BMC Nephrology

RESEARCH Open Access

Symptom reduction in kidney transplant patients from 20-minute mindful breathing: a randomized controlled trial

Kai Wei Lim[1], Kok Peng Ng[1*], Shok Hoon Ooi[1], Wei San Siow[1] and Seng Beng Tan[2]

Abstract

Background Many kidney transplant recipients continue to be affected by multiple symptoms even after their transplant. Mindfulness may be helpful to alleviate some of the symptoms.

Objectives Our current study aimed to determine the efficacy of a single session of 20-minute mindful breathing in alleviating multiple symptoms in kidney transplant patients.

Methods Adult kidney transplant patients with at least one symptom scoring ≥ 4/10 based on the Edmonton Symptom Assessment Scale (ESAS) were recruited from November 2020 to May 2021. Participants were randomly assigned to either 20-minute mindful breathing or control.

Results Sixty participants were recruited and randomly assigned to intervention ($N=30$) or control ($N=30$). There was statistically significant greater reduction of the total ESAS score in the intervention group compared with the control group (mean difference = -4.833, confidence interval = -7.837, -1.830, t = -3.251, $p=0002$).

Conclusion Our results provided evidence that 20-minute mindful breathing could reduce multiple symptoms rapidly in kidney transplant recipients.

Keywords Kidney transplant, Mindfulness, Symptoms reduction, Mindful breathing, Brief mindful breathing exercise, Anxiety

Background

Although kidney transplant is the treatment of choice for patients with end-stage kidney failure, many transplant recipients continued to be troubled by various symptoms even after their transplant [1]. On average, kidney transplant patients experienced a total of seven symptoms, compared to nine symptoms for those who were on dialysis [1, 2]. While certain symptoms definitely showed improvement post-transplantation, such as pruritus, fatigue, xeroderma, cramps, and anorexia; many symptoms remained after transplant, such as weakness (55%), sleep disturbances (45%), dyspnoea (42%), anxiety (36%), drowsiness (35%), body image dissatisfaction (35%), weight gain (33%), and depression (32%) [1, 3]. These symptoms can be attributed to medication side effects or poor allograft function [1, 4].

It is crucial to recognize and manage symptoms in transplant patients because a high symptom burden may affect the outcome of both the transplant and the patient. It may contribute to anxiety and depression [5]. Anxiety and depression in turn are associated with noncompliance with medications, higher morbidity, graft failure and death [6–8]. Therefore, transplant patients should be monitored for symptoms and interventions should be delivered if clinically appropriate. Patients may require modifications to their immunosuppressive regimens

*Correspondence:
Kok Peng Ng
kokpeng@um.edu.my
[1]Department of Medicine, University of Malaya Medical Center, Kuala Lumpur, Malaysia
[2]Subang Jaya Medical Center, Subang Jaya, Malaysia

or prescription of adjunctive therapies to manage their symptoms [9]. Among the interventions to reduce symptoms, non-pharmacological strategies should be considered first-line to avoid complicating the complex transplant regimens [10].

Mindfulness is a moment-to-moment awareness, cultivated by paying attention in a specific way, in the present moment, as non-reactively, non-judgmentally, and open-heartedly as possible [11]. The practice of mindfulness may increase metacognitive awareness, which is the ability to reperceive or decenter from one's thoughts and emotions, and view them as passing mental events rather than to identify with them or believe them to be accurate representations of reality [12]. Mindfulness-based interventions, such as mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT), have been shown to improve pain acceptance, fatigue, insomnia, stress, anxiety, and depression [13–16].

Although conventional 8 weeks of mindfulness intervention has been proven effective in reducing symptoms of anxiety, depression, and insomnia in solid organ transplant patients, the efficacy of brief mindfulness exercises in the transplant setting remain unexplored [17]. Brief mindfulness exercises lasting 5–30 min have been reported to reduce suffering, pain, breathlessness, and multiple symptoms among palliative care patients [18–20]. In a transplant survey, 78% of respondent preferred brief mindfulness session lasting no more than 60 min over the conventional two-hour practice [21]. We have previously conducted few studies to evaluate the efficacy of 20-minutes mindful breathing exercises in symptoms reduction among different populations including cancer patients, chronic lung diseases patients, acute decompensated congestive heart failure patients and caregiver [22–26]. Hence, our current study is a replication study aimed to determine the efficacy of a single session of 20-minute mindful breathing in alleviating multiple symptoms in kidney transplant patients. Among many other types of mindfulness practice, mindful breathing exercise was chosen because it is the core practice in mindfulness. Other types of mindfulness practice will be studied in subsequent studies.

The study has been registered under ClinicalTrials.gov with first registration date on 09/11/2022, searchable by the identifier NCT05809440 with Protocol ID 2020116-9206.

