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The nexus of mental health and COVID-19-related duties among medical laboratory professionals: the mediating role of resilience

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Abstract

Background: The COVID-19 pandemic has placed a huge mental health burden on healthcare workers. Evidence suggests that medical laboratory professionals have been particularly susceptible to experiencing psychological distress during the COVID-19 pandemic.

Objective: This study aimed to assess the association between psychological distress, burnout, and resilience among medical laboratory professionals in Ghana during the COVID-19 pandemic.

Methods: A nationally stratified anonymous online cross-sectional survey was conducted to assess psychological distress, burnout, and resilience among 483 laboratorians. Depression Anxiety Stress Scale 21 was used to measure psychological distress. Burnout symptoms were assessed with the 14-item Shirom Melamed Burnout Measure tool. Resilience was assessed using the 10-item Connor Davidson Resilience Scale. Mediation analysis using structural equation modelling and linear regression analysis were adopted to assess the mediation and strength of association, respectively. In all analyses, a $p < 0.05$ was considered statistically significant.

Results: The overall mean ± standard deviation for psychological distress, burnout, and resilience were 14.19 ± 7.60, 35.35 ± 16.44, and 26.75 ± 7.97 respectively. There was a positive significant relationship between psychological distress and burnout [correlation coefficient (r_s) = 0.72, $p \leq 0.001$) whereas a negative relationship was observed between psychological distress and resilience (r_s = -0.16; $p < 0.001$) and burnout and resilience (r_s = -0.18, $p < 0.001$). Resilience served as a mediator between burnout and psychological distress with a significant indirect effect [Sobel z-score = 3.35; $p = 0.001$]. An increased unit of psychological distress and burnout score, significantly decreased resilience score by approximately 11 and 5 points respectively [adjusted beta (aβ) = -11.23; 95% confidence interval (CI) = -16.81 – 5.67 versus aβ = -4.85; 95% CI = -6.97 – 2.73]

Conclusion: Medical laboratory professionals in Ghana are at heightened risk of impaired mental health as they perform their duties during the COVID-19 pandemic. Supporting the psychological needs of this cadre of health staff is an essential component in combatting the pandemic. National and institutional policy and structural modifications required to enhance resilience among health providers will be key to controlling the current and future pandemics.

INTRODUCTION

The illness caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) officially called coronavirus disease of 2019 (COVID-19) is a global health concern that has already affected millions of people

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[1]. The virus, which originated in Wuhan the capital of China's Hubei province [2], spread rapidly across the world. By March 11 2020, the World Health Organization (WHO) declared it a pandemic [3]. Globally, as of May 3 2021, there were 52,534,452 confirmed cases of COVID-19, including 3,198,528 deaths, reported to WHO [4]. In December of 2020, WHO confirmed reports of variants of SARS-CoV-2 [5]. Since then, genomic sequencing has confirmed new variants of concern in parts of the United

States of America, the United Kingdom, and South Africa. Notably amongst them are the B.1.17., B.1.35., P.1, B.1.427 and B.1.429 [6,7]. A major concern about these mutations is the implication for the treatment and prevention of COVID-19. The disease is a highly contagious viral respiratory infection that severely affects the elderly and people with existing medical conditions. Person-to-person transmission is efficient, with multiple clusters reported [8,9]. Ghana's fight against the novel coronavirus started on March 12 2020 when the Ministry of Health and Ghana Health Service reported the country's index case. This sparked considerable interventions geared towards containing the spread of the virus and treating the affected. The initial intervention focused mainly on mandatory quarantine and routine surveillance and testing of persons arriving in the country. As the infection spread through the community, enhanced contact tracing and testing were also initiated. One year down the line, the case count continues to soar and as of 2nd April 2021, Ghana recorded 92,683 confirmed COVID-19 cases, with 779 reported deaths and 1,580 active cases [10].

