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The psychological well-being of people in a COVID-19 supervised quarantine facility: A mixed methods study

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Accessible summary

What is known on the subject?

- Supervised Quarantine has been shown to impact the psychological well-being of those in quarantine both during the COVID-19 pandemic and in previous pandemics.
- There are few studies regarding the psychological impact of supervised quarantine for the purpose of COVID-19 mitigation.
- There is little research regarding the psychological well-being of professionals maintaining quarantine, despite the fact they risk potential psychological distress.

What the paper adds to existing knowledge?

- This paper addresses the paucity of knowledge regarding the psychological well-being of those undergoing quarantine in a purpose-built facility.
- The quarantined study population involved uniquely domestic arrivals and also professionals maintaining quarantine.
- Lack of control, isolation and miscommunication were perceived as challenging mental well-being.

What are the implications for practice?

- Although psychological distress in Domestic arrivals appeared low, there are still identifiable stresses on mental well-being.
- Mental health workers need to be cognizant that point entry to COVID-19 quarantine (Domestic vs. International as well as specific regions) may influence risk of psychological distress.
- Mental Health nurses supporting those in quarantine should afford quarantined individuals a degree of choice, establish regular clear communication and consider how to establish peer support mechanisms within the quarantine environment.

Abstract

Introduction: Supervised quarantine may compromise psychological well-being. There is equivocal evidence regarding psychological distress in compulsory supervised quarantine facilities.

Aims: To evaluate the mental well-being of people undergoing and working in a supervised COVID-19 quarantine facility.

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Method: Mixed methodology was used, including a cross-sectional analysis of psychological distress (DASS-21) and individual semi-structured interviews (10 professionals maintaining quarantine and 10 quarantined persons).

Results: Overall levels of psychological distress were low. Those quarantining from Victoria had significantly lower depression scores compared to all other departure points. Qualitative analysis identified distress being linked to a lack of control, isolation and miscommunication.

Discussion: Quarantine was associated with low levels of psychological distress. This was lower in people travelling from Victoria, a state where there were higher rates of infections and restrictions. Interviews showed that psychological distress was conceptualized as being associated with supervised quarantine, but participants recognized the overall importance of quarantine.

Implications for Practice: Mental health professionals supporting quarantined people should consider original departure points may predict levels of psychological distress. Implementing ways of gaining control through affording choice, improving communication channels and establishing peer support networks within quarantine settings may help maintain mental well-being.

KEYWORDS

anxiety, COVID-19, depression, pandemic, psychological distress, quarantine

1 | INTRODUCTION

Quarantine is the separation and restriction of movement of people whom are potentially exposed to a communicable disease to ascertain if they become unwell, thus reducing the risk of transmission to others. Both in Australia and abroad we have seen a range of quarantine measures imposed to address the COVID 19 Pandemic (Anderson et al., 2020; Andrikopoulos & Johnson, 2020; Chang et al., 2020; Jefferies et al., 2020; O'Sullivan et al., 2020; Pachetti et al., 2020).

In Australia these restrictions have been applied to the movement of people into Australia from overseas as well as movements between states and territories. Mandatory supervised quarantine has been applied to persons entering states and territories from both overseas and interstate hotspots. Within Australia's federated system the individual states and territories control their own public health responses. This system resulted in heterogeneous COVID prevention responses due to the varying policies. Throughout 2020 the Northern Territory was pursuing an elimination response to the virus whilst other states and territories were combatting significant outbreaks. The cornerstone of the Northern Territory's response at this time was strict border controls. At the time of data collection there were international border controls with mandatory supervised quarantine of overseas arrivals. People entering the Northern Territory from locations within Australia with significant rates of transmission, so-called 'hotspots' were also required to quarantine for 14 days on arrival into the Northern Territory. At the time of the current study in late 2020, quarantine in the Top End of the Northern Territory was

almost exclusively supervised quarantine with the Howard Springs Facility (HSF), more recently named the Centre for National Resilience (CNR).

Quarantine may present a considerable risk for people's psychological well-being. This has been demonstrated both in previous pandemics and the more recent COVID-19 pandemic (Bai et al., 2004; Jiménez-Pavón et al., 2020; Kaparounaki et al., 2020; Lei et al., 2020; Liu et al., 2012; Mediouni et al., 2020; Nielsen et al., 2008; Yoon et al., 2016). The potential for boredom, disrupted plans, a sense of lack of control and separation from loved ones are just some of the factors that might contribute to psychological distress in quarantine. There is also potential of psychological impact on the multidisciplinary workforce that services quarantine (Mediouni et al., 2020; Yoon et al., 2016).

