

RESEARCH ARTICLE

Stress-induced cognition among radiologic technologists in COVID-19 quarantine centres in Palestine

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Abstract

Background: The outbreak of COVID-19 brought high mortality rate from the viral infection and caused a huge psychological stress for healthcare staff who work under great pressure during the pandemic.

Aims: The purpose of this study is to assess the level of stress-induced cognition among radiologic technologists (RTs) in COVID-19 quarantine centres in Palestine after the outbreak of COVID-19.

Methods: Stress-induced cognition was assessed using Stress-induced Cognition Scale (SCS) questionnaire. The validity and stability of the measuring tool was verified. The sample consisted of 61 RTs who are working currently at various quarantine centres in Palestine.

Results: Cognition-induced stress was higher than average. There was a statistically significant difference between RTs working directly with COVID-19 patient compared with RTs working indirectly. Additionally, results show an increased level of stress for RTs having children compared with single or non-parent RTs. Also, RTs who dealt with COVID-19 patients for prolonged periods over a month had higher level of stress-induced cognition. Other variables did not show significant differences among RTs.

Conclusion: It is recommended to provide psychological support for RTs who dealt and are currently involved in COVID-19 quarantine centres to alleviate stress-induced cognition.

KEYWORDS

COVID-19, radiologic technologists (RTs), stress-induced cognition

1 | INTRODUCTION

The novel coronavirus (COVID-19), which started in Wuhan, China, by the end of 2019, has caused a widespread concern (Wang, Horby, Hayden, & Gao, 2020). This outbreak of COVID-19 not only brought the high mortality rate from the viral infection but also caused a huge psychological stress for healthcare staff who work under great pressure during the pandemic (Xiao, 2020). Healthcare workers (HCWs) have great worries regarding their health and the health of

their families. Additionally, they are worried about getting infected with the novel virus. They worry about the safety of themselves and the safety of their colleagues and colleagues in the healthcare environment. They currently face isolation, anxiety, and fear of spreading the disease among their colleagues and to their beloved ones, all of which are stress related (Leo et al., 2003; Mak et al., 2009). Daily news reported everywhere carry further stress, especially those concerning death rate for both citizens and medical staff working with COVID-19 patients (Zhang et al., 2020).

Frontline HCWs in Wuhan have come under tremendous stress and risk of contracting COVID-19 since the start of the quarantine. As

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of February 12, 2020, 21 569 HCWs from other cities in China have been deployed to support the emergency response efforts in Wuhan (Du et al., 2020), while 1716 HCWs have contracted COVID-19 and five have died (Surveillances, 2020).

A study (Chew et al., 2020) of HCWs who participated in the treatment of COVID-19 patients showed (5.3%) positive results for moderate to very severe depression, (8.7%) for moderate to very severe anxiety, and (2.2%) for moderate to severe depression. Severe-severe stress, and (3.8%) moderate to severe levels of psychological distress. The most common symptom reported was headache (32.3%), and older people were found to be more likely to have these findings. Di Tella et al. (2020) showed that HCWs who treat COVID-19 patients are most likely to develop psychological distress and posttraumatic stress symptoms (PTSS), especially females not in a relationship (single, divorced, or widowed) and older healthcare profession female workers. A survey in Wuhan and other regions in China for healthcare professionals directly engaged in the diagnosis, treatment, and care for patients with COVID-19 reported that they experienced psychological stress, especially nurses and women (Lai et al., 2020). A systematic review reported that considerable proportion of HCWs experience mood and sleep disorders during COVID-19 pandemic, suggesting the need to establish ways to alleviate mental health risks (Pappa et al., 2020). Traumatic stress and associated factors among COVID-19 HCWs highlighted the presence of trauma-related stress and a prevalence rate between 7.4% and 35%, particularly in women, nurses, and frontline workers (Benfante et al., 2020).

A recent study reported a low prevalence of depression, anxiety, and stress among Vietnamese nation, which was explained by the high doctor's ability to recognize COVID-19 symptoms at early stages of disease, and people's satisfaction with health information distributed by Vietnam government that helped keeping the infection low and death rates at zero (Le et al., 2020). Notwithstanding, Vietnamese respondents who were single, separated, or widowed, had a higher level of education, belonged to a larger family, lost their jobs due to the pandemic, and were in contact with COVID-19 patients, reported higher levels of depression, anxiety, and stress (Le et al., 2020). The COVID-19 pandemic posed a major health effect on the Palestinian community, especially among young people, women, those with lower economic status, and those living with high-risk people (Ghandour et al., 2020). An investigation on the prevalence of PTSS in the general Italian population after COVID-19 outbreak revealed that high percentages of participants reported clinically relevant anxiety and depressive symptoms (69% and 31%, respectively) (Castelli et al., 2020). Risk factors associated with high levels of psychological distress during COVID-19 pandemic include females, younger age groups (≤ 40 years), people with chronic/psychiatric disorders, unemployment, students, and being exposed to social media/news about COVID-19 (Xiong et al., 2020). The COVID-19 pandemic has a sudden and massive impact on healthcare infrastructure, transportation, daily activity, freedom of movement and the distribution of medical resources globally (Gautam & Sharma, 2020; Joob & Wiwanitkit, 2020; Simpson & Katsanis, 2020).

