healthcare workers in the Northern regions of Ghana in their pursuit of the frontline duties during the COVID-19 pandemic. The study also sought to examine the psychological factors, distress and the determinants of burden levels among FHW with the aim of contributing towards planning relevant culturally sensitive interventions to improve on the mental wellbeing of FHW in Ghana.

## **2. Materials and Methods**

### **2.1 Study Area**

The study was carried out in five Regions of Ghana, namely Northern, Savannah, North East, Upper East and Upper West region.

### **2.2. Measures**

The Zarit Burden Interview Scale (ZBIS)— The ZBI includes 22 items recorded in a five-point (0–4) Likert scale (total score range from 0 to 88). They refer to problems arising in several domains: health and well-being, personal and social life and finances. As the ZBIS assesses the feelings/thoughts of informal caregivers on the impact of the disease on their lives, it is considered to focus on the subjective component of burden of care (as measured by the caregiver's self-rating of the ZBIS). Higher scores on the ZBIS mean higher burden [36].

To determine the severity of burden of each Frontline healthcare workers (FHW), a cumulative score of the Zarit burden interview scale was computed and score of 0 - 20 was interpreted as little or no burden, 21 - 40 as mild to moderate burden, 41 - 60 as moderate to severe burden and a score 61 - 88 as severe burden. The amount of burden for each FHP was also determined and categorized as; less than average burden ( $\leq 41$ ) and more than average burden ( $\geq 42$ ). The total score of the ZBI scale was further subjected to factor analysis to determine the psychological constructs of caregivers of COVID-19 patients. Finally, the cumulative burden score was modeled using the multiple linear regression model.

### **2.3. Data Collection**

A diagnostic survey method utilizing a questionnaire technique was used to assess the levels of the psychological impact of COVID-19 of frontline health workers. Due to the COVID-19 pandemic to minimize contact with other people, potential respondents were invited via email to participate in the study. Volunteers completed the survey questionnaires via an online platform (<https://docs.google.com/> (accessed on )). A Standardized survey instruments were used to assess the psychological impact of COVID-19 of frontline health workers, which were grouped into two parts. The instrument solicited

information on socio-demographic characteristics of the FHW such as age, gender, level of education, working experience and their level of burden.

The researchers entered the questionnaire items into the Google Forms software and the link generated was sent online to different social media platforms of FHW. The participants completed the questionnaire within 10 minutes and the responses were retrieved via the Google Forms response platform in spreadsheet by the researchers. Data collection spanned a period of four weeks.

## 2.4. Multiple Linear Regression Model

The multiple linear regression model is used for modeling response variables that are measured on the interval or ratio scale. The multiple linear regression model is a family of techniques that are used to explore the relationship between one continuous dependent or response variable and a number of independent or predictor variables, usually continuous. If we denote the response variable by  $y$  and the explanatory variables by  $x_1, x_2, \dots, x_k$ , then a general model relating these variables is given by;

$$\begin{aligned} y &= \mu_y | x_1, x_2, \dots, x_k + \varepsilon \\ &= \beta_0 + x_1\beta_1 + x_2\beta_2 + \dots + x_k\beta_k + \varepsilon \end{aligned} \quad (1)$$

Where  $\mu_y$  is the mean value of the dependent variable  $y$  when the values of the independent variables are  $x_i (i = 1, 2, \dots, k)$  and  $\beta_i (i = 1, 2, \dots, k)$  are the unknown regression parameters relating the mean value of  $y$  to  $x_1, x_2, \dots, x_k$ . Whereas  $\varepsilon$  is the error term that describes the effects on  $y$  of all factors other than the values of the independent variables  $x_1, x_2, \dots, x_k$ .

## 3. Results and Discussions

The amount and severity of burden of frontline health workers (FHW)/caregivers are presented in Table 1. The results revealed that 85% of FHW experienced more than average amount of burden while 60% of them suffered severe burden of care levels in pursuit of their duties for COVID-19 patients. This is consistent with findings in Africa and elsewhere in the world ([49], [36], [50] and [51]).

**Table 1: Amount and Severity of Caregiver Burden**

Severity of Burden	Frequency	Percent (%)
Moderate to Severe Burden (41 - 60)	48	40
Severe Burden (61 - 88)	72	60
Total	120	100
Amount of Burden	Frequency	Percent (%)
Less than average burden ( $\leq 41$ )	18	15
More than Average Burden ( $>42$ )	102	85
Total	120	100

The reliability of the ZBI scale as a measure of burden for FHP caring for patients of COVID-19 was assessed using a Cronbach's alpha test. A Cronbach's alpha value of 0.801 was reached for this data indicating adequate internal consistency. The item total correlations were sufficiently acceptable, ranging from 0.253 to 0.625, except for five items namely item number 4,

5, 16, 18, and 19 whose correlations were weaker. There was no significant change in the Cronbach's alpha values after deletion any item, it remained close to the full scale affirming the consistency of the scales.