There is emerging research into the psychological well-being of those in supervised quarantine for the mitigation of COVID-19 infections (D'Onise et al., 2021; Alkamees et al., 2020; Bahadur et al., 2021; Reagu et al., 2021; Zhu et al., 2020). These earlier studies appeared to have focussed on hotel, public sites and home models of quarantine. In contrast the HSF model was unique in being a specifically purposed quarantine facility as well as being located in a comparatively more rural and remote setting. A relatively distinct aspect of the Australian response to the COVID-19 pandemic was that state and territory borders were also highly regulated, as a result the HSF accommodated a large proportion of Australians travelling interstate as opposed to quarantine facilities in other countries that only serviced international arrivals. However, there was an opportunity to fill the research gap within this important COVID-19 pandemic initiative. Furthermore,

we saw the opportunity to enhance this area of research by including mixed methodology. This was to obtain both qualitative and quantitative data to better understand how the psychological well-being of those in quarantine may be affected during their confinement. Quantitative measures of psychological distress have been included in other previous studies (D'Onise et al., 2021), (Alkhamees et al., 2020), (Reagu et al., 2021), (Zhu et al., 2020), (Bahadur et al., 2021). However, the qualitative experience that underpinned this experience is likely equally relevant and appeared in fewer studies (Bahadur et al., 2021; Reagu et al., 2021). Finally, the psychological well-being of those working in this quarantine setting was potentially at risk. This warranted further exploration given the limited studies of health care workers (Bahadur et al., 2021) as well as the uncertain generalizability of earlier findings to the study setting.

2 | AIMS

The overall aim of this project was to evaluate the mental well-being of people undergoing and working in a supervised COVID-19 quarantine facility.

2.1 | Objectives

The quantitative objectives were to assess the prevalence of psychological distress within those undergoing quarantine within a facility using a standardized psychometric screening tool (DASS-21) and how that related to both individual demographics and domestic point of entry to quarantine in the NT.

The qualitative objectives were to better understand, through individual interviews, the experience of quarantine and how this impacted upon the psychological well-being of people quarantined and those working within the quarantine facility.

3 | METHODS

3.1 | Study design

A concurrent triangulation mixed methods study design was utilized consisting of an observational cross-sectional survey of quarantined individuals and individual qualitative interviews with quarantine workers and people under quarantine. Recent studies of quarantine for COVID-19 in Australia had shown relatively low levels of distress on psychometric screening (D'Onise et al., 2021). We intended to explore the subjective experience of quarantine beyond the prevalence data and in a way that may allow for the nuances of sub-clinical distress. Also, it was anticipated that the qualitative experience may better explain the objective findings, such as the low distress levels previously reported in the Australian context.

3.2 | Study setting

HSF was a worker's village constructed in 2012 to accommodate 3000 workers in Darwin during the construction of the Inpex LNG gas plant. It was transitioned to the NT Government in 2018. The facility became a quarantine facility for repatriated Australians from Wuhan China at the start of the COVID-19 pandemic. The facility has provided quarantine services for the NT Government since 23 March 2020. Since October 2020 it has received repatriated Australians. The accommodation is organized in blocks of four self-contained rooms with en-suites and a balcony in sections of 8–12 blocks over many acres. It has laundry facilities, sporting facilities, a pool and centralized administrative and dining facilities, repurposed for quarantine. The village is in bushland 30km out of metropolitan Darwin. Strict infection prevention and control has been paramount. The single level structures and lack of internal corridors differs to hotel quarantine in term of intra-quarantine spread of the virus due to ventilation issues.

Psychosocial supports were available at the site. There was a welfare team comprising of social workers and mental health nurses that telephone called those individuals undergoing quarantine during their quarantine. They were available to see in person using personal protective equipment (PPE). The facility has an on-site General Practitioner and community nurse whom can consult with patients for assessment, management and referral to other psychological supports. There was a visiting mental health nurse. Psychological support could be accessed through the territory wide NT Mental Health line. Phone calls were assessed by a mental health nurse or allied health mental triage clinician and escalated if required to the psychiatrist based with the team at the Royal Darwin Hospital. First responder emergency services such as paramedics could be deployed to transfer urgent cases to the Royal Darwin Hospital under strict quarantine protocol.

3.3 | Subjects

Participants in the study needed to be over 18 years old, have capacity to consent to participate in the study and fluent in English for the DASS-21 or interview. The cohort undergoing quarantine were between day 7 and day 10 of the 14-day mandatory quarantine period in the Domestic Quarantine Facility for those transiting interstate. The cohort of quarantine workers were employed in the service of the HSF and included a range of professions—social workers, health staff, security and cleaners.

The aim of the study was to describe the prevalence of psychological distress as measured by the DASS-21 screening in a convenience sample. We utilized convenience sampling given the facility's restrictions on the frequency of research team visits and the maximum number of participants allowed to be recruited. Although central limit theorem (Rosenblatt, 1956) suggests a minimum sample of 30–40 would be sufficient to estimate the mean (M), standard deviations (SD) and 95% confidence intervals of each DASS subscale (the

primary quantitative objective), we inflated this minimum to 100. This was because sampling distribution tends to become normal in larger sample sizes irrespective of the shape of the data (Ghasemi & Zahediasl, 2012) and 100 was the maximum number of participants we were permitted to recruit by the quarantine facility. For the qualitative study sample size was determined based on reaching data saturation, with an initial estimate of 10–15 participants.