The impact of the COVID-19 pandemic has been significant on health systems' ability to continue providing crucial health services. The fear of infection and the continued prioritization of COVID-19 over other health needs are negatively impacting other health programs such as mental health, tuberculosis, malaria, and child immunization, amongst others [11,12]. Healthcare professionals play a key role in combating the COVID-19 pandemic. Recent research has shown that healthcare professionals are more likely to be exposed to SARS-COV-2 and, as a result, are at a higher risk of COVID-19 infection than the general public [13]. The upsurge in COVID-19 testing placed a huge strain on medical laboratory professionals. A pivotal group of healthcare professionals who are often behind biohazard labelled doors, these professionals brought swift changes to their operations to help with the fight against COVID-19 [14]. As the pandemic continued to spread in Ghana, many of these professionals volunteered on various national and local COVID-19 teams and travelled to new locations to provide support in overburdened facilities. As a result of extra demands at the facility level, coupled with the low number of professionals available, a considerable amount of pressure is placed on the laboratorians who work long hours to meet the demands of the nation.

Despite exhaustion, personal risk of infection, fear of transmission to family members, sickness or death of colleagues and friends, and the loss of many patients, the commitment of medical laboratory professionals, like other healthcare workers, remain unwavering. As reported by Mehta et al., 2021, the huge demands for testing coupled with inadequate protective equipment, poor conditions of service and the general apprehension in dealing with a largely unknown virus led to sequelae of psychological distress and burnout [15]. Psychological distress is a multi-factorial construct resonant with impaired mental health, which is related to poor psychological function and quality of life; it is also a predictor of higher rates of psychiatric morbidity and burnout[16]. Psychological distress among healthcare workers in general during the COVID-19 pandemic has been documented in Asia and other parts of the world [17–19]. During the outbreak of infectious diseases with high mortality, adverse psychological outcomes among healthcare workers are usually determined by a variety of factors such as quarantine duration, inadequate personal protective equipment, fear of contagion, stigma and discrimination, and moral injury among others [20–22]. A recent study in the Ashanti region of Ghana reported over 40% of healthcare workers exhibited symptoms of fear while 21.1%, 27.8% and 8.2% had depression, anxiety and stress, respectively. Positive attitudes from colleagues and the government's tax-free salary relief were some factors said to reduce the psychological effects while over half of participants indicated praying more often as a coping strategy. There is a need for health systems to recognize the presence of these adverse psychological effects in health workers and take pragmatic steps to address them [23].

Burnout is a major occupational health concern among healthcare providers, especially during pandemics [24]. According to a study by Maslach and colleagues' in 2001, emotional exhaustion, depersonalization, and diminished feelings of personal accomplishment are the three main components of burnout syndrome which have been observed in all types of professions and occupational groups [25]. Shirom, in 2009, also conceptualised burnout as an affective reaction to ongoing work-related stress [26]. The core content is the gradual depletion of individuals' intrinsic resources over time and is reflected primarily in emotional exhaustion, physical fatigue and cognitive weariness [27]. Standard factors contributing to burnout during the COVID-19 pandemic include sustained high caseloads, time pressures and insufficient job resources. And the consequences of burnout in health care include damage to individual professionals, adverse events in the care of patients, and a strain on organizations [28]. Resilience on the other hand is a developmental and psychosocial process through which individuals exposed to sustained adversity or traumatic events experience positive psychological adaptation over time [29].

According to the American Psychological Association, resilience is defined as a process of adapting well in the face of adversity, trauma, tragedy, threats, or significant sources of stress including health problems, or workplace and financial stressors [30]. It has become a valuable resource that helps mitigate the effects of traumatic conditions as well as build resistance to withstand difficult challenges from the COVID-19 pandemic. Evidence suggests that healthcare professionals have been particularly susceptible to experiencing psychological distress and burnout during the COVID-19 pandemic [31,32] hence the need to build resilience to improve mental health [30]. Though literature exists on psychological distress, burnout, and resilience — among physicians, nurses and other professionals— there is a dearth of evidence among medical laboratory

professionals who play a vital role in Ghana's health sector. This study, thus, sought to assess psychological distress and burnout among medical laboratory professionals and quantify its association with their state of psychological resilience as they work on the front line of the COVID-19 pandemic in Ghana.

