

Experiences of Radiographers during the COVID-19 Pandemic: A Qualitative Systematic Review

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Abstract

Introduction: Throughout the pandemic, radiographers globally continued to offer services, putting them on the frontlines of the fight against the COVID-19 pandemic. Understanding the experiences radiographers have during pandemics is necessary to create specific support mechanisms and to prepare for future pandemics or health crises. The aim of this review was to synthesize qualitative primary research on the experiences of radiographers during the COVID-19 pandemic.

Methods: A qualitative systematic review was conducted according to the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) guidelines.

Results: Seven studies were found that addressed the experiences of radiographers using a qualitative methodology and were deemed of sufficient quality to be included in the review. Five key themes emerged, including factual information challenges, increased human emotional responses, altered workplace conditions, increased mental health concerns, and support for radiographers.

Conclusion: Radiographers, like many other healthcare professionals, faced information, fear, anxiety, and heightened mental issues. Despite these challenges, some radiographers complained about a lack of adequate support. We hope that this review will enhance the understanding of the experiences of radiographers during pandemics so as to create specific support mechanisms and also prepare for future pandemics or health crises.

Keywords: Experiences, Radiographers, COVID-19, Systematic Review

Introduction

The COVID-19 pandemic put enormous strain on healthcare workers all across the world.¹ Health services had to alter significantly and act quickly to meet the growing demand in order to provide high-quality care and save lives.² Throughout the pandemic, radiographers have continued to offer high-quality diagnostic imaging services and administer radiation therapy to cancer patients.³ This has placed thousands of radiographers at the forefront of the battle against the COVID-19 pandemic. From a global perspective, studies have shown that healthcare workers on the front lines of the pandemics like COVID-19 are more vulnerable to physical and mental health problems.⁴⁻⁶ This has been attributed to the heavy workload, long hours, lack of extensive support, social stigmatization, and mental stress brought on by worry about catching and exposing their family to the virus.⁷ The World Health Organization (WHO) has called on policymakers

and healthcare leaders to address persistent threats to the health and safety of healthcare workers during COVID-19 and other future pandemics.⁸ However, due to the different healthcare services they provide to patients, each healthcare profession has unique challenges and experiences. Research evidence is needed to guide healthcare administrations in making decisions to support specific healthcare personnel based on their experiences.

For radiographers, understanding these experiences and challenges is particularly important as this professional group uses hazardous ionising radiation in the execution of their duties. From the onset of the pandemic, it was immediately discovered that chest radiography and computed tomography (CT) scans of the chest played a key role in the diagnosis and management of individuals with COVID-19.^{9,10} As a result, the demand for imaging services increased,

forcing radiographers to adapt to new ways of performing their duties. However, the majority of the early research on COVID-19 in radiography has been quantitative in nature.¹¹⁻¹⁴ While quantitative research is significant, it does not aid in our understanding of the varied experiences of radiographers and the contextual factors that influence them. Indeed, prior studies have underscored the significance of qualitative research as a means of understanding the experiences and concerns of frontline healthcare professionals.¹⁵⁻¹⁶ To date, a systematic review on this subject has been on the global impact of the COVID-19 pandemic on clinical radiography education, focusing on both radiography students and educators.¹⁷ However, the reviewers were unable to find any qualitative systematic review that focused on the experiences of radiographers working on the front lines during the COVID-19 pandemic.

The aim of this study was to systematically review the experiences of radiographers during the COVID-19 pandemic globally. Understanding the experiences of radiographers during pandemics is necessary to create specific support mechanisms and also to prepare for future pandemics or health crises. Undoubtedly, the resilience of imaging and radiation therapy services during a pandemic must, therefore, be strengthened by measures that support radiographers.

Materials and Methods

A qualitative systematic review was conducted according to the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) guidelines.¹⁸ The steps that were followed are outlined below;

Review Question

The aim of this review was to synthesize qualitative primary research on the experiences of radiographers during the COVID-19 pandemic. The question that the researchers sought to answer was;

“What are the experiences of radiographers during the

COVID-19 pandemic?”

Inclusion and Exclusion Criteria

The population of interest included radiographers working on the frontline during the COVID-19 pandemic irrespective of geography and setting. To be included the papers were supposed to: (a) be original qualitative (b) mixed methods and quantitative studies where data on the qualitative component of the study was available (c) explore the experiences of radiographers during the COVID-19 pandemic, and (d) be available in full text in the English language. Quantitative studies without open ended questions, studies involving students or radiographers in academia, and studies published in any other language were excluded. Table 1 summarise the inclusion and exclusion criteria of the study.