The mean scores on the individual items of the ZBI Schedule ranged between 1-4. (Lowest scores = 1 and highest scores = 4). The highest mean score was found on the item 22 with a mean of 3.2083 and a standard deviation of 0.7846 and the lowest mean score was on the item 1 with a mean of 2.4083 and standard deviation of 0.96577. this result is consistent with the findings of Sami *et al.*, 2016 where they examine the reliability and validity of the ZBI in caregivers of patients with heart failure.

The Cronbach's alpha value in this study is consistent to those in previous studies ([49] [52]; [52];[53] and [54]). The mean item-item correlation, a useful index of internal consistency was within the acceptable range of 0.15 – 0.50. Also, all item-total correlations were significant and positively correlated with the total score affirming the homogeneity of the scale.

**Table 2: Mean Scores and Reliability Test**

No.	Items	Mean	Std. Deviation	Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	patients asks for more help than they needs	2.4083	0.96577	0.253	0.799
2	Not having enough time for yourself	2.8667	0.85929	0.576	0.781
3	Stressed for meeting other responsibilities	3.0667	0.95911	0.506	0.784
4	Embarrassed about patient's situation/behavior	2.7000	0.78430	<b>0.108</b>	0.804
5	Feel angry around COVID-19 patient	2.6667	0.79212	<b>0.062</b>	0.807
6	Negative Effect on other relationships	2.8167	0.98717	0.510	0.784
7	Afraid about what the future holds for you	3.0667	1.02681	0.503	0.784
8	Feel that patient is dependent on you	2.6250	0.95321	0.370	0.792
9	Feel strained around patient	2.5417	0.95174	0.440	0.788
10	Health suffered by caregiving	2.8750	0.90342	0.371	0.792
11	Lack much privacy	2.7000	0.93125	0.239	0.799
12	feeling your social life has suffered	2.9000	0.93844	0.625	0.777
13	uncomfortable having your friends around	2.9083	0.93482	0.454	0.787
14	Patients expected you as the only caregiver	2.8750	0.88463	0.416	0.790
15	Not compensated enough for risking your life	3.3667	0.88814	0.359	0.793
16	Unable to take care of patients much longer	2.6750	0.80087	<b>0.104</b>	0.805
17	lost control of your life as a frontline healthcare	2.8500	0.83666	0.283	0.797
18	Wish to leave the care of COVID-19 patients	<b>3.0833</b>	0.94008	<b>0.139</b>	0.805
19	Feel uncertain about what to do	<b>3.0917</b>	0.81988	<b>0.081</b>	0.806
20	Feel doing more for your covid-19 patients	<b>3.1250</b>	0.90342	0.436	0.789
21	Could do better job in caring for patients	<b>3.1500</b>	0.80597	0.393	0.791
22	Overall burdened as caregiver	<b>3.2083</b>	0.78746	0.421	0.790
<b>Reliability Statistic</b>		Cronbach's Alpha		<b>0.801</b>	

A chi-square test of association between caregivers' socio-demographic characteristics and severity of burden was also evaluated in Table 3. The results revealed that, of the 118 FHW who provided their sex, 85 (72%) of them were male and 33 (28%) were female, with 70 (59.3%) of them experiencing severe burden while 48 (40.7%) experienced moderate to severe burden. This indicates that gender is significantly associated with caregiver burden level (burden ( $\chi^2 = 5.421$ ,  $P$  – value  $< 0.05$ ). Age of caregivers was not significantly associated with burden level ( $P$  – value  $> 0.05$ ). Majority of the caregivers in the age group 31 – 40 years (65.8%) experienced the most burden level 65.8%.

The results from Table 3 also revealed that FHW who were married and caring for own children had positive relationship with burden of care level with the relationship being significant in the later ( $\chi^2 = 3.233$ ,  $P$  – value  $> 0.05$  and  $\chi^2 = 3.835$ ,  $P$  – value  $< 0.05$ ) respectively. This result implied that frontline workers who are married and caring for own children are more severely burdened than those who were single with no children to care for and is consistent with findings of [49] and [50].