Key Practitioner Message

- Psychological stress is a common experience among radiologic technologists (RTs) who work under great pressure during COVID-19 pandemic.
- No interventions currently exist aimed to help reduce psychological stress that RTs experience, with emphasis currently being on dealing with COVID-19 patients.
- Cognition-induced stress was assessed in RTs working in COVID-19 quarantine centres in Palestine, and it was higher for RTs directly working with COVID-19 patients for prolonged time periods.
- Providing psychological support for RTs is recommended to mitigate and alleviate stress-induced cognition and improve the mental health of RTs.

Stress is a well-known risk factor for a number of neuropsychiatric disorders including depression and posttraumatic stress disorders (PTSDs) (Hammen, 2005; Lupien et al., 2009; Schneiderman et al., 2005; Sinha, 2008). Stress-related neuropsychiatric disorders are characterized by deficits in emotional regulation and cognition (Ferreri et al., 2011). The measurement of stress-induced cognition helps increasing the efficiency of cognitive functions, especially under stressful situations (Koh et al., 2006). Chronic or severe stress could lead to a reduction in functional and intellectual capabilities of workers, such as unproductive or indecisiveness (Breznitz & Goldberger, 2001). Even though most HCWs who have worked under similar pandemics suffered from psychosocial and mental issues, they did not often seek professional psychosocial and mental healthcare (Xiang et al., 2020). Therefore, addressing mental issues in HCWs is important for the better prevention and control of the pandemic.

The main aim of the present study is to investigate the psychological impact of the COVID-19 outbreak on Palestinian radiologic technologists (RTs). First, we assessed the stress-induced cognition among RTs working within COVID-19 quarantine centres in Palestine. Second, we explored sociodemographic and clinical factors that could significantly predict stress-induced cognition levels in RTs involved in the care of COVID-19 patients. Our results will help in providing counselling and support for RTs and will reduce the mental and psychosocial pressures.

2 | METHODS

2.1 | Study design

We conducted a survey using a self-administered online questionnaire. Data were collected in Palestine from March 10 to April 15, 2020.

2.2 | Participants and procedures

The study consisted of 84 individuals working as RTs. They all received written explanation of the study and agreed to complete a questionnaire and an informed consent to fulfil the criteria of the study. Before filling in an Stress-induced Cognition Scale (SCS) questionnaire, all RTs were contacted by psychiatric specialists to ensure that they had no psychiatric or mental disorders. None of them reported being treated for psychiatric disorders nor having symptoms of such disorders. A total of 61 RTs working across four COVID-19 quarantine centres in Palestine completed the questionnaires, with a response rate of about 73%.

The sample was selected among RTs who work in close proximity to confirmed COVID-19 infected patients. The questionnaire was initially sent to the Palestinian Association of Medical Radiation Technologists who distributed the tool via e-mail to RTs working at the four quarantine centres. Table 1 shows sociodemographic characteristics and distribution of RTs among four quarantine centres.

2.3 | Study tool

An SCS (Koh et al., 2006) was used to assess stress among RTs. The scale consisted of 21 items, divided into three areas of thoughts: extreme, aggressive-hostile, and self-depreciativeness. Each item on the questionnaire was arranged in a Likert-type format from 1–5: (1 [Not at all] to 5 [Absolutely]). Participants responses were categorized into three levels; low, medium or average, and high. Levels were specified according to (a) low (≤ 2.33), (b) medium or average (2.34–3.67), and (c) high (≥ 3.68).

2.4 | Study tool validity and reliability

The study instrument validation was assessed using exploratory factorial analysis. Factor loading for all items exceeded 0.65 (from 0.68 to 0.87), which implied that these questions were capable of measuring each element of stress-induced cognition (SCS) among the

sampled population. Reliability was checked using Cronbach's alpha, which demonstrated excellent reliability and consistency (0.95).

2.5 | Data analysis

After verifying the validity and reliability of the study tool for statistical analysis, the mean and standard deviations were extracted for each part of the scale using SPSS V20, where Cronbach's alpha, T test, and one-way ANOVA were determined.