Literature Search and Selection of Studies

A three-step strategy was employed in the search for relevant literature from 12 December 2022 and 15 January 2023. Firstly, a search of electronic healthcare databases such as MEDLINE, EMBASE, PsycINFO, ScienceDirect, and CINAHL. The search terms and synonyms “radiographer”, OR “radiology technologist”, OR “Medical Radiation Science” OR “Radiotherapy” OR “Therapy” AND “experiences” AND “COVID-19” OR “Pandemic” were used. The keywords were combined using the Boolean operators “AND”, “OR” and “NOT”. Secondly, other radiography/medical imaging/radiation sciences journals were hand searched. Hand searching was done because it locates pertinent papers that are incompletely or incorrectly indexed or not indexed; enables researchers to swiftly scan content for pertinent studies from high-impact journals; and ensures that pertinent studies are not missed.¹⁹ The journals that were hand searched include Radiography Journal (UK), Journal of Medical Imaging and Radiation Sciences (Canada), Journal of Medical Radiation Sciences (Australia) and the South African Radiographer Journal among others. Grey literature in

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> • Original qualitative • Quantitative and mixed methods studies with available qualitative components • Primary studies exploring experiences of radiographers during the COVID-19 pandemic • Primary studies published in English 	<ul style="list-style-type: none"> • Primary studies exploring radiographers in academia • Primary studies involving students or interns • Expert opinions, reviews and case reports • Primary studies published in any other language