MATERIALS AND METHODS

Study design
An online cross-sectional survey stratified across Ghana, and previously described by Swaray et al. in 2021 was employed for this current study [33]. Data collection was done using a Google® form questionnaire administered in English through a specified link disseminated across social media channels. Within the constraints of COVID-19, our online sampling boosted the reach of respondents.

Study participants
Laboratorians from Ghana's 16 administrative regions participated in this study. A total of 483 laboratorians from Ghana's Northern (n = 70), Central (n = 124) and Southern zones (n = 289) participated in the study. With the agreement of the Ghana Association of Medical Laboratory Scientists, an online questionnaire was distributed to all laboratorians across the country. Participation was voluntary. Data was gathered from 1st May to 30th September 2020 to allow for a broader sample size.

Measurement of psychological distress
The Depression Anxiety Stress Scale (DASS-21) was used to measure psychological distress among the population. This Scale is a self-reporting tool that assesses the severity of a range of symptoms associated with depression, anxiety, and stress. The most significant function of DASS-21 is to assess the severity of the core symptoms of Depression, Anxiety, and Stress [34]. With a score ranging from 0 to 3, the tool assesses the presence of depression, anxiety, and stress symptoms over the previous week (0 = did not apply to me at all over the last week, denoted as 'never'; 1 = applied to me to some degree or some of the time, denoted as 'sometimes'; 2 = applied to me to a considerable degree or a good part of the time, denoted as 'often'; 3 = applied to me very much or most of the time over the past week, denoted 'almost always' [34]. In total, there are seven items in each of the DASS-21 domains, with an overall score ranging from 0 to 21 points signifying asymptomatic to symptomatic depression, anxiety, and stress in individuals. The DASS-21 is documented as a validated and reliable instrument in clinical and non-clinical investigations [34–36]. It is recommended tool for accurate screening of symptoms of depression, anxiety, and stress in persons. It has been used in the Ghanaian population with reports of good reliability [23, 37–39]. The overall raw score of DASS-21 was used in our inferential analysis [23, 37–39].

Burnout Scale
Burnout symptoms were assessed with the 14-item Shirom Melamed Burnout Measure (SMBM) [40, 41]. The SMBM consists of the three subscales labelled physical fatigue [six items (e.g. 'I feel physically drained' or 'I feel fed up')], cognitive weariness [five items (e.g. 'I feel I am not thinking clearly' or 'I have difficulty concentrating')] and emotional exhaustion [three items (e.g. 'I feel I am unable to be sensitive to the needs of co-workers and customer' or 'I feel I am not capable of being sympathetic to co-workers and customers')]. The tool assesses how workers feel at work with scores ranging from 1 ('never' or 'almost never') to 7 ('always' or 'almost always'). Raw scores were used in our inferential analysis.

Resilience measure
Resilience was assessed using the 10-item Connor Davidson Resilience Scale (CD-RISC-10) [42]. The CD-RISC-10 is a unidimensional self-reported scale consisting of 10 items measuring resilience. The CD-RISC has demonstrated good internal consistency and displays excellent psychometric properties and allows for efficient measurement of resilience [42]. Respondents rate items on a 5-point Likert scale, ranging from 0 (not true at all) to 4 (true nearly all the time). Each item has a minimum score of 0 and a maximum of 4. Total scores for the CD-RISC-10 range from a minimum of 0 to a maximum of 40. Total scores were calculated by summing all the 10 items with a higher score indicating higher resilience. Raw scores were used in our inferential analysis.