3.4 | Ethical considerations and approval

The study was approved by the NT Department of Health and Menzies School of Health Human Research Ethics Committee (reference: MENZIES HREC 2020–3761) prior to commencement of the project. The study details were explained to the potential participants by a research nurse (not otherwise involved in providing support at the quarantine centre) and they were also given written information. They were required to provide their written informed consent after considering their participation. All participants were informed that participation was entirely voluntary and that they could withdraw from the study at any time without penalty. They were also informed that declining the invitation would not jeopardize their relationships with, or support from, staff working at the centre.

3.5 | Recruitment and data collection

The DASS-21 was administered to a convenience sample of 100 people undergoing quarantine in the HSF. Research staff visited the facility weekly on a Thursday morning. Prior to entering quarantine, the researchers identified with the quarantine staff which individuals in quarantine were between days 7 and 10 of their quarantine period. Days 7–10 were chosen because this was around the mid-point of the quarantine period and therefore potential participants would have had sufficient exposure to quarantine to develop adverse psychological reactions. We also wanted to avoid recruiting participants at the beginning or end of their quarantine period to obtain a relatively homogenous group that were not experiencing an initial problem adjusting to the situation upon arrival or a potential improvement in psychological well-being immediately prior to release. Those individuals were approached and if they agreed to participate they were given the survey to complete, a consent form and participant information. The completed survey was collected the same day and kept in a sealed bag until decontaminated. This was repeated over a period of 5 weeks until the sample of 100 was reached.

The semi-structured interviews were completed with participants in quarantine between days 7 and 10 of the 14-day quarantine period. Individuals meeting the eligibility criteria were identified by the research team upon entry to the facility. Potential participants were then approached to invite them to participate. Once they had provided written informed consent the interview proceeded. Workers in quarantine were also recruited and were required to

TABLE 1 Demographics of persons in HSF quarantine completing DASS-21 screens.

Demographic	
Aboriginal status	N(%)
Aboriginal	0 (0)
Non-Indigenous	94 (100)
Not specified	0 (0)
Gender	N(%)
Male	62 (66)
Female	32 (34)
Mean age in years	(SD)
40.5	9.9
Marital status	N(%)
Married	33 (35.1)
Single	57 (60.6)
Divorced	4 (4.3)

provide written informed consent. There were five main service areas working directly with quarantined individuals. These were health, security, welfare, administration and auxiliary. The research team rotated the selection of worker participants through these providers so that a range of professions were captured. If there was no worker available in one area on the day of interview, the next service area in the sequence was approached. We did not recruit auxiliary staff such as cleaners who had no contact with those in quarantine. Workers consented to the interview prior to this being undertaken. The study, including administration of the screening tools and semi-structured interviews was conducted between the 29/10/20 and the 3/1/21.

3.6 | Study variables

Simple demographic data were collected on the demographics of all individuals entering quarantine in the NT and stored electronically on the Primary Care Information System (PCIS) data base. Demographics are summarized in Table 1 for those completing the DASS-21 screening tool.

The DASS-21 was used to levels of depression, anxiety and stress. The DASS-21 was administered as it is a well-validated tool for measuring psychological distress across different cultures (Oei et al., 2013) and it is reported to have sound psychometric properties in a range of populations, including good internal consistency and concurrent validity with the original DASS-42 (Antony et al., 1998). The internal consistency of the DASS-21 in the current study was good (Cronbach's alpha = .86). All three DASS-12 subscales (Depression, Anxiety and Stress) conceptually capture psychological distress and the measure takes only a few minutes to complete. The 21-item assessment consists of seven questions per subscale. Participants recorded their response to each question on a Likert scale of 4 (never, sometimes, often and almost always,

correspondingly scored as zero, one, two and three respectively). This allowed for quantitatively ascertaining the levels of psychological distress during quarantine generally and more specifically in the three conceptual domains of Depression, Anxiety and Stress. Where culturally and linguistically appropriate the modified PHQ9 for indigenous persons was proposed to be offered as an alternative screening tool (Esler et al., 2008); however, we later found participants all identified as non-indigenous.