Methods

A parallel-group, non-blinded, randomized controlled trial based on the CONSORT criteria was conducted at the University of Malaya Medical Centre, Malaysia, from November 2020 to May 2021, in accordance with the Declaration of Helsinki Ethical Principles and Good Clinical Practices. Approval was obtained on 25/01/2021 from the Medical Ethics Committee of University of Malaya Medical Centre (MREC no: 2020116-9206). Patients were recruited by investigators from the transplant clinic. Inclusion criteria were (1) stable adult kidney transplant patients > 6 months post op aged 18 years and older, and (2) at least one symptom scoring ≥ 4/10 based on the Edmonton Symptom Assessment Scale (ESAS) [22]. Patients were excluded if they were dialysis-dependent, medically unstable defined by abnormal readings of vital signs (blood pressure < 100/60mmHg, heart rate > 100 beats per minute, respiratory rate > 16 breath per minute, SpO2 < 95%), or having serious pre-existing mental health issues (previously diagnosed with psychiatric disorders not in remission yet). Written consent was obtained from all participants. Participants were randomly assigned by the investigators to either intervention or control based on computer generated random number with 1:1 allocation ratio. Allocations were concealed with sealed envelopes.

Participants assigned to the intervention group received a 20-minute mindful breathing session guided by a trained medical doctor. The session consisted of four 5-minute breathing exercises done consecutively. Participants were instructed to close their eyes and bring their attention to their breathing, and re-direct their attention back to their breathing once they were distracted. The four exercises are presented in Table 1. Participants in the control group were informed to carry on with what they were initially doing.

Outcome was measured in both group of participants at baseline (T0) and after 20 min (T20) using ESAS, a validated scale to assess 10 symptoms commonly experienced by patients, which are: pain, fatigue, nausea, depression, anxiety, drowsiness, shortness of breath, anorexia, other symptoms, and feelings of well-being. The severity of each symptom was rated on a numerical scale of 0 to 10 (0 = no symptom; 10 = worst possible symptom) [22, 23, 27, 28]. Feedback were collected from intervention group by asking the participants how they feel during the exercise and challenges faced during the exercise.

Statistical analyses were performed using SPSS (version 21.0). Within-group comparison of ESAS scores at T0 and T20 was analysed using paired t-tests, while between-group comparison of changes in ESAS scores was analysed using independent sample t-tests. A p value of < 0.05 was used to define statistical significance. The effect size was calculated using Cohen's D. For a power of 80% and type I error of 0.05, taking a difference of 10, expected population standard deviation of 12, and 20% drop rate, a sample size of 60 (30 in each arm) was determined [20].

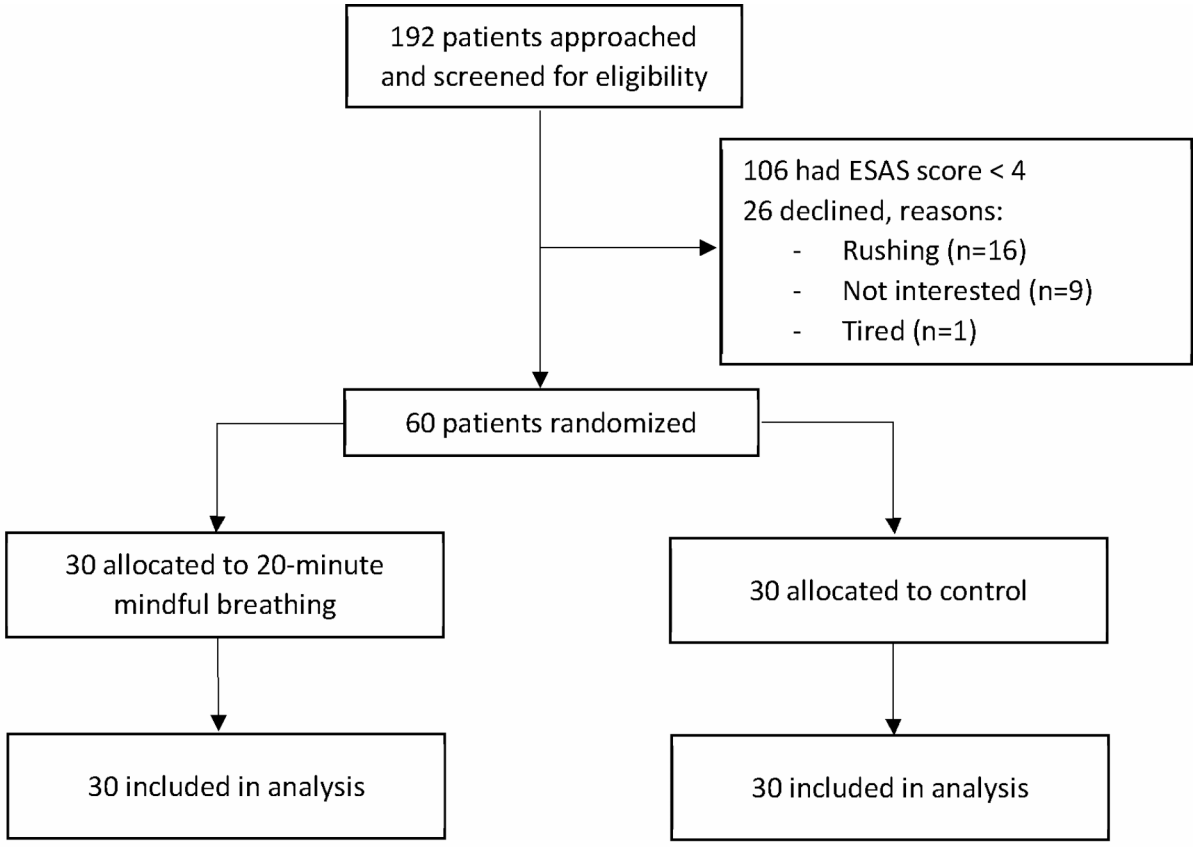
Table 1 Instructions for 20-min mindful breathing