Explanatory variables
Laboratorians in COVID-19-related responsibilities were the major observed explanatory variable evaluated in this study. Participants were asked whether they were involved in COVID-19-related duties since the outbreak of COVID-19 in Ghana. Under this category, four observed variables were considered: contact tracing and tracking, sample collection, sample testing, and facilitating COVID-19-related training. These variables were assigned a value of 1 for "Yes" or 0 for "No". A composite variable was created with scores ranging from 0 – 4, with 0 indicating no involvement in COVID-19 activities and 4 indicating involvement in one or more duties. The variable was subsequently divided into three categories: 0 (no involvement);1(just one responsibility); and 2 / 4 (two or more tasks). Sex (male or female); age group (≤ 29 years, 30 – 39 years, and > 40 years); marital status (single and married); the number of children (none, 1 – 2, and > 3); religion (Christian and Islam); and ever experienced outbreak (No or Yes) were among the independent variables examined in this study. Other independent variables included professional cadre [Medical Laboratory Assistant (MLA), Medical Laboratory Consultant (MLC), Medical Laboratory Scientist (MLS), and Medical Laboratory Technician (MLT)]; and work experience (1, 2 – 5, 6 – 10, and > 11)

Statistical analysis
The Chi-square (χ^2) test statistic was used to describe the significant independent proportions. The two-sample t-test was adopted to assess the mean difference in the main domains (psychological distress, burnout and resilience) between laboratorians who were involved in COVID-19-

related duties and their counterparts who were not involved. Pearson correlation analysis was performed to assess the hypothetical relationship between distress, burnout and resilience, and involvement in COVID-19-related duties. Mediation analysis using structural equation modelling was employed to assess the hypothetical mediation impact of resilience to burnout and psychological distress. This was adopted by considering the Delta, Sobel, and Monte Carlo test of mediation effect. The Ordinary Least Square (OLS) regression analysis was performed to assess the strength of association between resilience and burnout and psychological distress individually, adjusting for demographic variables. Dependent variables were log-transformed to fulfil the assumption of OLS. Three models were considered individually: model 1 was restricted to laboratorians involved in COVID-19-related duties; model 2 was restricted to those not involved in any COVID-19-related duties, and model 3 involved pooled data among all participants. The variance inflation factor and tolerance analysis were performed initially before OLS analysis to eliminate any potential multicollinearity. All analyses were performed using STATA Statistical Software (Version 16, StataCorp LLC, College Station, Texas, USA) and $p < 0.05$ was deemed significant.

Table 1: Demographic characteristic of participants by involvement in COVID-19 related duties

| Variable | Involved in COVID-19 related duties | | Total n = 483 | χ^2 |
	None n = 122 (25.31%)	Yes n = 361 (74.69%)		
Sex				6.16*
Female	34 (35.05)	63 (64.95)	97	
Male	88 (22.80)	298 (77.20)	386	
Total	122 (25.26)	361 (74.74)	483	
Age group in years				6.39*
≤ 29	51 (32.08)	108 (67.92)	159	
30 – 39	51 (21.61)	185 (78.39)	236	
> 40	17 (20.99)	64 (79.01)	81	
Total	119 (25.02)	357 (75.01)	476	
Marital status				1.07
Married	61 (23.37)	200 (76.63)	261	
Single	61 (27.48)	161 (72.52)	222	
Total	122 (25.26)	361 (74.74)	483	
Number of children				1.17
None	50 (27.78)	130 (72.22)	180	
1 – 2	37 (23.87)	118 (76.13)	155	
> 3	22 (24.45)	76 (77.55)	98	
Total	109 (25.17)	324 (74.83)	433	
Religion				5.18*
Christian	104 (23.74)	334 (76.26)	438	
Islam	17 (39.53)	26 (60.45)	43	
Total	121 (25.16)	360 (74.84)	481	
Ever experience an outbreak				7.37**
Yes	20 (16.13)	104 (83.87)	124	
No	102 (28.41)	257 (71.59)	359	
Total	122 (25.26)	361 (74.74)	483	
Professional cadre				1.67
MLA	10 (29.41)	24 (70.59)	34	
MLC	9 (34.64)	17 (65.38)	26	
MLS	72 (24.24)	225 (75.76)	297	
MLT	31 (25.20)	92 (74.80)	123	
Total	122 (25.42)	358 (74.58)	480	
Work experience in years				6.47*
≤ 1	22 (38.60)	35 (61.40)	57	
2 – 5	33 (25.19)	98 (74.81)	131	
6 – 10	36 (23.23)	119 (76.77)	155	
> 11	29 (22.97)	103 (78.03)	132	
Total	120 (25.26)	355 (74.74)	475	