3.7 | Statistical analysis

Data were analysed using Microsoft excel software. Proportions were expressed as percentages, whereas means (M) and standard deviations (SD) were used for measures of centrality where appropriate. Comparisons of means were analysed using independent *t*-tests. Parametric tests were utilized despite the DASS subscales being positively skewed. The DASS by nature would be expected to be skewed in a non-clinical population because participants would not be expected to have symptoms of depression, anxiety and stress centred around the midpoint score (e.g. the 'normal' clinical relevance raw scores for depression are 0–4 and 0–3 for anxiety, whereas the midpoint of the subscales are 10.5; Henry & Crawford, 2005). We also checked the analyses by running the non-parametric equivalents of *t*-tests and ANOVAs, which did not result in any different significant findings. We applied the Bonferroni correction to minimize the risk of type I errors due to conducting multiple comparisons. Given there were four group comparison tests the adjusted *p*-value of $p < .0125$ was considered statistically significant (i.e. 0.05 divided by 4). The *t*-tests used for group comparisons were informed by previous equivocal evidence on differences in distress among quarantined individuals. Specifically, some earlier studies highlight significant differences in distress associated with quarantine across different demographics such as gender (i.e. Alkhamees et al., 2020), whereas previous similar Australian studies have reported no difference across demographics (D'Onise et al., 2021). Therefore, we sought to clarify these issues in a different setting. We also considered there may be differences in levels of psychological distress associated with the domestic departure point of quarantined individuals due to the varying rates of infections and restrictions across Australia at that time. We initially conducted an ANOVA, however post-hoc we collapsed the point of departure variable into Victoria versus others due to the magnitude of difference in the Depression scores, the overwhelming number coming from Victoria and the context of Victoria at the time (in lock down, with strict curfew and reporting high infection rates).

3.8 | Qualitative interview design

In order to complete the semi-structured interviews of individuals and workers in quarantine, the research team formulated an

interview template. The template was designed as a guide to explore the interviewee's experience of quarantine, particularly with regard to its psychological impact. Questions acted as probes. For example, '*You have worked in quarantine. From your experience what sort of stresses exist for you in this environment that aggravate mental health*'. Factors such as subject selection, exploration of key themes and the intended thematic analysis, as well as attempting to avoid bias and allowing the subject to lead the interview were all considered. The designed template was tested for timing and practical application.

3.9 | Qualitative interviews

Individual semi-structured interviews were completed with people in quarantine, to qualitatively understand their experience and distress associated with this. Persons in quarantine between day 7 and 10 were approached to participate in an interview. If they consented, they participated in an interview lasting approximately 40 min conducted by a Psychiatrist and Psychiatric Registrar using techniques such as rapport building, open-ended questions and inquisitive exploration. Of the 10 interviews conducted there were 16 individuals approached.

We similarly conducted semi-structured interviews with a sample of professionals working within the quarantine facility, to qualitatively understand the experience of quarantine workers. A range of professions in the quarantine environment were approached. Demographic data including age, sex and profession were recorded and the interviews used the same protocol to individuals in quarantine. All 10 workers approached agreed to participate in the interviews.

3.10 | Qualitative interview analysis

Data were analysed thematically as outlined by Braun and Clarke (Braun & Clarke, 2006). The verbal responses in the interview were transcribed by the interviewer. Two researchers familiarized themselves with the data, reading and re-reading the transcriptions. One researcher generated initial codes from the transcriptions. A second researcher independently reviewed the transcriptions to also generate codes. The coding was compared and differences in coding were resolved through discussion. Thematic codes emerged through exploring the data and initial content codes. The adopted was both inductive, attempting to understand the patterns that are established when individuals were asked about their experience of quarantine at the HSF, and reflexive, acknowledging that the researcher brings their own position and background knowledge to the analysis. Four interviews of each group (quarantined and workers) were initially conducted and reviewed. Subsequent runs of two interviews were then completed and reviewed until theme saturation was apparent. We then completed two further interviews to ensure no new themes

emerged. Through this process dozens of codes were generated and were then combined as appropriate and sorted into four themes for quarantined persons and four associated with quarantine workers.

4 | RESULTS

There were 100 DASS-21 screening tools completed during the project. This was exclusively obtained from domestic arrivals to the Northern Territory from interstate locations. We distributed a total of 141 DASS-21 screening tools before we obtained the target of 100. Hence the completion rate was 70.9%. Surveys were collected on the same day, placing some time imperative on the participants to complete the surveys promptly.

5 | DEMOGRAPHICS

Demographic data supplied by the study participants on the screening tool was cross-referenced with the Primary Care Information System (PCIS) database, given a file was created for persons undergoing quarantine at the HSF. Of the recorded data, 94 had complete data sets which could be confirmed with PCIS. These were included in the study. The mean age of participants was 40.5 (9.9). There were 62 males (66%), and all participants identified as non-indigenous (100%). 33 participants were married (35.1%), four were divorced (4.3%) and the remaining 57 were single (60.6%). There were a small number of persons whom were from the NT or from states where the NT had an open border but needed to quarantine due to Fly-in-Fly out type (FIFO) work. For instance, oil rig workers from WA but working offshore in the Timor Sea in a mixed international crew and therefore quarantining on return to Darwin. In such as case, there state of origin prior to offshore work was recorded. Please see [Table 1](#) for demographic details.