Step 1 (5 minutes): Identifying the in- breath and out-breath Make yourself comfortable. Relax your body. Close your eyes gently. Take two deep breaths slowly. Then, breathe naturally. Notice the flow of air through your nose. Rest your attention gently on the breath. Breathing in, you know you are breathing in. Breathing out, you know you are breathing out. In – out, in – out, in – out. If you are distracted by any sounds, body sensations, thoughts or feelings, gently come back to your breath. Be aware of your in-breath and out-breath for the next few minutes.
Step 2 (5 minutes): Following the entire length of the breath Continue to relax your body with your eyes closed. Continue to pay attention to your breath. Follow the entire length of your breath. Follow the beginning, the middle and the end of your in- breath, and the beginning, middle and the end of your out-breath. If you are breathing in a long breath, you know you are breathing in a long breath. If you are breathing in a short breath, you know you are breathing in a short breath. If you are breathing out a long breath, you know you are breathing out a long breath. If you are breathing out a short breath, you know you are breathing out a short breath. Do not force yourself to take a long or short breath. Just breathe naturally. Be aware of the entire length of the breath. In – in – in, out – out – out, in – in – in, out – out – out. If you are distracted by any sounds, body sensations, thoughts or feelings, gently come back to your breath. Follow the entire length of your breath for the next few minutes.
Step 3 (5 minutes): Bringing the mind back to the body As you follow the entire length of your breath, bring your mind back to your body. Instead of thinking about the past or future, bring your mind back to now. Bring your mind and body together as one. As you breathe in, feel your whole body moving with your breathing in. As you breathe out, feel your whole body moving with your breathing out. Breathing in, you are aware of your whole body as you are breathing in. Breathing out, you are aware of your whole body as you are breathing out. Feel the different parts of your body as you breathe in and out. Then, feel the body as a whole, fully united with your mind. Feel the wholeness of yourself with each breath for the next few minutes.
Step 4 (5 minutes): Relaxing the body Once your breathing is harmonious, your body will relax naturally. Feel whether there is any tension in your body. Breathe and relax the tension one by one, from the top to the bottom. Relax your head, face, neck, arms, forearms, hands, chest, abdomen, legs, feet. Then relax your whole body all at once. Breathing in, you calm your body when you are breathing in. Breathing out, you smile. Again, breathing in, you calm your body when you are breathing in. Breathing out, you smile. In – out – calm – smile, in – out – calm – smile, in – out – calm – smile. Feel your breath flowing through your body and calming your body. Feel your breath leaving your body and smile. Continue to relax your whole body for the next few minutes.

Results

Of the 192 patients approached and screened, 106 had a low ESAS score of < 4/10 for all symptoms, and 26 declined participation. Sixty participants were randomly assigned to either the intervention group ($N = 30$) or the control group ($N = 30$). The CONSORT flow diagram is illustrated in Fig. 1. Sixty participants completed the study and were all included in the intention-to-treat analyses. Table 2 shows the demographic characteristics of these participants. The mean age was 50 in the intervention group and 48 in the control group. The majority of them were Chinese, followed by Malay and Indian. The commonest kidney transplant was living-related, followed by cadaveric and living-unrelated. There was no statistically significant difference in all the demographic characteristics between the two groups except for previous mindfulness experience, in which the intervention group had more participants with previous mindfulness experience.

For within-group comparison of the total ESAS score, there were statistically significant reductions in both the intervention group (mean difference = -8.933, standard deviation = 7.423, t = -6.592, $p = 0.000$) and the control group (mean difference = -4.100, standard deviation = 3.346, t = -6.711, $p = 0.000$). Regarding within-group comparisons of the individual ESAS symptoms, significant improvements were observed for fatigue, nausea, depression, anxiety, well-being and shortness of



ESAS, Edmonton Symptom Assessment Scale

Fig. 1 CONSRT (consolidated standards of reporting trials) flow diagram

breath in the intervention group, and fatigue, depression, drowsiness and shortness of breath in the control group. These results are shown in Table 3.

For between-group comparison of changes in the total ESAS score, there was statistically significant greater reduction in the intervention group compared with the control group (mean difference = -4.833, confidence interval = -7.837, -1.830, t = -3.251, $p = 0002$). Multivariate analysis was done using ANCOVA to adjust for previous mindfulness exposure, which showed significant effect in change in total ESAS score between intervention and control group after adjusted for previous mindfulness exposure, F (1, 57) = 7.273, $p = 0.009$. Regarding changes in the individual ESAS symptoms, significant greater reductions were observed for nausea and anxiety in the intervention group compared with the control group. The results are reported in Table 4. The changes in total ESAS scores for all 60 participants are further illustrated with a Waterfall Plot in Fig. 2.

Feedback from the participants in the intervention group were classified into positive feedback and challenges, and reported in Table 5. There were no adverse events reported in both groups except one participant from the intervention group who mentioned that the exercise triggered distressing past memory in her but her unpleasant feelings went away during the third and fourth exercises.