3 | RESULTS

The total sample had a mean age of 26.23 (SD = 13.90) years. A review of the study results show that the total scores and the level of stress-induced cognition among RTs in COVID-19 quarantine centres in Palestine were above the average (2.34–3.67), (mean 2.76, SD 0.96), and it was found that extreme thought area possesses the highest scores with an arithmetic mean and a standard deviation of (mean 2.87, SD 0.92) relative to other areas of thoughts.

Table 2 shows statistically significant differences in the level of stress-induced cognition for extreme and aggressive-hostile thoughts subscales among RTs working in COVID-19 quarantine centres in Palestine due to number of parents in favour of one–two children (mean 3.22, SD 0.83) compared with no children (mean 2.60, SD 0.86) and compared with three or more (mean 2.48, SD 1.13). There was no significant difference according to number of children in self-depreciative thought subscale. One-way analysis of variance (ANOVA) value is ($F 3.33, p = 0.04$).

Table 3 shows no statistically significant differences in the level of stress-induced cognition in all subscales among RTs working in COVID-19 quarantine centres in Palestine due to age up to 30 years (mean 2.7, SD 0.89) compared with 31–45 years (mean 2.71, SD 1.01) and compared with 46 or more years (mean 3.19, SD 1.30). One-way ANOVA value is ($F 0.51, p = 0.60$).

Table 4 shows statistically significant differences in the level of stress-induced cognition for extreme and self-depreciative thoughts

TABLE 1 Distribution of study individuals according to characteristics

Demographics	Characteristic	N (61)	N %
Number of children	None	27	44.3
	1–2	19	31.1
	3 or more	15	24.6
Age (years)	Up to 30	35	57.4
	31–45	21	34.4
	46 or more	5	8.2
Duration of work with COVID-19 patients	<2 weeks	25	41.0
	2 weeks–1 month	18	29.5
	>1 month	18	29.5
Job nature with COVID-19 patients	Direct	40	65.6
	Indirect	21	34.4

Thought area	Number of children	N	Mean	SD	F	p value
Extreme thought	No children	27	2.67	0.84	4.52	0.01
	One-two	19	3.37	0.88		
	Three or more	15	2.59	0.92		
Aggressive-hostile thought	No children	27	2.66	0.87	1.15	0.32
	One-two	19	2.93	0.78		
	Three or more	15	2.45	1.17		
Self-depreciative thought	No children	27	2.50	1.06	2.71	0.07
	One-two	19	3.19	0.97		
	Three or more	15	2.38	1.45		
Total	No children	27	2.60	0.86	3.33	0.04
	One-two	19	3.22	0.83		
	Three or more	15	2.48	1.13		

TABLE 2 Results of one-way analysis of variance (ANOVA) for differences of the number of children variable

Thought area	Age	N	Mean	SD	F	p value
Extreme thought	Up to 30	35	2.82	0.93	0.87	0.42
	31-45	21	2.82	0.90		
	46 or more	5	3.40	1.04		
Aggressive-hostile thought	Up to 30	35	2.65	0.82	0.28	0.75
	31-45	21	2.69	0.98		
	46 or more	5	3.00	1.54		
Self-depreciative thought	Up to 30	35	2.68	1.08	0.27	0.75
	31-45	21	2.60	1.25		
	46 or more	5	3.05	1.70		
Total	Up to 30	35	2.7	0.89	0.51	0.60
	31-45	21	2.71	1.01		
	46 or more	5	3.19	1.30		

TABLE 3 Results of one-way analysis of variance (ANOVA) for the differences of the age variable

TABLE 4 Results of one-way analysis of variance (ANOVA) for the differences of the period of dealing with a COVID-19 patient's variable

Thought area	The period of dealing with COVID-19 patients	N	Mean	SD	F	p value
Extreme thought	<2 weeks	25	2.53	0.60	5.93	0.005
	2 weeks-1 month	18	2.78	0.93		
	>1 month	18	3.43	1.06		
Aggressive-hostile thought	<2 weeks	25	2.52	0.83	2.45	0.095
	2 weeks-1 month	18	2.54	1.02		
	>1 month	18	3.09	0.90		
Self-depreciative thought	<2 weeks	25	2.22	0.94	5.75	0.005
	2 weeks-1 month	18	2.65	1.14		
	>1 month	18	3.36	1.23		
Total	<2 weeks	25	2.41	0.69	5.79	0.005
	2 weeks-1 month	18	2.68	0.98		
	>1 month	18	3.34	1.04		

subscales among RTs due to the period of dealing with a COVID-19 patients in favour of more than a month (mean 3.34, SD 1.04) compared with less than 2 weeks (mean 2.41, SD 0.69) and to periods ranging

between 2 weeks and 1 month (mean 2.68, SD 0.98). There was no significant difference according to number of children in aggressive-hostile thought subscale. One-way ANOVA value is ($F 5.79, p = 0.005$).