6 | DASS 21 SCREENING TOOLS

DASS 21 screening tools were conducted with participants between day 7 and 10 of quarantine. Of the 100 collected there were 94 DASS 21 surveys with complete data sets that were analysed. Depression, Anxiety and Stress levels appeared to be low. The mean subscale scores were 2.42 (SD = 2.80) for Depression, 0.72 (SD = 1.04) for Anxiety and 5.74 (SD = 5.59) for Stress. The ranges were similarly low with participants scoring between 0 and 12 for Depression, 0 and 4 for Anxiety and 0 and 8 for Stress. Of the 94 surveys analysed, 14 had Depression symptoms (Mild = 6, Moderate = 7, Severe = 1). There were four participants with Anxiety symptoms (Mild = 4) and one with Stress symptoms (Mild = 1).

There was no statistical difference between any of the scores for depression, anxiety or stress for the demographic comparisons. This included no difference for gender of the participants, marital status or age groups ($p > .0125$). The exception appeared to be for those arriving in quarantine from Victoria. There was a significant difference

between Depression scores for Victorians and non-Victorian arrivals ($t(88) = 3.03, p = .003$), with mean levels being lower in Victoria ($M = 1.58, SD = 1.99$) compared with the non-Victorian arrivals ($M = 3.26, SD = 3.25$). Please see [Table 2](#) for full details.

7 | SEMI-STRUCTURED INTERVIEWS

[Table 3](#) shows the identified themes and associated illustrative supportive quotes.

8 | QUARANTINED PERSONS

Theme saturation was reached after analysing eight interviews and 10 interviews were completed to ensure this had been reached. The interviews took between 45min and 1h to complete. There were six males (60%) and mean age was 34.0. All participants (10, 100%) related the experience of undergoing the interview as positive and valuable. Overall, quarantine appeared to be acceptable and well tolerated. Through thematic analysis several themes were deduced regarding the psychological welfare of those in quarantine.

8.1 | A sense of distress being linked to lack of control

Lack of agency in supervised quarantine was articulated with a diverse range of examples of difficulties such as no choice over food, minimal opportunity to use the facilities pool, feeling bored, feeling cramped or subject to government decisions. This can be summarized as issues that negatively affected the individuals' perception of locus of control. For example, individuals felt distressed by being unable to have adequate input into their situation and that agency was compromised through external influences.

8.2 | Coping with stress being linked to gaining control and preventing isolation

In turn, coping with stress required the individuals to enact a range of strategies but could be generalized as attempts to gain control as well as break social isolation.

8.3 | Distress with authorities in quarantine being linked to a perceived lack of communication

Another theme that emerged was that of communication. Similar to a lack of control, distress arose from the anticipation of not being heard or ignored by those supervising quarantine. Several participants spoke of medical emergencies taking place to other individuals in the facility and having to wait hours for ambulances to arrive. This led to anticipation of a negative outcome.

TABLE 2 DASS-21 results.

DASS 21 subscale scores	Depression	Anxiety	Stress
Group (n)	Mean (SD) (CI)	Mean (SD) (CI)	Mean (SD) (CI)
Overall (94)	2.42 (2.80) (1.85–2.99)	0.72 (1.04) (0.51–0.93)	2.45 (2.50) (1.94–2.96)
Male (62)	2.67 (2.95) (1.93–3.40)	0.67 (0.89) (0.50–0.90)	2.31 (2.29) (1.74–2.90)
Female (32)	1.91 (2.44) (1.08–2.74)	0.76 (1.28) (0.33–1.20)	2.70 (2.81) (1.74–3.66)
t-Test	–1.27	0.38	1.04
p Value	.104	.352	.151
Married (33)	3.24 (3.45) (1.64–3.99)	0.88 (1.04) (0.46–1.17)	(2.60) (1.41–3.19)
Not married (61)	2.18 (2.37) (1.57–2.78)	0.64 (1.03) (0.37–0.90)	2.52 (2.43) (1.89–3.14)
t-Test	1.12	0.70	0.72
p Value	.265	.486	.470
18–34 years (38)	2.16 (2.67) (1.24–3.03)	0.74 (1.08) (0.38–1.09)	2.84 (2.70) (1.95–3.73)
>34 years (56)	2.57 (2.89) (1.79–3.34)	0.64 (1.01) (0.43–0.97)	2.18 (2.30) (1.56–2.79)
t-Test	0.80	0.42	1.77
p Value	.424	.678	.080
Victoria (48)	1.58 (1.99) (1.08–2.08)	0.58 (1.13) (0.30–0.90)	2.48 (2.75) (1.74–3.22)
Other states (46)	3.26 (3.25) (2.97–4.30)	0.83 (0.93) (0.56–1.10)	2.65 (2.50) (1.90–3.39)
t-Test	3.03	1.14	0.32
p Value	.003*	.258	.751

* $p < .0125$.