Interestingly, the result of this study shows that religion has a positive significant association with burden of care level ( $P$  – value  $> 0.05$ ) and majority of caregivers were Muslims. This may be as a result of the fact that the five regions of Northern Ghana are predominated by Muslims and Christians.

The result further revealed that caregivers' academic qualification has significant positive association with level of burden ( $\chi^2 = 10.801$ ,  $P$  – value = 0.029). This result is an indication that the caregiver's academic qualification plays an important role in the level of burden of care. However, nurses suffered the most burden (92.1%) with 54.4% of them experiencing significantly ( $P$  – value = 0.041) severe burden level.

**Table 3: Association of Severity of Burden and Caregivers Factors**

CARE GIVER FACTORS	Severity of Caregiver Burden			Test
	Moderate to Severe Burden	Severe Burden	Total	
<b>Gender</b>				
Male	29 (24.6%)	56 (47.5%)	85 (72.0%)	$\chi^2 = 5.421$ df = 1 <b>P = 0.020</b>
Female	19 (16.1%)	14 (11.9%)	33 (28.0%)	
Total	48 (40.7%)	70 (59.3%)	118 (100%)	
<b>Age Group</b>				
18-30	16 (13.3%)	20 (16.7%)	36 (30.0%)	$\chi^2 = 1.357$ df = 3 $P = 0.716$
31-40	31 (25.8%)	48 (40.0%)	79 (65.6%)	
41-50	1 (0.8%)	3 (2.5%)	4 (3.3%)	
51-60	0 (0.0%)	1 (0.8%)	1 (0.8%)	
Total	48 (40.0%)	72 (60.0%)	120 (100%)	
<b>Marital Status</b>				
Married	29 (24.4%)	52 (43.7%)	81 (68.1%)	$\chi^2 = 3.233$ df = 2 $P = 0.199$
Single	19 (16.0%)	18 (15.1%)	37 (31.1%)	
Divorced	0 (0.0%)	1 (0.8%)	1 (0.8%)	
Total	48 (40.3%)	71 (59.7%)	119 (100%)	
Religion				

Christianity	28 (23.3%)	24 (20.0%)	52 (43.3%)	$\chi^2 = 7.330$ df = 1 <b>P = 0.007</b>
Islamic	20 (16.7%)	48 (40.0%)	68 (56.7%)	
Total	48 (40.0%)	72 (60.0%)	120 (100%)	
<b>Caring for children?</b>				
Yes	31 (25.8%)	58 (48.3%)	89 (74.2%)	$\chi^2 = 3.835$ df = 1 <b>P = 0.041</b>
No	17 (14.2%)	14 (11.7%)	31 (25.8%)	
Total	48 (40.0%)	72 (60.0%)	120 (100%)	
<b>Educational Qualification</b>				
Certificate	15 (12.8%)	12 (10.3%)	27 (23.1%)	$\chi^2 = 10.807$ df = 4 <b>P = 0.029</b>
Diploma	12 (10.3%)	17 (14.5%)	29 (24.8%)	
Degree	21 (17.9%)	32 (27.4%)	53 (45.3%)	
Masters	0 (0.0%)	5 (4.3%)	5 (4.3%)	
PhD.	0 (0.0%)	3 (2.6%)	3 (1.6%)	
Total	48 (41.0%)	69 (59.0%)	117 (100%)	
<b>Professional Fraternity</b>				
Medical Doctor	0 (0.0%)	2 (1.8%)	2 (1.8%)	$\chi^2 = 1.749$ df = 2 <b>P = 0.417</b>
Nursing Officer	43 (37.7%)	62 (54.4%)	105 (92.1%)	
Lab. Technician	2 (1.%)	5 (4.4%)	7 (6.1%)	
Total	45 (39.5%)	69 (60.5%)	114 (100%)	

A further assessment of caregivers/FHP features revealed that majority (28.6%) of them had within 1 – 3 years of working experience while 24.4% of them had more than 10 years of working experience in their various medical fraternity. A more experience health worker is less likely to be psychologically burdened than a less experience personnel during a pandemic like COVID-19 [16]. Table 4 also shows that majority (91.4%) of the caregivers had inadequate supply of PPEs at the time of the study while 91.5% of them had adequate knowledge of Coronavirus Disease.