Discussion

The results provided evidence that 20-minute mindful breathing could reduce multiple symptoms rapidly in kidney transplant recipients. Participants randomized to the 20-minute mindful breathing arm reported significant improvement in 6 symptoms – fatigue, nausea, depression, anxiety, well-being and shortness of breath. Compared to the control group, participants in the intervention group experienced less nausea and anxiety. These findings suggest that brief mindfulness exercise can be recommended to kidney transplant recipients who are bothered by these symptoms.

This is the first randomized controlled trial of a single session of 20-minute mindful breathing in kidney transplant recipients. Compared with conventional mindfulness-based interventions that require 8 weeks of

Table 2 Demographic characteristics

Characteristics	Group		p value
	20-Minute Mindful Breathing (n=30)	Control (n=30)	
Mean age ± SD	50.3 ± 12.2	48.8 ± 12.1	0.634*
Gender, n (%)			
Female	18 (54.5)	15 (45.5)	0.436†
Male	12 (44.4)	15 (55.6)	
Patient Type, n (%)			
Outpatient	26 (86.7)	29 (96.7)	0.161†
Inpatient	4 (13.3)	1 (3.3)	
Race, n (%)			
Chinese	18 (60.0)	21 (70.0)	0.227†
Malay	7 (23.3)	8 (26.7)	
Indian	5 (16.7)	1 (3.3)	
Religion, n (%)			
Buddhist	9 (30.0)	18 (60.0)	0.107†
Islam	7 (23.3)	7 (23.3)	
Christian	7 (23.3)	3 (10.0)	
Hindu	5 (16.7)	1 (3.3)	
No religion	2 (6.7)	1 (3.3)	
Marital Status, n (%)			
Married	24 (80.0)	19 (63.3)	0.204†
Single	6 (20.0)	9 (30.0)	
Divorced/Separated	0 (0.0)	2 (6.7)	
Educational Level, n (%)			
Tertiary	17 (56.7)	11 (36.7)	0.181†
Secondary	12 (40.0)	15 (50.0)	
Primary	1 (3.3)	4 (13.3)	
Employment Status, n (%)			
Government Sector	1 (3.3)	2 (6.7)	0.499†
Private Sector	7 (23.3)	5 (16.7)	
Self-employed	8 (26.7)	11 (36.7)	
Unemployed	8 (26.7)	10 (33.3)	
Retired	6 (20.0)	2 (6.7)	
Income Group, n (%)			
RM0 - RM4849	17 (56.7)	21 (70.0)	0.547†
RM4850 - 10959	8 (26.7)	6 (20.0)	
> RM10960	5 (16.7)	3 (10.0)	
Staying with, n (%)			
Partner and/or children	24 (80.0)	19 (63.3)	0.092†
Parents and/or siblings	3 (10.0)	10 (33.3)	
Alone	1 (3.3)	1 (3.3)	
Others	2 (6.7)	0 (0.0)	
Cause of Renal Failure, n (%)			
Unknown	10 (33.3)	12 (40.0)	0.765†
Primary GN	7 (23.3)	7 (23.3)	
DM	4 (13.3)	4 (13.3)	
ADPKD	4 (13.3)	1 (3.3)	
Hypertension	3 (10.0)	4 (13.3)	
Lupus Nephritis	1 (3.3)	1 (3.3)	
Reflux Nephropathy	1 (3.3)	0 (0.0)	
Drug-related	0 (0.0)	1 (3.3)	
Age at Transplantation, mean ± SD	37.8 ± 10.1	41.5 ± 11.2	0.181*
Months Post-transplant, median (IQR)	102.0 (211)	61.5 (125)	0.115‡
Types of Transplantation, n (%)			
LRRT	22 (73.3)	22 (73.3)	0.270†
Cadaveric	7 (23.3)	4 (13.3)	
LNRRT	1 (3.3)	4 (13.3)	
Charlson Comorbidity Index, n (%)			
2	10 (33.3)	10 (33.3)	0.478†
3	7 (23.3)	10 (33.3)	
4	5 (16.7)	5 (16.7)	
5	4 (13.3)	4 (13.3)	
6	3 (10.0)	0 (0.0)	
7	1 (3.3)	0 (0.0)	
8	0 (0.0)	1 (3.3)	
Karnofsky Performance Status, n (%)			
A (No special care needed)	26 (86.7)	29 (96.7)	0.161†
B (Needs assistance in selfcare)	4 (13.3)	1 (3.3)	
C (Unable to care for self)	0 (0.0)	0 (0.0)	
Recruitment			
Outpatient	26 (86.7)	29 (96.7)	0.161†
Inpatient	4 (13.3)	1 (3.3)	
Total ESAS Score at Baseline, median (IQR)	21.5 (18)	17.0 (14)	0.198‡
Previous mindfulness experience			
Yes	8 (26.7)	2 (6.7)	0.038†
No	22 (73.3)	28 (93.3)	

* Independent T-Test; † Chi-Square Test; ‡ Mann-Whitney U Test; DM, Diabetes Mellitus; GN, Glomerulonephritis; ADPKD, Autosomal Dominant Polycystic Kidney Disease; LRRT, Living Related Renal Transplant; LNRRT, Living Non-related Renal Transplant.

commitment to achieve a sustained effect, our findings support the use of 20-minute mindful breathing when a quick relief is needed [17, 29]. Benefits from a non-pharmacological intervention are important for this population because adding further symptom control medication to the complex immunosuppression regimen can complicate the situation.