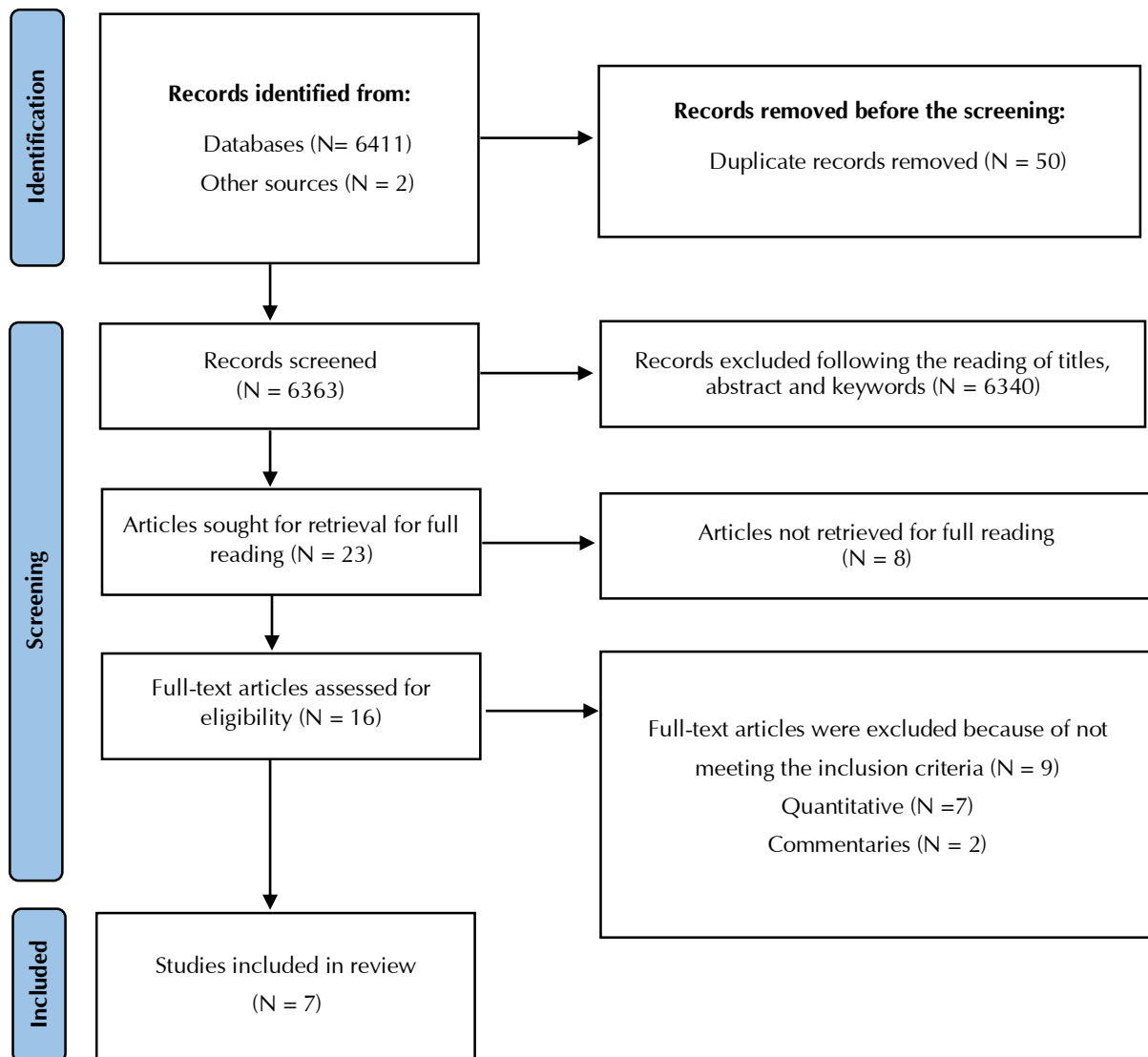


Figure 1. Flowchart of Primary Study Selection According to the PRISMA Guidelines

the form of conference proceedings, google scholar, theses and dissertations were also searched. Lastly, a hand searching technique called snowballing or citation chaining whereby the reference lists of articles were checked to identify relevant papers was done. Studies that met the inclusion criteria were included. Since COVID-19 is a recent phenomenon, a time limit of 5 years was applied.

A total of 6411 articles published since the COVID-19 pandemic started were identified during the initial phase of the search. The titles of the articles were read and those not relevant to the aim were excluded, leaving 16 articles. However, upon further scrutiny, 7 articles were excluded because they were not qualitative studies but quantitative in nature. The other 2 were opinion articles using anecdotal evidence from

clinical practice were excluded due to low rigour. The seven articles were read in full and included in the synthesis as shown in Figure 1.

Critical Appraisal

The included studies were evaluated for methodological soundness by two independent reviewers. The Critical Appraisal Skills Program (CASP) tool for assessing the quality of qualitative studies,²⁰ was used to evaluate the studies. The CASP qualitative checklist has 10 questions in total. There were no significant differences between the reviewers, so there was no need for a third reviewer to settle them. If a disagreement arose, it was to be resolved by a third reviewer. Two studies were awarded a high level of rigour for meeting the requirements in all ten critical review questions.^{21,22}

Table 2. CASP Outline of the Articles

Item	Study Number						
	1	2	3	4	5	6	7
1. Was there a clear statement of the aims of the research?	1	1	1	1	1	1	1
2. Is a qualitative methodology appropriate?	1	1	1	1	1	0	1
3. Was the research design appropriate to address the aims of the research?	1	1	1	1	1	1	1
4. Was the recruitment strategy appropriate to the aims of the research?	1	1	0	1	0	1	0
5. Was the data collected in a way that addressed the research issue?	1	1	1	1	1	1	1
6. Has the relationship between researcher and participants been adequately considered?	1	1	1	1	0	1	1
7. Have ethical issues been taken into consideration?	1	1	1	1	1	1	1
8. Was the data analysis sufficiently rigorous?	1	1	1	1	1	1	1
9. Is there a clear statement of findings?	1	1	1	1	1	1	1
10. How valuable is the research?	1	1	1	0	1	1	1
Total score of each study	10	10	9	9	8	9	9

The rest of the studies also had rigour, all scoring above 8 points. Table 2 gives a summary of the results of the scoring of the studies.

Data Extraction

The quotes of the participant's experiences from study 'results' or 'findings' in the selected studies were copied and entered verbatim into QSR's NVivo software for data management. For studies that did not have electronic versions, the quotes were re-typed and also entered accordingly. To maintain consistency, the data extraction was done by a single reviewer.

Data Synthesis and Analysis

The merging and analysis of the data in this review followed thematic synthesis as suggested by Thomas and Harden.²³ The process has three main stages that partly overlap: (i) the free line-by-line coding of original study findings; (ii) the grouping of these "free codes" into related categories to create "descriptive" themes; (iii) and the creation of "analytical" themes.

Results

From the systematic review, five themes emerged from the synthesised findings. These themes could summarise the experiences of radiographers working on the frontlines during the COVID-19 pandemic. The themes that emerged from the synthesis include;

- i. Factual information challenges.
- ii. Increased human emotional responses
- iii. Altered workplace conditions
- iv. Increased mental health concerns
- v. Support for radiographers

Theme 1: Factual Information Challenges

The theme has 3 sub-themes namely knowledge-related challenges, lessons learned and the way forward, and reliable COVID-19 response plan. This theme relates to the difficulties in getting correct information about the virus, how to use PPE and COVID-19 examination procedures. The fact that this was a novel coronavirus made it difficult for radiographers to undertake COVID-19 related examinations and procedures due to a lack of evidence-based information. The quotes below exemplify this;

*"At the beginning, there was very limited factual information about the virus itself and an overload of information about different theories/conspiracies about covid-19 and this has in turn resulted in so much confusion and difficulty to find the path of how to deal with the situation and find a way forward. There were many arguments and different opinions of how one should go about doing things."*²¹ (p. 349)

*"In March 2020, when the COVID-19 pandemic started, we had almost no knowledge of the disease. I only knew that it was transmitted by the respiratory route. There was no COVID-19 PCR test for the most part. A chest CT scan was used to detect the disease."*²⁷ (p. 113)

Even the correct way of wearing PPE was initially also a subject of debate.