8.4 | An overall sense that quarantine was important

Despite any perceived adversity there was an overwhelming sense of quarantine being important and necessary.

9 | QUARANTINE WORKERS

Ten semi-structured interviews of quarantine workers were completed. Theme saturations was achieved at eight interviews and another two were conducted in to ensure no new themes emerged. The mean age was 37.5. There were three welfare officers (social work background), two security guards, three registered nurses (one general nurse, one mental health nurse and one nurse in management). Several things emerged from thematic analysis of the reviews.

9.1 | Fear of making a mistake

A common fear was raised regarding the fear of failure or letting the workforce down. Many participants shared a common fear of

becoming infected in quarantine and then being the person whom allowed COVID to spread to the general community. This created a sense of apprehension in the daily work within the quarantine facility.

9.2 | That there were inherent stresses in working in the quarantine space

Participants appeared in agreement that quarantine had inherent stresses to the participants as well as the workforce. For the workers stress was related to a dynamic environment with changing work directions, staff turnover and long hours.

9.3 | Clients with complex needs

Several workers reflected on the challenges of complex psychosocial cases in quarantine. There were references to persons with high mental health needs and social issues caused intensive work for a small number of individuals. There was a sense of being unable to easily link these people into care due to the barriers of strict

TABLE 3 Thematic analysis of interviews of participants in HSF quarantine and workers.

Themes	Quotes taken from interview transcripts
Persons HSF quarantine	
A sense of distress being linked to lack of control	'I feel trapped as my space is limited to this veranda'. (Participant 6, Female) 'I feel like a hamster on an exercise wheel' and 'I am unable to partake in my normal routine or activities'. (Participant 4, Male) 'there is a lack of choices'. (Participant 1, Male)
Coping with stress being linked to gaining control and preventing isolation	'I exercise regularly or click and collect snacks and I leave the door open to feel connected to others in quarantine, so it is like community' (Participant 2, Female)
Distress with authorities in quarantine being linked to a perceived lack of communication	'I feel left in limbo as if no one is listening and I worry that if I get sick no one will respond'. (Participant 5, Male) 'There was a guy who needed an Ambulance, and it was (like) hours before it came and I can't imagine if it was me needing help, waiting' (Participant 8, Male).
An overall sense that Quarantine was important	'It's important (quarantine), to keep everyone safe'. (Participant 7, Female) 'Quarantines important, our situations not' (Participant 4, Male)
Workers in HSF quarantine	
Fear of making a mistake	'I fear making a mistake leading to community transmission' (Participant 1, Female Welfare Officer)
That there were inherent stresses in working in the quarantine space	'I get fatigued and stressed from the length of shifts' (Participant 1, Female Welfare Officer) 'I get uncomfortable in PPE (Personal Protective Equipment) in this heat' (Participant 5, Male Mental Health RN)
Clients with complex need	'(My) Lack of mental health experience makes meeting residents needs difficult' (Participant 4, Female General RN) 'It's difficult at times to manage emotional needs of residents, particularly struggling with feeling too contained' (Participant 2, Female Welfare Officer) 'There is limited training for support staff in increasingly demanding roles' (Participant 5, Male Mental Health RN)
An overall sense that Quarantine was important	'It's important (quarantine) to safeguard people' (Participant 2, Female Welfare Officer) 'It's important. Quarantine in HSF is better than my experience in hotel quarantine' (Participant 3, Male Security Guard) 'It's vital (Quarantine)' (Participant 8, Female RN)

quarantine. It was seen as difficult with quarantine restrictions to transfer to tertiary level care or arrange an in-reach mental health review. Access to telephone options appeared to be limited or workers were unsure of their utility. The stress of looking after high-needs clients was seen a potential risk for the workers psychological well-being.

9.4 | Overall sense of importance of quarantine

Similarly, workers felt that quarantine was highly important and felt despite any issues or unintended adverse effects of quarantine it was overall needed as a public health strategy. There was a sense of it being necessary to keep the community safe.

10 | DISCUSSION

The first objective of this study was to assess the prevalence of psychological distress within those undergoing supervised COVID-19 quarantine in the HSF, a repurpose built facility for the northern region of the Northern Territory.

In terms of psychological distress levels, of the 94 DASS-21 screening tools analysed at the HSF, overall mean levels were low. This is in comparison with the literature that would suggest normative data in a non-clinical US population were somewhat higher (Depression $M = 5.70$, $SD = 8.20$; Anxiety $M = 3.99$, $SD = 6.27$; Stress $M = 8.12$, $SD 7.62$; total $M = 17.81$, $SD = 20.18$) (Sinclair et al., 2012). Similar results were found in other non-clinical samples (Crawford & Henry, 2003). It is also conceivably lower than many of the other quarantine models previously reviewed, although varying psychometric tools were used (Alkhamees et al., 2020; Bahadur et al., 2021; D'Onise et al., 2021; Reagu et al., 2021; Zhu et al., 2020). Categorical comparisons further emphasize low distress levels.