Positive feedback from the participants in the mindful breathing group suggested that the mechanism of symptom reduction could be related to the relaxation of the body and the calming of anxiety since anxiety can be associated with many physical symptoms [30–32]. Mindfulness based interventions target at cognitive reactivity by breaking the cycle of negative emotion - negative thinking pattern - painful bodily sensation through cultivation of awareness, decentering, and reactivity [33, 34] The therapeutic stance of mindfulness based intervention is grounded on promoting enhanced awareness towards thoughts and feelings. It exerts its psychological mechanisms of action by increasing acceptance, self-compassion, present-moment awareness, and ability to selectively deploy one's attention, while enhancing cortical regulation of limbic circuits involved in affective disorders [35, 36]. Anxiety and physical symptom reduction could be mediated by increased parasympathetic activity while focusing one's attention on the breath [32].

Challenges faced by the participants in the mindful breathing group included difficulty to focus due to distractions from their troublesome symptoms or the environment, and falling asleep during the practice. These challenges are known hindrances in mindfulness practices [35].

The description of unpleasant memory triggered by the mindfulness exercise in one participant warrants proper attention. Although that participant did not have a medical record of psychiatric illness, and that her experience was transient and it disappeared towards the second half of the practice, caution needs to be exercised for patients with prior mental health problems or past traumatic experiences to avoid any untoward adverse effect. Patients with higher levels of repetitive negative thinking, those who engage in deconstructive types of meditation such as insight meditation, and those who attend a meditation retreat are more likely to report unpleasant meditation-related experiences [36]. Causative mechanism behind is likely related to increased body awareness and/or activation of the insula cortex, which can be associated with increased anxiety, panic, and flashbacks. Mindfulness based practice mechanisms of decentering, or increased psychological distance from experience, and prefrontal control over the amygdala can be associated with disembodiment, affective blunting, and dissociation

Table 3 Within-group comparison of ESAS scores at T0 and T20 for intervention and control group

	Mean ± SD		Mean Difference	SD	t	P value*	Effect size#
	T0	T20					
20-minute Mindful Breathing Group (n=30)							
Pain	1.33 ± 1.936	0.93 ± 1.701	-0.400	1.429	-1.533	0.136	0.220
Tiredness	3.20 ± 2.235	1.63 ± 2.008	-1.567	2.239	-3.833	0.001	0.739
Nausea	0.43 ± 1.135	0.13 ± 0.507	-0.300	0.750	-2.192	0.037	0.341
Depressed	2.23 ± 2.269	1.13 ± 1.676	-1.100	1.709	-3.525	0.001	0.551
Anxiety	4.07 ± 1.856	1.50 ± 1.697	-2.567	1.851	-7.595	0.000	1.445
Drowsiness	2.07 ± 2.288	1.20 ± 1.972	-0.867	2.662	-1.783	0.085	0.407
Lack of Appetite	2.40 ± 2.430	2.33 ± 2.233	-0.067	2.016	-0.181	0.858	0.030
Well-being	3.17 ± 2.437	2.10 ± 2.090	-1.067	1.799	-3.247	0.003	0.471
Shortness of Breath	2.00 ± 2.334	0.83 ± 1.510	-1.167	2.001	-3.193	0.003	0.595
Other Symptoms	1.17 ± 2.276	1.33 ± 2.695	+0.167	2.335	+0.391	0.699	0.064
Total Score	22.07 ± 11.960	13.13 ± 12.596	-8.933	7.423	-6.592	0.000	0.728
Control Group (n=30)							
Pain	1.80 ± 2.340	1.43 ± 1.924	-0.367	1.326	-1.515	0.141	0.173
Tiredness	3.03 ± 2.456	2.03 ± 1.956	-1.000	1.509	-3.631	0.001	0.450
Nausea	0.17 ± 0.648	0.23 ± 0.626	+0.067	0.450	+0.812	0.423	0.094
Depressed	1.60 ± 1.958	1.00 ± 1.661	-0.600	1.303	-2.523	0.017	0.330
Anxiety	2.30 ± 2.087	2.00 ± 2.133	-0.300	1.343	-1.224	0.231	0.142
Drowsiness	2.17 ± 1.895	1.63 ± 1.771	-0.533	0.900	-3.247	0.003	0.294
Lack of Appetite	2.40 ± 2.044	2.23 ± 2.144	-0.167	0.874	-1.044	0.305	0.081
Well-being	2.53 ± 2.161	2.17 ± 1.931	-0.367	1.159	-1.733	0.094	0.176
Shortness of Breath	1.20 ± 1.769	0.80 ± 1.424	-0.400	0.968	-2.262	0.031	0.249
Other Symptoms	0.77 ± 2.254	0.33 ± 1.322	-0.433	1.305	-1.819	0.079	0.238
Total Score	17.97 ± 9.053	13.87 ± 8.613	-4.100	3.346	-6.711	0.000	0.464