*"In the beginning, it was difficult for us to wear PPE. We had almost no information about how to put on filtered masks. We used to wear a surgical mask underneath our filtered masks, which we have now realized was utterly wrong."*²⁷ (p. 113)

"To me when we first started it felt like Ebola or

Table 3. Characteristics of the Studies (N = 7)

No	Author and year	Title	Country	Design and data collection tool	Experiences
1.	Lewis and Mulla (2020) ²¹	Diagnostic radiographers' experience of COVID-19, Gauteng South Africa	South Africa	Qualitative approach, online questionnaire	<ul style="list-style-type: none"> • A shift in their professional work routine and home/family dynamics, diagnostic radiographers' • Well-being has been impacted. • Adapting to the "new way of work" has been challenging yet their resilience and dedication to their profession, providing quality patient care and skill expertise is their arsenal to combat these challenges.
2.	Naylor et al. (2021) ²²	Experiences of diagnostic radiographers through the Covid-19 pandemic	UK	Interpretative phenomenology, virtual focus group interviews	<ul style="list-style-type: none"> • Adapting to new ways of working, • Feelings and emotions, support mechanisms, self-protection • Resilience, and professional recognition
3.	Yasin et al., (2021) ²⁴	The impact of the Covid-19 pandemic on the mental health and work morale of radiographers within a conventional X-ray department	UK	Quantitative and qualitative data was obtained through an online survey.	<ul style="list-style-type: none"> • mental health challenges/work morale in Radiology, • Demand of mobile imaging and departmental and • Trust-wide mental health support. • A high demand in mobile imaging which has made a significant difference in the working life of some radiographers
4.	McFadden et al. (2022) ²⁵	The lessons learned working in diagnostic and therapeutic radiography departments through the COVID-19 pandemic in Northern Ireland, UK. What can we do differently the next time?	Ireland	Mixed methods study, survey and interviews	<ul style="list-style-type: none"> • morale declined in their departments • the pandemic had a negative impact on their physical or mental health and wellbeing. • Managers felt that to improve staff morale and motivation, incentives need to be offered including remuneration, flexible working and support for professional development.
5.	Lewis (2022) ²⁶	Two years on and four waves later-Johannesburg diagnostic Radiographers' experiences of COVID-19	South Africa	Qualitative explorative, in-depth interviews.	<ul style="list-style-type: none"> • Participants shared synchronistic experiences with the four COVID -19 waves, the heterogeneous vaccination ideologies and their support and coping skills. • lessons learnt and the way forward
6.	Shamshiri et al. (2022) ²⁷	Experiences of Radiology Personnel About the COVID-19 Crisis: A Qualitative Content Analysis	Iran	Qualitative content analysis, In-depth interviews	<ul style="list-style-type: none"> • Psychological-emotional reactions, • Knowledge-related challenges, • Humaneness, workplace conditions, • Hopefulness, • Support.
7.	Flood et al., (2022) ²⁸	The impact of COVID-19 on the mental health of radiography staff and managers in Northern Ireland, UK: The radiography managers' perspective	Ireland		<ul style="list-style-type: none"> • Factors perceived to have negatively influenced mental health, which included changing PPE guidance, restructuring of work conditions, social isolation, challenges to patient care and lack of quality vacation leave. • Factors perceived to have positively influenced mental health, which included witnessing staff resilience and team camaraderie. • Support provided for mental health.

