



MENTAL AND PSYCHOLOGICAL HEALTH PROBLEMS OF NURSES, LABORATORY STAFF AND PARAMEDICS DURING THE CORONA PANDEMIC

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ABSTRACT:

During the coronavirus disease 2019 (COVID-19) pandemic, an increased mental burden has been widely reported among medical health workers such as physicians, nurses, laboratory technicians and paramedics. The aim of this study was to assess the magnitude of psychological symptoms among laboratory technicians, nurses and analyze potential risk factors associated with these symptoms. Methods: A cross-sectional online survey was performed via the Enjoining platform (a professional online questionnaire platform) (<https://www.wjx.cn/mobile/statnew.aspx>) to investigate the mental health of laboratory technicians during the COVID-19 pandemic in Hebei, China from October 4, 2021, to November 3, 2021. The online questionnaire included demographic and occupational characteristics data of responders, and the Symptom Check List-90-Revised (SCL90-R) was used to quantify the magnitude of psychological symptoms among laboratory technicians. Participants' demographic and occupational characteristics were analyzed using descriptive statistical analyses. Chi-square tests were applied to compare the severity of each symptom between two or more groups. A binary logistic regression model was developed to identify the predictors of laboratory technicians' mental health in response to the COVID-19 pandemic, and outcomes are presented as odds ratios and 95% confidence interval. Statistical analysis was performed using SPSS version 21 (SPSS, New Orchard Road, Armonk, New York, USA). Results: A total of 3081 valid questionnaires were collected. Of these 3081 participants, 338 (11.0%) reported a total SCL90-R score >160, which indicated positive psychological symptoms. Among the 338 participants who reported psychological problems, most of them were mild symptoms. Several factors associated with mental health problems in laboratory technicians during COVID-19 were found, which include a history of physical and/or psychological problems (all 10 symptoms $p < 0.001$), more than 10 years of work experience (depression symptoms: OR = 2.350, $p = 0.024$; anxiety symptoms: OR = 2.642, $p = 0.038$), frontline work (depression symptoms: OR = 1.761, $p = 0.001$; anxiety symptoms: OR = 2.619, $p < 0.001$; hostility symptoms: OR = 1.913, $p = 0.001$), participant in more than 3 times large-scale SARS-CoV-2 screenings and more than 36 h per week in SARS-CoV-2 nucleic acid testing. Conclusion: A portion of laboratory technicians reported experiencing varying levels of psychological burden. During the COVID-19 pandemic, multiple interventions should be developed and implemented to address existing psychosocial challenges and promote the mental health of laboratory technicians and nurses.

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1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic has been spreading globally for more than two years, causing hundreds of millions of infections and deaths. Despite extensive public health measures, the number of infected cases and deaths continues to rise owing to the variability, high transmission rate and serious pathogenicity of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [2]. Healthcare providers play an important role in the battle against COVID-19. Meanwhile, they are also victims of the pandemic. Medical health workers are at a high risk of being infected [3]. In the early stages of the COVID-19 epidemic, more than 3000 medical staff were infected in Hubei, of whom 40% were infected in hospitals because of insufficient understanding of the virus and prevention strategies [4,5]. Obviously, the dangerous and heavy work may put medical staff under tremendous physical and psychological pressure. A recent study reported that a considerable proportion of physicians in Hubei, China reported symptoms of depression (225 [45.6%]), anxiety (200 [40.6%]), insomnia (135 [27.4%]), and distress (330 [66.9%]) [6]. Moreover, a study by Baraka et al. [7] revealed that 38.5% and 62.0% of nurses had severe stress and anxiety, respectively. Notably, compared with healthcare workers working at the frontline such as doctors and nurses who directly contact patients, few studies have reported the mental health status of laboratory technician, those who conduct SARS-CoV-2 nucleic acid testing and on high risk of exposure to SARS-CoV-2 virus in laboratory samples. During the COVID-19 pandemic, mental health and psychosocial problems of laboratory technicians in response to the sudden increase in workload and high risk of being infected need to be studied. Factors associated with mental health outcomes among physicians and nurses exposed to COVID-19 have been widely studied and well recognized [6]. According to a meta-analysis, existing mental disorders, female sex, and concerns about getting infected were repeatedly reported as risk factors for developing mental disorder, and a good economic situation was considered a protective factor [8]. In a study by Galanis et al. [9], younger age, increased perceived threat of COVID-19, longer working time in quarantine areas, working in a high-risk environment, increased workload and lower level of specialized training regarding COVID-19 were the main risk factors that increased burnout in nurses during the COVID-19 pandemic. Unlike doctors and nurses, laboratory technicians need to handle a large number of samples that could be infectious.