* Paired T-Test; SD, Standard deviation

Cohen D

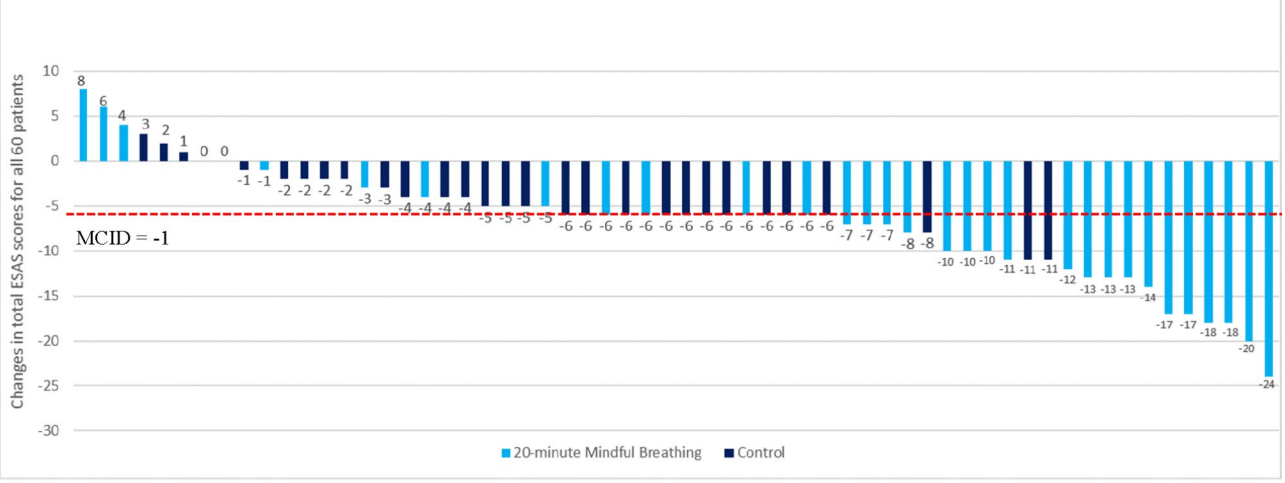
[37]. These undesired adverse effects should be included as part of the informed consent, while monitoring and observations need to be carried out during and after the intervention, and the activity should only be carried out by certified mindfulness trainer.

Our study has several limitations. The study was conducted in non-blinded method because intervention involve physical participation which makes blinding not easily applicable, which may introduce bias in self-reporting outcome. Majority of the patients were outpatients with good performance status. All were post-transplant for more than 5 years. These factors limit the generalization of the results to inpatients who are sicker or to those within the earlier period post-transplant. The study examined the immediate effect of a single session of 20-minute mindful breathing, but not the sustained effect. Questions remained to be answered include the optimal duration of a single session that can produce a maximally intended outcome, and the number of sessions required to produce a sustained effect. Both intervention and control group had significant reduction in some symptoms after 20 min, it is possible that the reduction happens with time regardless in both intervention and control group. Intervention group has more participants with prior mindfulness experience, it is possible that cumulative meditation effect could result in

Table 4 Between-group comparison of changes in ESAS scores

Variable	Mean Changes ± SD		Mean Difference	95% Confidence Interval		t	p value*	Effect Size #
	20-Minute Mindful Breathing (n=30)	Control Group (n=30)		Upper Limit	Lower Limit			
Pain	-0.40 ± 1.429	-0.37 ± 1.326	-0.033	-0.746	0.679	-0.094	0.926	0.021
Tiredness	-1.57 ± 2.239	-1.00 ± 1.509	-0.567	-1.553	0.420	-1.150	0.255	0.299
Nausea	-0.3 ± 0.750	0.07 ± 0.450	-0.367	-0.688	-0.046	-2.297	0.026	0.598
Depressed	-1.10 ± 1.709	-0.60 ± 1.303	-0.500	-1.285	0.285	-1.274	0.208	0.329
Anxiety	-2.57 ± 1.851	-0.30 ± 1.343	-2.267	-3.104	-1.429	-5.429	0.000	1.403
Drowsiness	0.87 ± 2.662	-0.53 ± 0.900	-0.333	-1.374	0.707	-0.650	0.520	0.704
Lack of Appetite	-0.07 ± 2.016	-0.17 ± 0.874	0.100	-0.703	0.903	0.249	0.804	0.064
Well-being	-1.07 ± 1.799	-0.37 ± 1.159	-0.700	-1.485	0.085	-1.791	0.079	0.462
Shortness of Breath	-1.17 ± 2.001	-0.40 ± 0.968	-0.767	-1.586	0.053	-1.889	0.066	0.490
Others	0.17 ± 2.335	-0.43 ± 1.305	0.600	-0.378	1.578	1.228	0.224	0.317
Total Score	-8.93 ± 7.423	-4.10 ± 3.346	-4.833	-7.837	-1.830	-3.251	0.002	0.839

* Independent T-Test
# Cohen's D



ESAS, Edmonton Symptoms Assessment Scale; MCID, Minimal Clinically Important difference.

Fig. 2 Changes in total ESAS scores for all 60 patients (waterfall plot)

more significant reduction. Recommendations for future studies include wider patient demographic to increase generalisability of the result, examining the effect of regular self-practice in reducing multiple or individual symptom, practice with a longer duration such as 1–2 h, or combining the practice with other pharmacological or non-pharmacological treatment.