Table 4. Theme, Sub-themes and Exemplary Quotes

Theme	Subtheme	Exemplary quote
i. Factual information challenges	<ul style="list-style-type: none"> Knowledge-related challenges Lessons learned and the way forward Reliable COVID-19 response plan 	<i>"At the beginning there was very limited factual information about the virus itself and an overload of information about different theories/conspiracies about covid-19 and this has in turn resulted in so much confusion and difficulty to find the path of how to deal with the situation and find a way forward. There were many arguments and different opinions of how one should go about doing things."</i> R5 ²¹
ii. Increased human emotional responses	<ul style="list-style-type: none"> Psychological-emotional reactions Feelings and emotions 	<i>"I've been in this job for 12 years now and I have to admit the first time I've ever felt anxious about going into work because I didn't know what I was walking into. I didn't have a clue."</i> DR7 ²²
iii. Altered workplace conditions	<ul style="list-style-type: none"> Workplace conditions New workflow operations Aligning resources and workflow to 'new' working practices 	<i>"I didn't report for three months at all....so all the skill kind of had to go on the back burner while I supported the rest of the team to image potentially really sick patients. My role completely switched. That was the biggest thing to deal with, the thing I love doing is reporting."</i> DR5 ²²
iv. Mental health issues	<ul style="list-style-type: none"> Factors perceived to have negatively influenced mental health Effect on radiographer well-being 	<i>"Emotionally, physically and mentally exhausting... I'm tired of patient's condition deteriorate because there is no cure so their symptoms are only being treated. I'm tired of seeing patients lose their lives. It's also heart breaking to see patients so short of breath and a lot of the patients are elderly and end up on ventilators..."</i> R10 ²¹
v. Support for radiographers	<ul style="list-style-type: none"> Support mechanisms Self-protection and resilience Professional recognition 	<i>"I can't say our management have been very present or terribly supportive to be honest.... Most of them have worked from home... it wasn't I'm working from home and here's my phone number, it was I'm working from home, and you email me."</i> DR12 ²²

*something and it felt like oh my, if my PPE splits, I'm going to get COVID type thing, and it felt very scary."*²² (p. 189)

Some examinations, such as CT scans, were performed without a complete understanding of the protocols or the advantages of COVID-19 management.

*"In March 2020, when the COVID-19 pandemic started, we had almost no knowledge of the disease. I only knew that it was transmitted by the respiratory route. There was no COVID-19 PCR test for the most part. A chest CT scan was used to detect the disease."*²⁷ (p. 113)

*"Since there were not enough PCR detection kits for COVID-19 at the beginning, CT scans of the lungs were regularly performed to detect patients. To reduce the radiation exposure of the patients and personnel, we decided to reduce the radiation dose of CT scan."*²⁷ (p. 114)

However, some radiographers quickly felt that the availability of an all-encompassing, reliable COVID-19 response plan was critical in the fight against the pandemic.

"The biggest challenge for us is how do we become part of that and how does the NHS partner with all the

*independent sector providers in being a solution to that. We account for something like about ten percent of all imaging diagnostics and services in the country. So we are a sizeable chunk of being part of that solution."*²⁵ (p. S74)

However, some radiographers felt that they were not included in the COVID-19 response plan. Decisions were being made by other clinicians without consultation with radiology.

*"I do feel that maybe my voice wasn't heard loudly enough. And there were lots of decisions being made outside of radiology which affected radiology, and people forgot to let me know. Maybe it was forgetting to let me know so that they could get their own way, I don't know. So I think that probably if I could do it again, I would probably be a stronger voice for radiology at the beginning."*²⁵ (p. S74).

Theme 2: Increased Human Emotional Responses

This theme re-counts the humanness of radiographers despite being trained healthcare workers. Two subthemes were namely; psychological-emotional reactions and feelings and emotions. Radiographers reported experiencing a wide range of emotions during

the initial wave, including nervousness, fear, anxiety and compassion for COVID-19 patients. Some of this concern in the early stages of the pandemic was attributed to a worry about catching the virus or spreading it to family and friends.

*"Very early on I actually had a heated conversation ... well it wasn't heated, but the radiographer in question got very heated at a staff meeting prior to the guidance and prior to the PPE being sorted...she didn't scream across the room at me, but she was like, you're sending us out like lambs to the slaughter, was how she put it. Emotions were running very, very high, and rightly so."*²⁸ (p. S29)

*"I've been in this job for 12 years now and I have to admit the first time I've ever felt anxious about going into work because I didn't know what I was walking into. I didn't have a clue."*²² (p. 189)

"Quite anxious about what happens if you get COVID... just like really horrible feelings and being quite scared because you thought 'what if my family get it and they come in.'" ²² (p. 189)

Radiographers agonized at the number of patients infected by COVID-19, the age range of the patients, and the rate at which victims died from the illness.

*"I found that a little bit hard, thinking that, oh God, I X-rayed her or I CT'd her a while ago and now she's dead. I was more conscious of that in the second one than in the first one."*²² (p. 190)

*"Especially during the second one I would say it became more prevalent, we were seeing younger and younger people which was much harder."*²² (p. 190).

Theme 3: Altered Workplace Conditions

Theme 3 tells how radiographers had to adapt to new protocols and workflow operations to manage the COVID-19 pandemic. The theme also highlights the importance of customizing the resources available to fight the pandemic. Three subthemes were identified; workplace conditions, new workflow operations, and aligning resources and workflow to 'new' working practices.