**Table 4: Caregivers Characteristics**

Variables	Frequency	Percent (%)
<b>Years of Experience</b>		
1 – 3	34	28.6
4 – 6	25	21.0
7 – 9	31	26.1
Above 10 years	26	24.4
Total	119	100
<b>Adequate Knowledge of COVID-19</b>		
Yes	108	91.5
No	10	8.5
Total	118	100
<b>Adequate Supply of PPEs</b>		
Yes	10	8.4
No	109	91.4
Total	119	100

In order to determine the number of psychological constructs that underlies FHW source of burden in this study, the individual scores of the ZBI were subjected to factor analysis. The suitability of the data was tested and was found to be factorable (the Bartlett's test of sphericity reached statistically significant, P-value < 0.05 and the Kaiser-Meyer-Olkin measure of sampling adequacy index value was 0.759). Seven factors had Eigenvalues > 1 and this explained 59.8% of the total variance in the data set (Table 5). The seven factors were identified and labeled as consequences of caregiving on the caregiver; exhaustion and uncertainty; patient's dependence; Feeling burnout; Loss of locus of control; Inadequate Compensation and Disaffection.

Table 5 further revealed that 8 items loaded on the first Factor, consequences of caregiving with values > 0.4 and 3 items loaded on the second Factor exhaustion and uncertainty with values also > 0.4. The rest of the Factors were loaded with 2 items each with values > 0.4.

**Table 5: Psychological Constructs of Burden level**

No.	Items	Factors							
		1	2	3	4	5	6	7	
	Eigenvalue	4.884	1.828	1.628	1.361	1.228	1.144	1.033	
	% of Variation Explained (59.8%)	22.200	8.311	7.614	6.180	5.580	5.200	4.697	
12	feeling your social life has suffered	0.734							
2	Not having enough time for yourself	0.677							
7	Afraid about what the future holds for you	0.655	Consequence of caregiving						
6	Negative Effect on other relationships	0.637							
3	Stressed for meeting other responsibilities	0.598							
13	uncomfortable having your friends around	0.559							
9	Feel strained around patient	0.538							
20	Feel doing more for your covid-19 patients	0.531							
19	Feel uncertain of what to do		0.729						
18	Wish to leave the care of COVID-19 patients		0.628	Exhaustion and uncertainty					
5	Feel angry around COVID-19 patient		0.540						
1	patients ask for more help than they need			0.580					
8	Feel that patient is dependent on you			0.529	Patient dependency				
21	Could do better job in caring for patients			0.487					
16	Unable to take care of patients much longer				0.563	Moral-guilt			
22	Overall burden as caregiver				0.500				
4	Embarrassed about patient's situation/behavior					0.683	Helplessness		
17	lost control of your life as a frontline healthcare					0.499			
15	Not compensated enough for risking your life						0.472	Compensation	
10	Health suffered by caregiving						0.423		
14	Patients expected you as the only caregiver							0.536	
11	Lack much privacy							0.493	
					Overwhelmed				
Bartlett's test of sphericity, approx. $\chi^2=617.229$ , df = 231 P value = 0.000		KMO value = 0.759							



The results of this current study differ significantly from previous studies where much smaller number of factors were reported. For instance, [55] identified two factors in studies of caregivers of brain injuries: personal strain and role strain. Also, the same two factors were reported in caregivers of patients with dementia [56]. Three factors were identified in caregivers of patients with dementia in two studies [57] and Alzheimer’s disease and related disorders [58]. The Factors identified by these studies were embarrassment/anger, patient’s dependency, and self-criticism; and the effect of caregiving on the social and personal lives of caregivers; psychological burden, and feelings of guilt respectively.