Moreover, they may also be deployed to support areas with severe outbreaks at any time. Whether discomfort caused by heavy medical protective equipment and masks, circadian disruption due to intensive work, long-term workload, risk of occupational toxicant exposure and fear of the virus will contribute to the physical and mental burden of these laboratory technicians and nurses remains to be investigated. To assess the magnitude of psychological symptoms among laboratory technicians and nurses analyze potential risk factors associated with these symptoms, and provide a reference for social support to decrease adverse mental health consequences during the COVID-19 pandemic, we conducted a mental-health survey among laboratory technicians. We hypothesize that a proportion of laboratory technicians will develop psychological symptoms such as depression, anxiety and hostility in response to the pandemic. According to relevant research, female sex, increased age and history of physiological and/or physical problem were reported as risk factors for developing mental disorder, we hypothesis that these factors will also adversely affect the mental health of laboratory technicians. Given the way laboratory technicians work, we hypothesize that occupational related factors such as working in the frontline for a long time, frequently participating in large-scale coronavirus screening, more than 36 h spent in coronavirus nucleic acid detection per week and increasing times of quarantined are also detrimental to their mental health.

2. Method

2.1. Study design and participants

This study followed the American Association for Public Opinion Research reporting guideline. Approval from the clinical research ethics committee of The Second Hospital of Hebei Medical University (Approval No. 2022-R311) was received before the initiation of this study. A cross-sectional online survey was conducted in Hebei, China to investigate the mental health of laboratory technicians during the COVID-19 pandemic from October 4, 2021, to November 3, 2021. The survey was anonymous, and confidentiality of information was assured. All the laboratory technicians who work in Hebei Province, are over 18 years old and able to fill out and submit the questionnaire independently were invited to participate in this study.

2.2. Questionnaire design,

scales and measurement Heliyon 9 (2023) e13090 Z.-r. Ouyang et al. An electronic questionnaire

designed on the Wenjuanxing platform (a professional online questionnaire platform) (<https://www.wjx.cn/mobile/statnew.aspx>) was used in this study. The questionnaire was composed of three parts. Part one collected the demographic characteristics of responders, which included gender (male or female), age (≤ 25 , 26–30, 31–40, or > 40), marital status (unmarried, married, or widowed/divorced), education level (\leq undergraduate, undergraduate, or \geq postgraduate), actively share feelings (yes or no), contact with COVID 19 patient samples (yes or no), and history of physiological and psychological problems (yes, no, or uncertain). Part two assessed work-related variables, which included type of hospital (primary, secondary, or tertiary), years of work experience (10), education and training on SARS-CoV-2 nucleic acid detection (yes or no), working on the front line (yes or no), duration spent in frontline work (months) (9), hours spent in SARS-CoV-2 nucleic acid detection/week (≤ 36 h or > 36 h), number of times performing large-scale

SARS-CoV-2 screening (0, 1, 2, or ≥ 3), having been quarantined (yes or no) and number of times quarantined (1, 2, or ≥ 3), and family or colleagues infected with COVID-19 (yes or no). Part three was the 90-item Symptom Checklist-90 (SCL-90) developed by Derogatis, Lipman, and Covi [11]. It is a 90-item self-rating inventory with ten clinical scales (somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism and others [e.g., foraging status and sleep]). Each dimension consists of 6–13 questions. The score on each dimension represents the average score for that dimension and directly reflects the severity of mental health problems. A subscale score ≥ 2 indicates underlying mental health problems [12]. Items are rated on a 5-point Likert scale (from 0 “not at all” to 4 “extremely likely”). The scores of the measurement tool were interpreted as follows: not at all