As referrals increased, radiology departments had to deal with a significantly higher volume of patients. Radiographers experienced an alteration to their normal shifts, with most having to work extra hours.

"During this pandemic, we've also had to work extended hours at the hospital (12 hour shifts for 7 days and then 7 days off) which I feel also adds to the

*exhaustion."*²¹ (p. 348)

*"The workload was really heavy; a chest CT scan was requested for all patients; we had never had such workload in the radiology department until then; it was really exhausting."*²⁷ (p. 114)

*"During the second pandemic, it felt like there was ten times more pressure than the first because we were now having to make up time, and we still are, for all those lost appointments, those emergency CTs, those mammograms."*²² (p. 189)

Due to the fact that this was a new disease, the imaging protocols kept changing on a regular basis, and radiographers had to quickly adapt.

*"In my workplace, we do not have a set protocol in place for suspected and confirmed cases that are understood by everyone, it sometimes feels like protocols change every day based on who is in charge on that particular day."*²¹ (p. 348)

Some radiographers reported completely changing their usual roles so they could support other colleagues.

*"I didn't report for three months at all... so all the skill kind of had to go on the back burner while I supported the rest of the team to image potentially really sick patients. My role completely switched. That was the biggest thing to deal with, the thing I love doing is reporting."*²² (p. 189)

Radiographers felt that after altering the workplace, there was a need to make sure that all resources were commensurate with the task at hand.

*"In the future, we are just going to need more rooms, more equipment and more staff, because I don't believe we'll ever catch up... the future challenge really is equipment... equipment is old, no matter where you look. It's a long time since we had any new equipment, and that is going to be a struggle."*²⁵ (p. S74)

Theme 4: Mental Health Issues

This theme highlights the heightened mental health issues experienced by radiographers due to fear of contracting the virus, compassion for patients, altered work routines, lockdowns and fatigue. There are two subthemes that appeared; factors perceived to have negatively influenced mental health and effect on radiographer well-being.

Radiographers highlighted that lockdowns reduced interactions with family and friends and this had a

negative mental effect.

*"The continual lockdowns and you can't see family and you can't see friends. That grates on you outside of work. And if you are in here 40, 50 hours a week and you come home and you get something to eat, watch 5 min of TV and go to bed, and you're back in here again."*²⁸ (p. S30)

*"Whenever we introduced the lunch bubbles, morale took a bit of a dip again, because you are telling people whom to go with on lunch, same time every day. It was just so restrictive."*²⁸ (p. S30)

Radiographers found the situation was exhausting at all levels. Seeing patients lose their lives in numbers was mentally challenging.

*"Emotionally, physically and mentally exhausting.... I'm tired of patients' conditions deteriorating because there is no cure, so their symptoms are only being treated. I'm tired of seeing patients lose their lives. It's also heart breaking to see patients so short of breath and a lot of the patients are elderly and end up on ventilators ..."*²¹ (p. 348)

Radiographers had to unlearn and learn new ways of handling patients.

*"Challenging and stressful at the same time. COVID-19 is a novel virus, I had to unlearn and learn new ways of providing health care to patients, as well as protecting myself from contracting the virus. But I got to learn and experience new things in the profession. This brought with growth and new knowledge."*²¹ (p. 349)

Because of the lockdowns, radiographers could not engage with their usual outdoor methods of reducing stress and depression.

*"I suffer from depression anyway, so it definitely, escalated during the pandemic... being outside in nature and exercise, that helps me a lot to cope with the depression in general... a lot of hikes with the dogs ... to get outside and exercise as much as possible just to cope and to breathe... and colleagues... lean on each other and share our experiences."*²⁶ (p. 8)

Theme 5: Support for Radiographers

The last theme relates to the support that radiographers felt they needed and received from their workplaces and how they coped with the stress that they were experiencing. The following subthemes emerged: support mechanisms, self-protection and resilience and professional recognition.

Initially, some radiographers were not recognized as frontline workers and hence, this meant they did not receive the necessary support.

*"Across the hospital, it didn't seem to be we were acknowledged as frontline workers initially."*²² (p. 191)

*"We kept getting told, 'oh well you don't need that, you are not going to be, you know within two metres of the patient'. But you know, you scan intubated patients, X-ray intubated patients, you go to the theatre."*²² (p. 191)

*"We were not really recognised as frontline workers, even though we come in contact with the patient but still they didn't wanna recognise us fully as frontline workers... it's somewhat changed, I think they just needed to realise what we do."*²⁶ (p. 9)

However, in settings where there was support from the institution, some radiographers felt that the support was not tailored to their specific needs.