* COVID-19, coronavirus infectious disease 2019; p value notation: *, p value < 0.05; **, p value < 0.01; MLA, medical laboratory assistant; MLC, medical laboratory consultant; MLS, medical laboratory scientist; medical laboratory technician.

RESULTS

The study involved 483 laboratorians in Ghana, and approximately 75% of them were involved in COVID-19-related duties (sample taking, contact tracing and tracking, and diagnostic testing for COVID-19). The independence test of proportion showed that sex, age group, religion, outbreak experience, and years of experience were significantly associated with involvement in COVID-19-related duties ($p \leq 0.05$) (Table 1). The overall mean ± standard deviation for psychological distress, burnout and resilience were; 14.19 ± 7.60, 35.35 ± 16.44, and 26.75 ± 7.97 respectively. The mean (14.67 ± 7.76) psychological distress for participants involved in COVID-19 was

Table 2: Equality of means of distress, burnout, and resilience by involvement in COVID-19 related duties and pairwise correlation among participants

| Domain | Overall | Involved in COVID-19 related duties | | t-test | Correlation | |
		No	Yes		Distress	Burnout
	Mean ± SD	Mean ± SD	Mean ± SD			
Distress	14.19 ± 7.60	12.76 ± 6.96	14.67 ± 7.76	2.41*	1	
Burnout	35.35 ± 16.44	33.05 ± 15.66	36.12 ± 16.65	1.78	0.72***	1
Resilience	26.75 ± 7.97	27.02 ± 8.02	25.97 ± 7.81	1.26	-0.16***	-0.18***

*SD, standard deviation; *p* value notation: *, *p* value < 0.05; **, *p* value < 0.01; ***, *p* value < 0.001; COVID-19, coronavirus infectious disease 2019

Table 3: Association between psychological distress and burnout by involvement in COVID-19 related duties among participants

| Variable | Model 1 | Model 2 | Model 3 |
	aβ (95% CI)	aβ (95% CI)	aβ (95% CI)
Burnout	-5.66 (-8.12 – -3.20)***	-3.85 (-8.51 – -0.81)	-4.85 (-6.97 – -2.73)***
Sex			
Female	Ref	Ref	Ref
Male	12.21 (-105.48 – 129.90)	109.60 (-58.45 – 277.6)	62.12 (-25.68 – 149.92)
Age group in years			
≤ 29	Ref	Ref	Ref
30 – 39	25.99 (-122.74 – 174.72)	3.64 (-332.6 – 339.9)	35.80 (-96.85 – 168.46)
> 40	64.97 (-124.85 – 254.81)	-70.76 (-476.0 – 334.5)	86.85 (-84.67 – 258.38)
Marital status			
Married	-33.68 (-150.92 – 83.55)	123.05 (-200.5 – 446.6)	0.75 (-111.99 – 113.49)
Single			
Number of children			
None	Ref	Ref	Ref
1 – 2	22.85 (-115.75 – 161.46)	-153.68 (-459.47 – 152.1)	-10.31 (-132.8 – 112.23)
> 3	-54.21 (-227.47 – 119.0)	-191.395 (-526.3 – 142.4)	-92.68 (-244.85 – 59.19)
Religion			
Christian	Ref	Ref	Ref
Islam	-113.22 (-280.95 – 54.50)	16.02 (-207.7 – 239.8)	-98.71 (-227.89 – 30.47]
Ever experience an outbreak			
Yes	102.92 (-1.39 – 207.24)	-21.97 (-199.79 – 155.8)	86.73 (-4.46 – 177.90)
No			
Professional cadre			
MLA	Ref	Ref	Ref
MLC	-42.66 (-284.03 – 199.4)	591.2 (-256.35 – 926.2]	110.91 (-97.70 – 319.52)
MLS	10.77 (-175.81– 197.3)	-16.82 (-283.41 – 249.7)	-0.26 (-153.95 – 153.43)
MLT	-42.51(-243.13 – 158.1)	61.07 (-248.4 – 370.5)	-29.59 (-195.17 – 135.9]
Work experience in years			
≤ 1	Ref	Ref	Ref
2 – 5	78.65 (-133.01 – 290.39)	70.72 (-225.52 – 366.9)	58.06 (-107.02 – 223.15)
6 – 10	-154.60 (-96.55 – 405.7)	256.70 (-150.9 – 664.3)	146.51 (-57.69 – 350.70)
> 11	214.52 (-62.78 – 491.80)	199.40 (-252 – 651.2)	195.75 (-32.73 – 424.24)