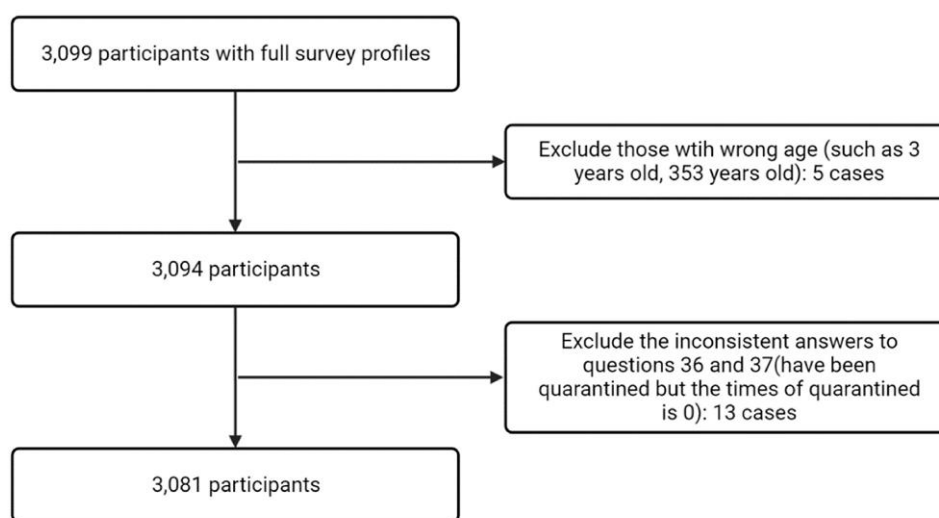


Fig. 1. Data filtering process.

3. Results

3.1. Demographic characteristics

The frequency description of participants' demographic characteristics is illustrated in Table 1. A total of 3081 laboratory technicians were included in this study. The majority of participants were female (2055 [66.7%]), were aged 31–40 years (1256 [40.8%]), and were married (2207 [71.6%]). Of all the participants, 1962 (63.7%) and 374 (12.1%) had undergraduate and postgraduate degrees, respectively. Most people (2622 [84.7%]) actively shared their feelings with family and friends. Only 131 (4.3%) of participants had a history of physiological problems, and 38 (1.2%)

had a history of psychological problems. 3.2. Occupational characteristics The frequency description of participants' occupational characteristics is illustrated in Table 2. Regarding work-related data, 1329 (43.1%) worked in a tertiary hospital, 1502 (48.8%) worked in a secondary hospital, and only 250 (8.1%) worked in a primary hospital. Among the laboratory technicians, 619 (20.1%) reported having between 6 and 10 years of work experience, and 1475 (47.9%) had more than 10 years of work experience. The percentage of laboratory technicians who had received education and training on SARS-CoV-2 nucleic acid detection

was 2969 (96.4%). In addition, 2359 (76.6%) of the respondents worked on the front line during the study, and more than half (1624 [52.7%]) of them had been engaged in this work for more than 9 months. Frontline laboratory technicians who had spent more than 2 months in the current round of work accounted for 47.9% (1131/2359) (eTable S1 in the Supplement) of the total respondents. Of these, 24.8% had been quarantined and a small percentage of them (41/765, 5.4%) had been quarantined more than three times (eTable S2 in the Supplement). Nearly one-third (1110 [36.0%]) had participated in three or more large-scale SARS-CoV-2 screening programs. Laboratory technicians who spent 36 h or more on SARS-CoV-2 nucleic acid detection per week accounted for 34.5% (1063/3081) of the total sample. The percentage who reported having colleagues infected with COVID-19 was 0.7% (22/3081). 3.3. Severity of psychological manifestations and associated

factors The frequency description of responders' psychological manifestations is illustrated in eTable S3 in the Supplement. As we predicted, due to the impact of the COVID-19 pandemic, a portion of the laboratory technicians reported psychological symptoms of varying degrees. Of these 3081 participants, 338 (11.0%) reported a total score ≥ 160 , 263 (15.5%) had obsessive-compulsive symptoms, and 444 (14.4%) had foraging and sleep disorders. Moreover, 324 (10.5%) and 254 (8.2%) of the participants had symptoms of depression and anxiety, respectively. Fortunately, only a small proportion (9 [0.3%]) had severe depression and anxiety. Table 3 shows the severity categories of laboratory technicians' psychological manifestations related to demographic characteristics. People who were reluctant to share their feelings

Table 1
Demographic characteristics of responders (N = 3081).

Variables		N	%
Gender	Male	1026	33.3
	Female	2055	66.7
Age (years)	≤ 25	490	15.9
	26–30	621	20.2
	31–40	1256	40.8
	>40	714	23.2
Marital status	Unmarried	831	27.0
	Married	2207	71.6
	Widowed/Divorced	43	1.4
Education level	\leq Undergraduate	745	24.2
	Undergraduate	1962	63.7
	\geq Postgraduate	374	12.1
Actively share feelings	Yes	2611	84.7
	No	470	15.3
Contacted with COVID-19 patients' sample	Yes	921	29.9
	No	2160	70.1
History of physiological problem	Yes	131	4.3
	No	2738	88.9
	Uncertain	212	6.9
History of psychological problem	Yes	38	1.2
	No	2806	91.1
	Uncertain	237	7.7

N, number.