*"Certainly, for us in radiography, you'd find that things had been put into place that certainly didn't necessarily meet the needs of the radiographers... for instance one of the things that happened more recently was the standard introduction of visors. And what was difficult for the radiographers in the treatment sense was, because of the glare off the plastic, it made viewing images online more challenging..."*²⁵ (p. S74)

*"At the beginning, it was hard to keep a positive morale but overall as the months have passed I feel as though it boosted my morale for the better and I feel as though I have become a better person from it."*²⁴ (p. 1067)

When their organization was unable to provide adequate support, radiographers relied on one another to cope with the stress.

*"We set up a WhatsApp group... as a means of urgent communication, PPE changes and that sort of thing but also we put jokes and other things in there."*²² (p. 190)

*"People put fun things on there as well... a bit of banter on there... it felt like you were keeping in touch without being bombarded with the seriousness of emails, it felt more light hearted."*²² (p. 190)

*"I think the team spirit in our working group has prevailed. We've got the various WhatsApp groups and we're quite sociable."*²² (p. 190)

Despite the challenges, radiographers were resilient and coped very well.

*"It's about resilience and being able to adapt for what's required of us at the time."*²² (p. 191)

*"I personally have faith that we can adapt, and we've coped exceptionally well. And we've proven that we have still been able to carry on and provide a good service through such a challenging time."*²² (p. 191)

Discussion

Throughout the pandemic, radiographers globally continued to offer services, putting them on the frontlines of the fight against the COVID-19 pandemic.^{3,29} The aim of this review was to synthesize qualitative primary research on the experiences of radiographers during the COVID-19 pandemic. The review was guided by the question, *"What are the experiences of radiographers during the COVID-19 pandemic?"* Qualitative research aided our understanding of the varied experiences of radiographers and the contextual factors that influence them. During the search and inclusion process, seven studies were found that addressed the experiences of radiographers using a qualitative methodology and were deemed of sufficient quality to be included in the review. The review shed light on a number of radiographers' experiences on the front lines of the COVID-19 pandemic. From the review, five key themes emerged, including factual information challenges^{21,27}, increased human emotional responses,^{22,28} altered workplace conditions,^{21,22,27,30} increased mental health concerns,^{25,26} and support for radiographers.^{21,22,30} The results suggest that the knowledge, fear, anxiety, workplace conditions, and mental health of radiographers improved over time as the pandemic went on. Nevertheless, understanding the experiences radiographers have during pandemics is necessary to create specific support mechanisms and to prepare for future pandemics or health crises.

Radiographers in this review reported difficulties in getting correct information about the virus, how to use PPE and COVID-19 examination procedures during the initial phase of the pandemic. Throughout the pandemic, an abundance of policies and protocols were developed for both the general population and healthcare staff, many of which were constantly changing and occasionally contradicting. This was especially true during the first wave when a lack of proof and factual information occasionally led to confusion among both the public and healthcare staff.²⁴ In our digital age, misinformation spreads like wildfire.

It creates a breeding ground for uncertainty. This misinformation put radiographers at even greater risk. The fact that this was a novel coronavirus made it difficult for radiographers to undertake COVID-19-related examinations and procedures due to a lack of evidence-based information. Other healthcare workers also reported similar information challenges.^{31,32} Acting on incorrect information can result in death,³³ and in the context of radiology, it can lead to radiation protection compromise. In a study by Shamshiri et al.,²⁷ radiology personnel reported a lack of knowledge about COVID-19 and reducing the radiation dose in CT. In the initial phases, the role of CT in the diagnosis and management of COVID-19 was poorly defined.³⁴ Therefore, to protect patients from radiation, radiographers had to instinctively use low-dose protocols.²⁷ Hence, managing rumors, dispelling misinformation and conspiracy theories, and mitigating fear and stigma directed toward persons and places affected are essential to pandemic preparedness and control. International health agencies, including the WHO,³³ recognized rumor, stigma, and conspiracy theories as emerging threats to pandemic preparedness and control.³⁵ This underscores the importance of managing the flow and establishing protocols in the case of another pandemic to protect patients and radiographers.