Table 5 shows statistically significant differences in the level of stress-induced cognition in all subscales among RTs working in COVID-19 quarantine centres in Palestine due to job nature with COVID-19 patients in favour of direct (mean 3.12, SD 0.94) compared with indirect job nature (mean 2.08, SD 0.56). The *t* test value is ($T 4.61, p = 0.00$).

4 | DISCUSSION

To the best of our knowledge, this is the first study on the issue of COVID-19 stress-related symptoms among Palestinian RTs. Previously published studies concerning COVID-19 pandemic have focused on general psychological distress and anxiety symptoms. High prevalence of depression and anxiety was reported among other HCWs, especially women and nurses (Pan et al., 2020; Pappa et al., 2020). Additionally, associated risk factors were highlighted, such as being a younger nurse, lacking adequate protective equipment, and being exposed to infected people (Brooks et al., 2020; Kisely et al., 2020; Rajkumar, 2020; Spoorthy, 2020; Walton et al., 2020). Other available studies show an important presence of COVID-19 stress-related symptoms in the general public and in patients (Bo et al., 2020; Rajkumar, 2020; Ren et al., 2020; Wang, Pan, Wan, Tan, Xu, McIntyre, et al., 2020).

RTs play an important frontline role during a pandemic. This puts them under huge anxiety and stress while serving the community, in addition to the fear of getting infected with COVID-19 (Koh et al., 2003; Wilson et al., 2005). At the beginning of COVID-19 pandemic, 29% of all hospitalized COVID-19 patients were infected HCWs (Wang, Hu, Hu, Zhu, Liu, Zhang, & Zhao, 2020). This situation forces HCWs, including RTs, to undergo an essential reorganization in the form of staffing, resources, working processes, and job allocation, which is similar among reported radiation oncology professionals (Filippi et al., 2020; Romeo et al., 2020; Simcock et al., 2020). This shows how HCWs might suffer mixed emotional and psychological distress, which could distract and affect their cognitive functions and clinical decision-making processes (LeBlanc, 2009).

The total scores and the level of stress-induced cognition among RTs working in COVID-19 quarantine centres in Palestine were above

the average (mean 2.76, SD 0.96). The results of stress-induced cognition among RTs working with COVID-19 patients indicate that mean scores for extreme thoughts were higher job nature other thoughts areas. Such results can pertain to psychological stress, fear, and anxiety experienced by RTs working in close proximity to COVID-19 patients and being directly engaged in the diagnosis and treatment of patients infected with COVID-19 patients compared with RTs working in other radiology divisions, as direct engagement with COVID-19 patients poses high risks on HCWs for symptoms of depression, anxiety, insomnia, and distress (Kang et al., 2020; Lai et al., 2020). Additionally, being a new virus that spreads in a pandemic way, there were no national previous knowledge, training, and arrangements on how to deal with infected people, which increased the level of stress among RTs. Moreover, being a part of the healthcare team involved in the diagnosis and treatment COVID-19 patients, RTs also face various sources of distress, such as concern about the virus spread, their own, and their loved ones health, in addition to changes in the work environment (Cacchione, 2020; Gavin et al., 2020; Lai et al., 2020; Menon & Padhy, 2020; Neto et al., 2020). A study carried out in the United Kingdom during avian influenza revealed that two thirds of doctors felt they are not ready due to lack of knowledge and skills (Cole, 2006), which could be explained that as doctors level of education, training, experience, and knowledge about infectious diseases, they will have lower level of stress and anxiety.

It has been shown that a larger family size is associated with higher levels of stress and anxiety (Taylor et al., 2017). Our study found statistically significant differences in the level of stress-induced cognition among RTs based on the number of children per parent in favour of RTs who have one–two children compared with parents with no children. This could be due to the importance of not adversely affecting children with any type of infection compared to parents who do not have children. A previous study on the psychological impact of COVID-19 reported that about 75.2% of participants were worried about other family members getting infected (Wang, Pan, Wan, Tan, Xu, Ho, & Ho, 2020). Similar association was found in a South Korean study, which reported greater stress among family members belonging to a larger household size (Noh et al., 2017). It could be explained by the increased levels of concern that other family members could get infected by the virus. Additionally, a family with more children means