* aβ, adjusted beta odds; CI, confidence interval; Ref, reference category; *, *p* value < 0.05; **, *p* value < 0.01; ***, *p* value < 0.001; MLA, medical laboratory assistant; MLC, medical laboratory consultant; MLS, medical laboratory scientist; medical laboratory technician

significantly higher compared with their counterparts who were not involved (12.76 ± 6.96) ($p \leq 0.05$). Whereas the mean difference was not significant for burnout and resilience, there was a high level of burnout and resilience among participants involved in COVID-19-related duties ($p \geq 0.05$) (Table 2). In addition, there was a significant positive relationship between psychological distress and burnout ($r_s = 0.72$, $p \leq 0.001$) However, a negative relationship exists between psychological distress and resilience ($r_s = -0.16$, $p \leq 0.001$) as well as burnout and resilience ($r_s = -0.18$, $p \leq 0.001$) (Table 2).

The analysis showed that among participants involved in COVID-19-related duties, an increased unit of burnout score significantly decreased resilience score holding other variables constant as predicted in model 1 [adjusted beta (aβ) = -5.66; 95% confidence interval (CI) = -8.12 – 3.20]. However, among participants not involved in COVID-19-related duties, a predicted decreased score as predicted in

model 2 was insignificant (aβ = -3.85; 95% CI = -8.51 – 0.81). However, the overall decreased association among all participants as predicted from model 3 was significant (aβ = -4.85; 95% CI = -6.97 – 2.73) (Table 3).
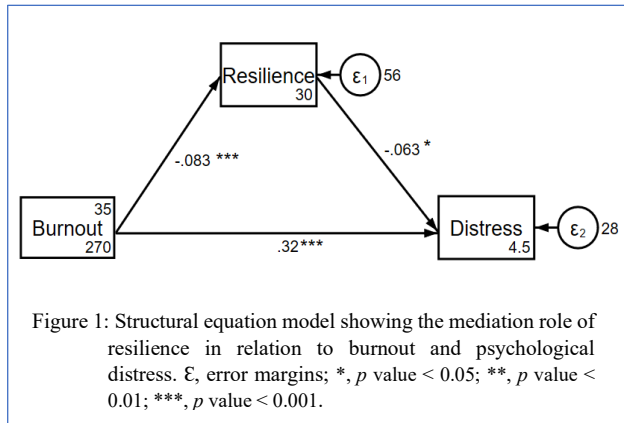
The association between psychological distress and resilience was highly significant — an increased unit of psychological distress score among participants involved in COVID-19-related duties significantly decreased resilience score by approximately 12 units holding other variables constant as predicted in model 1 [aβ = -12.27; 95% CI = -18.98 – -5.55]. Among participants not involved in COVID-19 related duties, a predicted decreased units of approximately 12 is expected as presented in model 2 (aβ = -12.09; 95% CI = -21.75 – -2.42). However, among all participants, a decreased unit of approximately 11 units was predicted from model 3 (aβ = -11.23; 95% CI = -16.81 – -5.67) (Table 4). Delta (z-score = 3.31; p = 0.001), Sobel (z-score =3.35; p = 0.001), and Monte Carlo (z-score = 3.22;