Findings from this review describe the humanness of radiographers despite being trained healthcare workers. Radiographers reported experiencing a wide range of emotions during the initial wave, including nervousness, fear, anxiety and compassion for COVID-19 patients. Some of this concern in the early stages of the pandemic was attributed to a worry about catching the virus or spreading it to family and friends. Despite the fact that healthcare workers are highly resilient individuals who are used to dealing with challenging and sometimes painful events, staff were apprehensive about catching COVID-19 and the possibility of infecting family, friends, and colleagues. Separation from family, childcare issues, misinformation, and a lack of knowledge have all had an impact on personnel, and the persistent media coverage has made it difficult for staff to leave even while off-shift.²⁴

Radiographers had to adapt to new protocols and workflow operations to cope with the COVID-19 pandemic. The findings also highlight the importance of customizing the resources available to fight the

pandemic. As the number of referrals increased, radiology departments had to cope with a much higher volume of patients. Radiographers' typical shifts were disrupted, with many needing to work extra hours. Radiography departments are critical in the identification, care, and monitoring of suspected and confirmed COVID-19 patients using imaging modalities such as computed tomography and/or general X-ray.²¹ As a result, this has overburdened radiography departments, contributing to significant changes to radiographers' working conditions.²⁹ Several studies have revealed changes in radiographers' working conditions around the world.^{11,30,36} Akudjedu et al.,³⁶ noted changes in workload and overall working conditions. Redeployments, task redistribution, and shifts, particularly at the departmental level, were highlighted by radiographers, as were perceived general workload increases. Radiography managers in Northern Ireland described the need to alter work practices to ensure that the radiology department copes with the pandemic.³⁷ The suggested changes included a) increasing working hours, b) restructuring of staff and resources, and c) changes to general departmental protocols. The radiography workforce has worked continuously throughout the pandemic and needs to be supported to deal with the potential increase in demand for services in the post-pandemic world. Furthermore, for the future, a pre-planned pandemic plan should be devised and stress tested.³⁷

Healthcare workers involved in providing front-line care during the COVID-19 pandemic are at increased risk of developing mental health problems.³⁸ Radiographers described heightened mental health issues they experienced due to fear of contracting the virus, compassion for patients, altered work routines, lockdowns, and fatigue. Radiographers highlighted that lockdowns reduced interactions with family and friends, which had a negative mental effect. Studies have shown that pre-pandemic, radiographers were suffering the effects of occupational stress, fatigue, and burnout.^{39,40} However, the COVID-19 pandemic has exacerbated mental health issues,⁴¹ and this has been documented by several studies globally.^{21,24,42-45} The factors that have contributed to these mental concerns include social distancing, lockdowns, fear of contracting the virus, fear of infecting loved ones, fear of quarantine, shortage of adequate PPE and lack of guidance, and a lack of recognition and support.²⁹

Negative mental health can lead to reduced productivity, high employee turnover, anxiety, depression, acute stress disorder, posttraumatic stress disorder, and burnout.⁴⁶ These findings are in sync with other studies involving other healthcare workers. A scoping review of COVID-19 studies similarly found unsafe workplaces, characterized by inadequate infection control practices and policies, were associated with the development of mental health problems among healthcare workers.⁴⁷ Further studies have suggested significant problems with depression and anxiety among staff occurred during the pandemic.⁴⁸ Our findings suggest radiographers, like all other healthcare workers working at the forefront of pandemics, are susceptible to various mental health consequences. This, therefore, highlights the importance of developing and implementing specific strategies to alleviate the burden of mental health consequences.

Pandemics exert significant psychological impacts on healthcare workers, emphasizing the need for appropriate mental health support and interventions.^{4,47} Despite continuing to work during the pandemic, the current review found that initially, in some settings, radiographers were not initially recognized as frontline workers and, hence, did not receive the necessary support.^{22,30} However, considering their role in providing imaging services and treating cancer during the pandemic, adequate mental health for radiographers is imperative. Radiographers in this study highlighted that they had to rely on each other for support by creating groups on social media.²² This, therefore, suggests the importance of embedding radiographer mental health support in a work environment that promotes collegial social support and a personal sense of control.

Limitations

Every review has limitations. First and foremost, this review comprises seven studies and does not include studies that have been conducted since the search was done. An update of this study may be required in the future when new studies are published. Another limitation of this review is that only studies published in English were included. There could be pertinent studies that were published in other languages. Despite these limitations, findings from this review offer an important insight into the experiences of radiographers during the COVID-19 pandemic.

Conclusion

This review identified seven primary qualitative studies from different radiography settings globally. Radiographers, like many other healthcare professionals, face information, fear, and anxiety challenges. Radiographers also experienced heightened mental health issues due to this fear, anxiety, and altered work conditions. However, unlike other healthcare professionals, radiographers were not initially recognised as frontline staff in the fight against COVID-19 in some settings. Furthermore, some radiographers complained about a lack of adequate support and had to rely on their colleagues to cope. The authors hope that this review will enhance the understanding of the experiences of radiographers during pandemics so as to create specific support mechanisms and also prepare for future pandemics or health crises.

Conflict of Interest

The authors declare no conflicts of interest.

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