The study has shown that a single session of 20-minute mindful breathing can provide quick relief for multiple symptoms in kidney transplant recipients. Besides

Table 5 Feedbacks from the participants in the intervention group

Positive feedbacks from the participants	Challenges faced by the participants
Calmness and reduced anxiety "It makes me feel calm and less anxious." "I feel less anxious after the session." "Coming to the hospital often makes me feel anxious but this exercise calms me down a bit." **Attention and focus** "This session helps me to focus and not to think of a lot of stuffs" "Focusing on the breath reduces my clinging to the sense of 'waiting' for the queue." "Now I know what I can do while waiting for my queue number to see the doctor." **Relaxation and stress relief** "It reduces my stress." "I feel less stressful because I have been feeling stressed for work-related issues, but it takes time and effort to make it a regular practice at home." "I feel light-weighted." "I like the part about relaxing each body part; it would be nice if it is being mentioned in the beginning." **Positivity and feeling good** "Good in reducing symptoms and brings positive mind on anything." "It will be helpful for patients who are feeling down due to ailments, financial, environment, etc." "It feels good generally."	**Sleepiness** "I fell asleep despite trying very hard to resist it." "I fell asleep, and felt a bit drowsy when I woke up, but feel relaxed after that." **Difficulty to focus** "I find it difficult to put my attention onto my breathing." "I feel like I was not able to breathe properly. I was disturbed by my backache due to my scoliosis." "I find the session too long and I was not able to focus." "I have sensation of chest tightness when I initially started to focus on my breathing but it goes away after a while." "I feel more breathless when I pay attention to my breathing and I couldn't stand sitting on the chair for so long." **The environment and setting** "The chair is uncomfortable and I feel uncomfortable sitting on it." "The air-conditioning is too cold here." "This should be done using a headphone, the effect will be better." "It would be nice if this is done in the nature instead of the clinic room." **Triggering of unpleasant memory** "The session just now reminded me of the hysterical episode I had before during one of my admissions many years back. It started with a headache, and I heard whispering from others but the voice wasn't clear. I was told I couldn't recognize my husband and spoke weird things in the ward. I was afraid I was going into that state again when I did the exercise, but after a while the sensation went away."

considering enrolling in a standard 8-week mindfulness programme to achieve sustained symptom improvement, 20-minute mindful breathing offers an additional inexpensive option for the rapid relief of symptoms in kidney transplant patients.

Acknowledgements
Not applicable.

Author contributions
Kai Wei Lim performed data collection and manuscript writing with direct supervision by Kok Peng Ng. Shok Hoon Ooi and Wei San Siow assisted in data collection and data anaylsis. Seng Beng Tan provided constructive ideas, feedbacks and supervisions throughout the whole process. All authors reviewed the manuscript.

Funding
This study is self-funded.

Data availability
The datasets used and/or analysed during the current study is available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The study is carried out in accordance with the Declaration of Helsinki Ethical Principles and Good Clinical Practices. Approval was obtained on 25-01-2021 from the Medical Ethics Committee of University of Malaya Medical Centre (MREC no: 2020116-9206). All participants have provided written informed consent prior to participating in the study. Full study protocol can be assessed by contacting the committee.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 27 April 2023 / Accepted: 11 October 2024
Published online: 16 April 2025