Table 4: Association between psychological distress and resilience by involvement in COVID-19 related duties among participants

Variable	Model 1	Model 2	Model 3
	Aβ (95% CI)	Aβ (95% CI)	Aβ (95% CI)
Psychological distress	-12.27 (-18.98 – -5.55)***	-12.09 (-21.75 – -2.42)*	-11.23 (-16.81 – -5.67)***
Sex			
Female	Ref	Ref	Ref
Male	14.26 (-104.10 – 132.70)	98.02 (-58.61 – 254.60)	53.81 (-35.19 – 142.8)
Age group in years			
≤ 29	Ref	Ref	Ref
30 – 39	25.74 (-117.10 – 168.60)	51.57 (-270.20 – 373.40)	44.89 (-82.84 – 172.60)
> 40	63.45 (-126.35 – 253.30)	-38.06 (-422.60 – 346.50)	94.67 (-74.95 – 264.30)
Marital status			
Married	-24.74 (-139.90 – 90.37)	132.6 (-172.0 – 437.20)	14.25 (-95.36 – 123.80)
Single			
Number of children			
None	Ref	Ref	Ref
1 – 2	27.79 (-109.30 – 164.90)	-192.31 (-475.10 – 90.50)	-17.98 (-138.40 – 102.50)
> 3	-29.36 (-204.0 – 145.30)	220.79 (-538.80 – 97.19)	-81.41 (-232.20 – 69.36)
Religion			
Christian	Ref	Ref	Ref
Islam	-102.50 (-266.60 – 61.60)	10.40 (-211.80 – 232.70)	-96.64 (-223.30 – 30.03)
Ever experience an outbreak			
Yes	114.78 (14.09 – 215.50)	-14.18 (-177.50 – 149.20)	98.59 (10.59 – 186.65)*
No			
Professional cadre			
MLA	Ref	Ref	Ref
MLC	-55.72 (-292.90 – 181.50)	616.56 (296.60 – 936.50)***	104.40 (-98.36 – 307.20)
MLS	0.32 (-188.80 – 417.70)	-14.42 (-271.0 – 242.20)	-3.41 (-155.30 – 148.50)
MLT	-16.96 (-218.10 – 184.20)	88.78 (-212.10 – 389.70)	-4.32 (-167.90 – 159.30)
Work experience in years			
≤ 1	Ref	Ref	Ref
2 – 5	111.40 (-98.23 – 321.07)	133.27 (-159.90 – 426.40)	96.43 (-66.36 – 259.20)
6 – 10	178.90 (-59.80 – 417.70)	270.55 (-132.30 – 673.50)	169.98 (-25.50 – 365.50)
> 11	244.10 (-23.09 – 511.30)	219.54 (-220.50 – 659.50)	219.90 (-0.61 – 440.37)

*CI, confidence interval; Ref, reference category; *, p value < 0.05; **, p value < 0.01; ***, p value < 0.001; MLA, medical laboratory assistant; MLC, medical laboratory consultant; MLS, medical laboratory scientist;MLT, medical laboratory technician

$p = 0.001$) tests of mediating effect showed that resilience served as mediator between burnout and psychological distress with a significant indirect effect (Figure 1). The direct effect of burnout on distress was approximately a 32% increasing rate while the indirect effect through resilience decreases by 6.3%.

Figure 1: Structural equation model showing the mediation role of resilience in relation to burnout and psychological distress. Ɛ, error margins; *, p value < 0.05; **, p value < 0.01; ***, p value < 0.001.