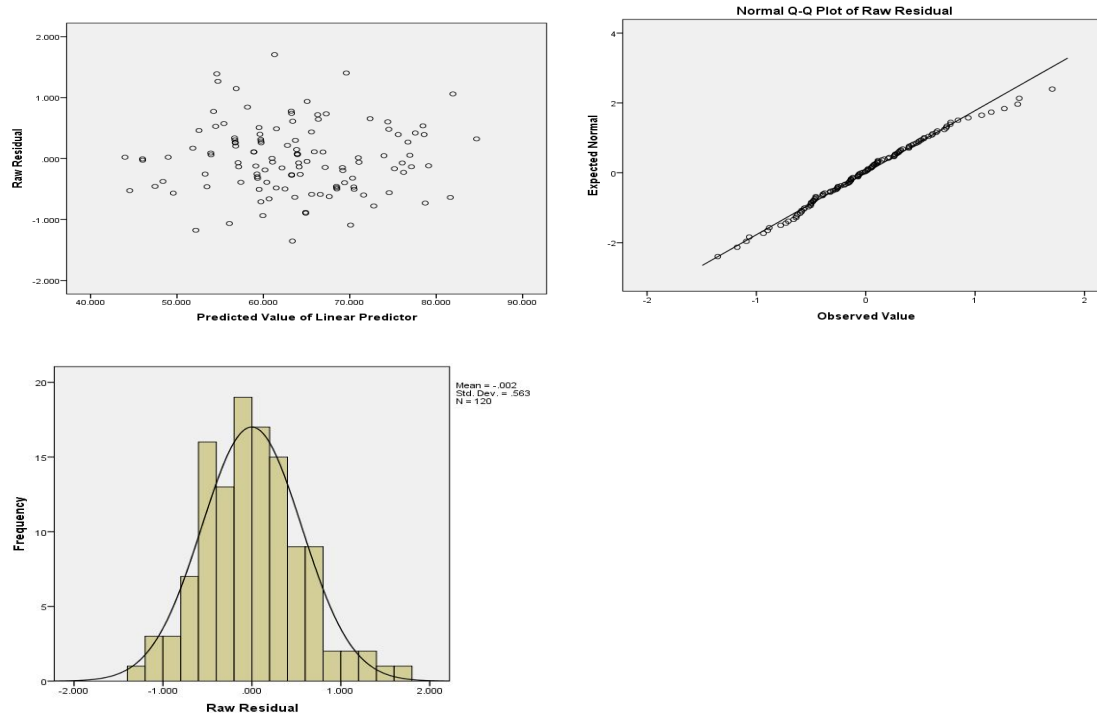
This current study identified more factors than in any other study, but the factors were conceptually similar to factors identified in previous studies ([49]; [56]; [57]; [58]; and [59]). The large number of factors in this study might be because caring for patients with different conditions requires different levels of caregiving involvement. Regardless of the number of factor dimensions produced, the ZBI total score remain the only scale for studying caregiver burden.

Furthermore, to model the determinants of the burden level of the FHW, a Multiple Linear Regression model was used. The results indicated that the overall model was significant ( $F$  – value = 3544.847 and  $P$ -value =0.000) at the 5% significance level. However, an individual test of significance of the parameters of the model revealed the seven psychological constructs were significant at the 5% significance level. The seven psychological constructs were all positively and statistically significantly related to the burden level. This implied that the burden level increases by 5.028, 4.490, 4.140, 1.360, 1.872, 2.173 and 1.575 for every unit increase in consequences of caregiving, exhaustion and uncertainty, patient’s dependency, feeling burnout, loss of locus of control, inadequate compensation and disaffection respectively at 5% significant level.

Figure 1 presents a diagnostic plot of the residuals of the reduce regression model. Clearly, the histogram of the residuals and the quantile plot shows that the residuals are normally distributed. Also, the plot of the residuals and the predicted values indicated that the residuals are random. This implies the residuals of the model were within acceptable range indicating that the model is adequate.

**Table 6: Parameter Estimates of the Regression Model**

	Unstandardized		Standardized			Collinearity Statistics	
	B	Std. Error	Beta	t	<i>P value</i>	Tolerance	VIF
(Constant)	63.567	0.055		1163.932	0.000		
consequences of caregiving	4.997	0.055	0.577	91.122	0.000	1	1
exhaustion and uncertainty	4.447	0.055	0.514	81.095	0.000	1	1
patient’s dependence	4.177	0.055	0.482	76.158	0.000	1	1
Inadequate Compensation	2.136	0.055	0.247	38.943	0.000	1	1
Loss of locus of control	1.863	0.055	0.215	33.961	0.000	1	1
Disaffection	1.613	0.055	0.186	29.42	0.000	1	1



**Figure 1.** Diagnostic plots of residuals

#### 4. Conclusions

This study provides evidence that there is a burden which is significant among frontline health workers (FHW) caring for COVID-19 patients during this pandemic in Ghana. The study apart from identifying seven factor dimensions which underlies FHP/caregivers of COVID-19 patients, also provided psychometric support for the ZBI as a measure of caregiving burden in caregivers of COVID-19 patients. The results further revealed that gender and caring for children, level in consequences of caregiving, exhaustion and uncertainty, patient’s dependency, feeling burnout, loss of locus of control, inadequate compensation and disaffection were useful in determining the perceived burden level of FHW of COVID-19. The ability of policy makers to address these experiences of FHW will have positive consequences on the overall containment of the pandemic.

#### Competing interests

The authors declare that they have no competing interests.

#### Authors’ contributions

AA designed the study and carried performed the statistical analysis. AYH worked on the background as well as the Literature. HS developed data collection instrument, managed the materials and methods and wrote the first draft of the manuscript. NG reviewed and edited the work thoroughly. All authors read and approved the final manuscript.

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