It is perhaps of significance that the HSF model studied was exclusively domestic interstate arrivals. Conceivably, the higher level of distress is contextualized by the other quarantine studies having reviewed international arrivals (Alkhamees et al., 2020; Bahadur et al., 2021; D'Onise et al., 2021; Reagu et al., 2021; Zhu et al., 2020). It is likely the pre-quarantine stresses differed and included any number of logistical challenges such as need to obtain international entry, time waiting and long travel distances.

At the HSF, depression, anxiety and distress were not significantly different across a range of demographics. This included

gender, age groups and marital status. It is notable that quarantine facilities with low psychological distress similarly recorded non-significant differences between demographics (D'Onise et al., 2021). Studies with higher levels of distress did discern significant demographic differences (Alkhamees et al., 2020; Reagu et al., 2021).

Quarantine during the COVID-19 pandemic has occurred in many forms globally. This included quarantine in residential accommodation, hotel settings as well as repurposed facilities. The levels of psychological distress have varied considerably between studies. In an Australian study of quarantine undertaking at medi-hotels in South Australia in 2020, levels of psychological stress were low (D'Onise et al., 2021). In contrast, it was higher within involuntary quarantine facilities in Saudi Arabia, as well as higher for females and those with pre-existing mental illness (Alkhamees et al., 2020). The levels of psychological distress were also high in state-managed facilities in Qatar (Reagu et al., 2021). The variation in distress levels is difficult to account for but highlights the heterogeneity of the quarantine experience. It is possible that both the quarantine setting, relative access to psychological support as well as the circumstances leading up to quarantine and personal vulnerabilities each contribute.

It could be speculated that quarantine in the HSF may not only have minimal impact on the psychological well-being of those in quarantine but also be protective. If the origin of those coming to quarantine is considered, the significant difference between those coming from Victoria and those coming from other states is pertinent. Those in quarantine from Victoria were significantly less likely to have depression features than those from the combined non-Victorian states. The study ran through the second wave of the pandemic in Melbourne and greater Victoria in late 2020, when the Victorian state government had put in place far reaching restrictions that affected the daily life of many of its residents. Possibly any inherent hardship in the HSF facility were mitigated in this group, whom whilst facing the restrictions of supervised quarantine, had negotiated their way out of a lock-down in Victoria. In short—where people's original departure point may impact on the level of psychological distress in quarantine.

The second study objective was to better understand the psychological experience of those undergoing quarantine, and those working at the facility. The semi-structured interviews provided qualitative insights into the psychological well-being of those quarantined. This added an evaluation dimension, not always captured in other studies. We also investigated the experience of a range of quarantine workers, both health and non-health related. Both those in quarantine and quarantine workers were able to conceptualize psychological distress being associated with supervised quarantine. Those quarantined identified distress as being linked to a lack of control, isolation and miscommunication. The key concepts identified were the link between perceived distressed and a lack of agency in quarantine. In such a scenario the antidote appeared to be implementing ways of gaining control. For instance, instead of supplying pre-made meals, giving persons supplies to prepare food as they like, instead of restricting persons, giving them space and resources to exercise and the opportunity to feel socially connected. Workers worried about COVID-19 infection, changing dynamics and long hours. Distress was potentially mitigated by both

groups perceiving the importance of quarantine as a public health strategy. A Nepal quarantine study was one of the few others to interview quarantined persons and workers, although on a smaller scale (Bahadur et al., 2021). It identified poor living conditions and lack of access to healthcare as adversely affecting mental health. Perhaps this accounts for the higher rates of depression and anxiety identified. The workers fear of infection in the Nepalese study (Bahadur et al., 2021) was notably similar to the current study.

In contrast, the HSF is a unique model of quarantine, in which the participants in quarantine, within the limits of social distancing and infectious control, are given certain liberties not always present in quarantine settings. This included open space, the use of a recreational pool and the ability to be in ground level demountable accommodation in proximity to others in quarantine. Whilst unlikely a perfect set-up, it may offer certain psychological advantages. Research into comparing the psychological effects of HSF with other models of quarantine is warranted.

At the time of writing there is a major transition within the HSF. The Northern Territory has begun to accept large numbers (up to 2000 at a time) of repatriated Australian citizens and permanent residents into the rebranded Centre for National Resilience (CNR). Simultaneously the governance and operations of the CNR has transitioned entirely to NT Health. This study provides learnings that may be relevant to this new cohort of arrivals. At the same time genomic variants with the potential for increased transmissibility mean that wellbeing initiatives deemed appropriate for domestic hotspot arrivals have been reshaped for repatriation arrivals. Whilst this study is reassuring, further study related to psychological distress among this new cohort is imperative. Similarly, understanding how the pre-departure experience of future arrivals impact on intra-quarantine psychological distress is clearly important.