DISCUSSION

This study examined a cross-sectional nationally stratified sample of medical laboratory professionals to determine the association between psychological distress, burnout, and resilience during the COVID-19 pandemic in Ghana. We found that sex, age group, religion, previous pandemic experience and working experience were significantly associated with involvement in COVID-19-related duties. Laboratorians directly involved in COVID-19-related duties were found to experience higher psychological distress. This is consistent with other reports of mental health impacts of COVID-19 on healthcare workers in other countries [43]. Similarly, Lai and colleagues also found that frontline healthcare workers engaged in the direct diagnosis, treatment, and care of patients with COVID-19 showed higher symptoms of psychological distress [17]. Laboratorians' high psychological distress levels could be a result of safety concerns, fear of contagion and poor working conditions which have been reported as factors contributing to psychological distress [22]. Although not statistically significant, burnout and resilience were relatively higher among laboratorians involved in COVID-19-related duties. This may imply that participating in COVID-19-related duties does not necessarily increase burnout in laboratorians or decrease resilience, perhaps due to their usual strenuous working conditions. The advent of the pandemic, with its high demands for tests, has contributed to the heightened psychological distress seen among laboratorians in Ghana. This is parallel to observations from other studies which found significant associations in burnout among health care professionals (including medical laboratory professionals); with higher risk associated with being directly involved with COVID-19 patients [32,44]. This study also revealed a positive significant relationship between psychological distress and burnout among laboratorians. Among laboratorians directly involved in COVID-19-related duties, an increased unit of psychological distress score was seen to increase burnout score by 6%. Perhaps, it can be argued out that, the exigent demands of working in the COVID-19 environment do take a toll on laboratorians making them more vulnerable to burnout [21]. This finding is comparable with that of Barello et. al., 2020, who found health professionals directly involved in the care of patients with COVID-19 reported significant work-related psychological pressure, emotional burnout, and frequent somatic symptoms [44]. Resilience is a protective factor that ideally helps individuals deal with the debilitating effect of stressful situations [45]. Our study found that resilience has a mediating role and had a negative relationship with both psychological distress and burnout. In all, we found that an increased unit of psychological distress score among laboratorians involved in COVID-19-related duties significantly decreased resilience score by approximately 12 units. This observation is analogous to a study on correlates of psychological distress, burnout and resilience among Chinese female nurses which found a negative relationship between resilience, burnout, and psychological distress. Thus, resilience as a potential protective factor has both direct and indirect influence on the mental health of health providers during a pandemic [16,46]. A higher resilience score directly predicts better mental health in exposed healthcare providers. Structural modifications of national and institutional policies that are required to enhance resilience will be key to controlling pandemics.

The study design does not allow for cause and effect analysis. However, it adapted stronger inferential analysis to support its conclusion. Burnout tends to be a chronic phenomenon evolving over weeks, months and even years, hence, a cross-sectional assessment may fail to capture the true extent of this problem. Future studies may focus on a longitudinal assessment of burnout/resilience after 3, 6, or 12 months among study participants. Participants were contacted through an online system which was a challenge for those without internet access or smartphones.

Conclusion

In this study, we showed that medical laboratory professionals directly involved in COVID-19-related duties are more susceptible to psychological distress. Resilience was seen as a mediating factor that improved psychological health. The focused commitment of resources to supporting the psychological needs of laboratorians is crucial in combating the COVID-19 pandemic. National and institutional policy and structural modifications required to enhance resilience among health providers will be key in controlling pandemics.

DECLARATIONS

Ethical considerations

The Korle-Bu Teaching Hospital Institutional Review Board granted ethical approval. The Ghana Association of

Medical Laboratory Scientists was approached for permission to conduct the study. All participants gave their explicit consent to participate in the survey.

Consent to publish
All authors agreed to the content of the final paper.

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Competing Interests
No potential conflict of interest was reported by the authors.

Author contributions
GE, SMS, JT developed the concept. JT analysed the data. GE, SMS, JT, ADS, AE, AEY contributed to writing the first draft manuscript. All the authors reviewed the final version of the manuscript before submission.

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Availability of data
Data is available upon request to the corresponding author.

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