Table 2
Occupational characteristics of responders (N = 3081).

Variables		N	%
Type of hospital	Primary	250	8.1
	Secondary	1502	48.8
	Tertiary	1329	43.1
Years of work experiences	<1	162	5.3
	1–5	825	26.8
	6–10	619	20.1
	>10	1475	47.9
Education and training on coronavirus nucleic acid detection	Yes	2969	96.4
	No	112	3.6
Working in the frontline	Yes	2359	76.6
	No	722	23.4
Duration spent in frontline work (months)	<3	1104	35.8
	3–6	199	6.5
	6–9	154	5.0
	>9	1624	52.7
Hours spent in coronavirus nucleic acid detection/week	≤ 36 h	2018	65.5
	>36 h	1063	34.5
Times of large-scale coronavirus screening	0	639	20.7
	1	853	27.7
	2	479	15.5
	≥ 3	1110	36.0
Have been quarantined	Yes	765	24.8
	No	2316	75.2
Infected colleagues with COVID 19	Yes	22	0.7
	No	3059	99.3

N, number.

4. Discussion

we found that 11.0% of laboratory technicians reported a total score >160, and were considered to have positive psychological symptoms, and this is consistent with our hypothesis that a proportion of laboratory technicians and nurses developed psychological symptoms. Among the 10 psychological symptom assessments, only a small proportion (less than 5%) reported moderate to severe symptoms. This ratio is lower than the findings of Teo et al. [13], who reported that more than half of the laboratory technicians experienced mild to severe fear, anxiety and depression. Probably, epidemic situation of different magnitude caused this difference. To our knowledge, this cross-sectional survey enrolling 3081 respondents is one of the few mental health studies of laboratory technicians during COVID-19 pandemic in China and provides initial evidence of their mental health status. The large population and active epidemic prevention policies created a huge workload for laboratory technicians, especially those working in the frontline against COVID-19. Our research timely provides valuable insights for the employer and relevant departments to formulate policies to improve the psychological symptoms of laboratory technicians. Additionally, compared with other similar studies, the sample size of this study is larger, which can better reflect the average status of mental health of laboratory technicians. Moreover, using the SCL-90R scale to evaluate the 10 psychological symptoms of laboratory technicians allows us to have a deeper and more comprehensive understanding of the mental health of them. According to our research, participants aged more than 40 years reported more somatization, hostility, phobic anxiety symptoms and foraging and sleep disorder. These results are consistent with those of Rossi et al. [15], who showed that older age was associated with insomnia among health-care workers during the COVID-19 pandemic. Moreover, this result echoes the finding that increasing years of work experience was associated with most psychiatric symptoms, especially in those with more than 10 years of work experience. The reason might be that older participants have poorer physical fitness than younger colleagues, and are prone to some psychiatric discomfort under continuous high-intensity coronavirus nucleic acid detection work. Consequently, when assigning work to older medical workers, their physical condition should be taken into consideration. Baraka et al. [7] assessed critical care nurses' stress, anxiety, and depression in response to the COVID-19 pandemic and suggested that a history of physical and psychological problems was a

significant predictor of depression. Our study came to the same conclusion. Although only 4.3% and 1.3% of participants had a history of physiological and psychological problems in our study, high prevalence rates of severe psychiatric symptoms were found among them. Among those with a history of psychological problems, 28.9% (11/38) reported moderate or severe symptoms of depression. They also had risk factors for developing all psychiatric symptoms

5. Limitations

The present study has limitations. First, we conducted a cross-sectional study rather than longitudinal follow-up, which means we cannot track the dynamic changes in the psychological status of the participants with the progression of the COVID-19 epidemic. Second, this study is limited to Hebei province, and only a sample of laboratory technicians participated. The overall psychological status of laboratory technicians in the whole province and even the whole country still needs further research. Third, there may have been systematic bias due to the differences in willingness among laboratory technicians to participate and complete the survey. 6. Conclusions Collectively, the presence of psychological symptoms was high among laboratory technicians during COVID-19, especially among women, frontline workers, and those with a history of physical and psychological problems. To prevent further deterioration of psychological symptoms among laboratory technicians and nurses, mental problems need to be addressed, and early monitoring, arrangement of adequate rest, and improvement of the working environment are essential. Author contribution statement Zi-rou Ouyang; Zhi-rong Li: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper. Pu Qin; Yu-lian Zhang; Min Zhao; Jia-yiren Li; Chao He; Ning Dong; Hai-qi Li; Hao-dong Wang: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

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