11 | RELEVANCE FOR MENTAL HEALTH NURSING PRACTICE AND RESEARCH

Mental health nurses have been the cornerstone of psychological support to the HSF Quarantine Facility, both working directly on-site as well as within the local mental health crisis and assessment services. It is likely that mental health nurses will be utilized as the key mental health support to other models of COVID-19 quarantine. We now have a better understanding of the psychological well-being of those in supervised COVID-19 quarantine for domestic purposes. Specifically, mental health nurses supporting those in quarantine should afford quarantined individuals a degree of choice to address a perceived lack of control, establish regular clear communication and consider how to establish peer support mechanisms within the quarantine environment to minimize feelings of isolation. These new insights into psychological well-being can be used to optimize the delivery of mental health nursing care to those undergoing quarantine during this pandemic and into the future. There is a need for further comparative research between HSF-type facilities and other models of quarantine to better ascertain the relative risk of psychological distress.

12 | STUDY LIMITATIONS

The study conclusions should be considered in light of several methodological limitations. The cross-sectional design of the study is relatively low on the hierarchy of evidence, despite suiting the goals of this descriptive project. In an ideal scenario there would be comparisons between the HSF and other models of care. Also, the DASS-21 screening was also only sampled at one point in time (days 7–10 in quarantine) due to logistical issues in accessing the quarantine facility more regularly. A more rigorous method may have been to sample two or more points in time during the quarantine process to discern temporal changes in psychological distress. It is our intention that more robust comparative studies are completed in future. Another limitation is the method of data collection. It should also be noted that whilst we intended to collect 100 DASS 21 screens this was reduced to 94 on analysis due to inconsistencies in the demographic data between the screening surveys collected the centralized data stored in PCIS. In the dynamic landscape of quarantine, it was probably not surprising that these data sets were not necessarily completely matching and a reminder of the logistical challenges of setting up these systems quickly in an emergency situation. There are also challenges in accurately collecting data in PPE whilst maintaining infection control. Researchers administered surveys and interviews to those in quarantine in extreme heat and humidity whilst in restrictive PPE, limiting comfort and the time that could be spent completing the required field work.

Convenience sampling suited the logistical challenges of the study. Data were collected expediently, in case the circumstances of quarantine rapidly changed. However, this was at the expense of sounder sampling methods. The small sample size was a further study limitation. It is also possible that those volunteering to participate in the study created a selection bias towards those more resilient to quarantine, thus giving the impression of relatively limited psychological distress. Ideally, the DASS 21 screening tool could be incorporated as a standard screening questionnaire for all persons entering the HSF or similar facility. If this were the case, we may have had a larger pool of data from which to make our conclusions. In reality this was not logistically possible and there was neither the resources from the research team nor the HSF to implement this strategy. The relatively short interviews and narrow line of questioning was necessitated by the research being undertaken in a high risk, real-life setting. The need to keep the questions tightly focused on the psychological impact of quarantine may have limited the depth of the responses and the quality of the data.

13 | CONCLUSIONS

Overall, supervised mandatory quarantine in the HSF appeared to be associated with relatively low levels of psychological distress. Those in quarantine from Victoria had significantly lower levels of depression than other states. It is possible that in that scenario, quarantining at the HSF, during the second wave of the COVID 19 pandemic and strict lock-downs in Victoria, was psychologically less

distressing than the alternative circumstance. There was no significant difference in distress levels between comparative groups (age, gender and relationship status). Both those in quarantine and those working in quarantine were able to conceptualize the link between quarantine and psychological distress but could see the overall importance of supervised quarantine as a public health strategy.

14 | RELEVANCE STATEMENT

Supervised Quarantine has been implemented in many countries to control the spread of COVID-19. However, it has the potential to significantly impact mental well-being and mental health nurses have been responsible to manage mental health in these settings. This study better discerns the impact of quarantine on mental health well-being within a purpose-built quarantine facility. Mental health workers should identify those at higher risk of psychological distress, afford quarantined individuals a degree of choice, establish regular clear communication and reduce the feelings of isolation.

AUTHOR CONTRIBUTIONS

DM and DE designed the study. DM, KS, DS, LV and LNG coordinated recruitment and data collection. DM, KS, LNG and DB analysed the data. DM, DB, DE and KS drafted the manuscript. All authors reviewed, revised and edited the final version of the manuscript.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICAL APPROVAL

The study was granted ethical approval by the MENZIES School of Health Research Ethics Committee (reference number 2020–3761) prior to commencement of the project in October 2020.

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