TABLE 5 *t* test for the differences in stress-induced cognition among healthcare workers in COVID19 according to the job nature with COVID-19 patients variable

Thought area	Job nature with COVID-19 patients	N	Mean	SD	F	p value
Extreme thought	Direct	40	3.22	0.91	4.69	000
	Indirect	21	2.21	0.49		
Aggressive-hostile thought	Direct	40	2.99	0.91	3.77	000
	Indirect	21	2.13	0.68		
Self-depreciative thought	Direct	40	3.08	1.18	4.08	000
	Indirect	21	1.92	0.72		
Total	Direct	40	3.12	0.94	4.61	000
	Indirect	21	2.08	0.56		

greater financial stress on the breadwinners. The age of RTs variable did not show statistically significant differences in the level of stress-induced cognition among RTs. However, the mean score for 46 or more years of age (mean 3.19) was higher compared with younger RTs mean value. This increase in stress-induced cognition among older RTs could result from their fear of death in case of getting infected with COVID-19.

There were statistically significant differences in the level of stress-induced cognition among RTs who work for longer periods (more than a month [mean 3.34]) with COVID-19 patients compared with those working for less than 2 weeks. It could be explained by the fact that those who work for longer periods with COVID-19 patients are more vulnerable for getting infected. The way the RTs deal with COVID-19 patients also show statistically significant differences in the level of stress-induced cognition among RTs in favour of direct (mean 3.12) compared with indirect (mean 2.08) job nature. This could be explained due to lack or scarce amounts of necessary protective equipment from the virus and that RTs who deal directly with infected people are more vulnerable to get infected. This is in good agreement with the results of Le et al. (2020), who reported that participants experienced stress after contact with COVID-19 suspected cases. It is also likely that respondents are worried to get isolated after direct contact with COVID-19 patients, which could greatly increase their level of psychological stress (Le et al., 2020).

Psychological distress symptoms must be early recognized so that appropriate interventions can be applied according to the needs of HCWs, and actions taken to mitigate stressful situations and foster posttraumatic growth (Brooks et al., 2020; Conversano et al., 2020; Romeo et al., 2020; Shah et al., 2020; Shanafelt et al., 2020). It is suggested that psychological trauma can have a positive impact on people, as they appreciate their values, lives, and work under emergency situations. These aspects can be improved through psychological interventions (Brooks et al., 2020; Xu et al., 2016).

Results of this research shows an immediate need to provide counselling and support for RTs working with COVID-19 patients. The country lacks such psychological interventions at the moment. An evidence-based available method for offering psychological treatments is the cognitive behaviour therapy (CBT), specifically the Internet CBT, which can provide useful information for preventing the spread of infection during the pandemic. According to Ho et al. (2020), CBT can enhance stress management through coping with stressful situations, avoidance of antagonistic confrontation, and self-blame. Internet CBT has been recognized as an effective method in treating depressive symptoms among individuals who have PTSD (Sijbrandij et al., 2016). The costs associated with implementing Internet CBT could be high. However, it can be implemented using Moodle, which is a commonly used open-source learning environment that can be utilized as a cost-effective method for delivering electronic forms of therapies (Zhang & Ho, 2017). Results and recommendations of this study will be shared with the Palestinian Ministry of Health to explain the importance of providing an Internet CBT for RTs during the current COVID-19 pandemic, which will be helpful for mental and psychological stability meanwhile and in the future.

5 | CONCLUSION

Stress-induced cognition among RTs working in COVID-19 quarantine centres in Palestine was higher than average. There were statistically significant differences for RTs who work directly with COVID-19 patients, having one or two children, and working in quarantine centres for more than a month. Results indicated elevated levels of stress among RTs and necessitate the interference and implementation of professional cost-effective psychological support for RTs in the form of Internet CBT to alleviate the stress-induced cognition caused by current and future pandemics. However, these results should be considered in the light of limitations. First, the sample size was small; RTs response rate was about 73%. Future research should broaden the participant sample and attempt to recruit a more representative population. Second, only one scale was used to assess stress induced cognition among RTs, and it was conducted across a short 5-week period. This potentially impacted the ability for more participants to join and fill-in the study scale.

ACKNOWLEDGMENTS

We received no funding for this project.

CONFLICT OF INTEREST

Authors have no conflict of interest to declare.

INFORMED CONSENT

Informed consent was obtained from all individual participants included in the study.

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How to cite this article: Rimawi O, ALMasri H. Stress-induced cognition among radiologic technologists in COVID-19 quarantine centres in Palestine. *Clin Psychol Psychother*. 2021; 1–8. <https://doi.org/10.1002/cpp.2585>