References

1. Afshar M, Rebollo-Mesa I, Murphy E, et al. Symptom burden and associated factors in kidney transplant patients in the U.K. J Pain Symptom Manage. 2012;44(2):229–38.
2. Yong DS, Kwok AO, Wong DM, et al. Symptom burden and quality of life in end-stage kidney disease: a study of 179 patients on dialysis and palliative care. Palliat Med. 2009;23(2):111–9.
3. Taylor K, Chu NM, Chen X, et al. Kidney disease symptoms before and after kidney transplantation. CJASN. 2021;16(7):1083–93.
4. Wang H, Du C, Liu H, et al. Exploration of symptom experience in kidney transplant recipients based on symptoms experience model. Qual Life Res. 2020;29(5):1281–90.
5. De Pasquale C, Pistorio ML, Veroux M, et al. Psychological and psychopathological aspects of kidney transplantation: a systematic review. Front Psy. 2020;11:106.
6. Noohi S, Khaghani-Zadeh M, Javadipour M et al. Anxiety and depression are correlated with higher morbidity after kidney transplantation. Transplant Proc. 2007; 39:1074e1078.
7. Denhaerynck K, Dobbels F, Cleemput I, et al. Prevalence, consequences, and determinants of nonadherence in adult kidney transplant patients: a literature review. Transpl Int. 2005;18:1121e1133.
8. Sketris I, Waite N, Grobler K et al. Factors affecting compliance with cyclosporine in adult kidney transplant patients. Transplant Proc. 1994; 26: 2538e2541.
9. Mecadon K, Med J. 2021; 104(1): 31–3.
10. Keown P. Improving quality of life: the new target for transplantation. Transplantation. 2001;72(12 Suppl):S67–74.
11. Kabat-Zinn J. Some reflections on the origins of MBSR, skillful means, and the trouble with maps. Contemp Buddhism. 2011;12(1):281–306.
12. Shapiro SL, Carlson LE, Astin JA, et al. Mechanism of mindfulness. J Clin Psychol. 2006;62(3):373–86.
13. Keng SL, Smoski MJ, Robins CJ. Effects of mindfulness on psychological health: a review of empirical studies. Clin Psychol Rev. 2011;31(6):1041–56.
14. Cramer H, Haller H, Lauche R, et al. Mindfulness-based stress reduction for low back pain. A systematic review. BMC Complement Altern Med. 2012;12:162.
15. Yook K, Lee SH, Ryu M, et al. Usefulness of mindfulness-based cognitive therapy for treating insomnia in patients with anxiety disorders: a pilot study. J Nerv Ment Dis. 2008;196(6):501–3.
16. Bohlmeijer E, Prenger R, Taal E, et al. The effects of mindfulness-based stress reduction therapy on mental health of adults with chronic medical disease: a meta-analysis. J Psychosom Res. 2010;68(6):539–44.
17. Gross CR, Kreitzer MJ, Thomas W, et al. Mindfulness-based stress reduction for solid organ transplant recipients: a randomized controlled trial. Altern Ther Health Med. 2010;16(5):30–8.
18. Beng TS, Jie HW, Yan LH, et al. The Effect of 20-Minute mindful breathing on the perception of suffering and changes in Bispectral Index score in Palliative Care patients: a randomized controlled study. Am J Hosp Palliat Care. 2019;36(6):478–84.
19. Tan SB, Liam CK, Pang YK, et al. The Effect of 20-Minute mindful breathing on the Rapid reduction of Dyspnea at Rest in patients with Lung diseases: a Randomized Controlled Trial. J Pain Symptom Manage. 2019;57(4):802–8.
20. Look ML, Tan SB, Hong LL et al. Symptom reduction in palliative care from single session mindful breathing: a randomised controlled trial. BMJ Support Palliat Care. 2020: bmjspcare-2020-002382.
21. Vinci C, Reblin M, Jim H, et al. Understanding preferences for a mindfulness-based stress management program among caregivers of hematopoietic cell transplant patients. Complement Ther Clin Pract. 2018;33:164–9.
22. Tan SB, et al. The effect of 20-minute mindful breathing on the perception of suffering and changes in Bispectral Index score (BIS) in palliative care informal caregivers: a randomized controlled study. Am J Hospice Palliat Medicine®. 2020;37(8):606–12.
23. Tan SB, Liam CK, Pang YK, et al. The effect of 20-minute mindful breathing on the rapid reduction of dyspnea at rest in patients with lung diseases: a randomized controlled trial. J Pain Symptom Manag. 2019;57(4):802–8.
24. Beng TS, et al. The effect of 20-minute mindful breathing on the perception of suffering and changes in bispectral index score in palliative care patients: a randomized controlled study. Am J Hospice Palliat Medicine®. 2019;36(6):478–84.
25. Ng DL, et al. The efficacy of a single session of 20-minute mindful breathing in reducing dyspnea among patients with acute decompensated heart failure: a randomized controlled trial. Am J Hospice Palliat Medicine®. 2021;38(3):246–52.
26. Look ML, et al. Symptom reduction in palliative care from single session mindful breathing: a randomised controlled trial. BMJ Supportive Palliat care. 2021;11(4):433–9.
27. Hui D, Bruera E. The Edmonton Symptom Assessment System 25 years later: past, Present, and future developments. J Pain Symptom Manage. 2017;53(3):630–43.
28. Bruera E, Kuehn N, Miller MJ, et al. The Edmonton Symptom Assessment System (ESAS): a simple method for the assessment of palliative care patients. J Palliat Care. 1991;7(2):6–9.
29. Howarth A, Smith JG, Perkins-Porras L, et al. Effects of brief mindfulness-based interventions on Health-related outcomes: a systematic review. Mindfulness. 2019;10:1957–68.
30. Currow DC, Chang S, Reddel HK, Breathlessness, Anxiety, Depression, and, Function-The BAD-F, Study et al. A Cross-Sectional and Population Prevalence Study in Adults. J Pain Symptom Manage. 2020; 59(2): 197–205.
31. So WK, Marsh G, Ling WM, et al. The symptom cluster of fatigue, pain, anxiety, and depression and the effect on the quality of life of women receiving treatment for breast cancer: a multicenter study. Oncol Nurs Forum. 2009;36(4):E205–14.
32. Pal GK, Velkumary S, Madanmohan. Effect of short-term practice of breathing exercises on autonomic functions in normal human volunteers. Indian J Med Res. 2004;120(2):115–21.
33. Sipe WE, Eisendrath SJ. Mindfulness-based cognitive therapy: theory and practice. Can J Psychiatry. 2012;57(2):63–9.
34. Alsubaie M, Abbott R, Dunn B, Dickens C, Keil TF, Henley W, Kuyken W. Mechanisms of action in mindfulness-based cognitive therapy (MBCT) and mindfulness-based stress reduction (MBSR) in people with physical and/or psychological conditions: a systematic review. Clin Psychol Rev. 2017;55:74–91.
35. Tan SB. Mindfulness and care of the dying. Partridge Singap. 2018. pp 65–9.
36. Schlosser M, Sparby T, Vörös S, et al. Unpleasant meditation-related experiences in regular meditators: prevalence, predictors, and conceptual considerations. PLoS ONE. 2019;14(5):e0216643.
37. Britton WB, Lindahl JR, Cooper DJ, Canby NK, Palitsky R. Defining and measuring meditation-related adverse effects in mindfulness-based programs. Clin Psychol Sci. 2021;9(6):1185–204.

Publisher's note

Kok Peng Ng is a consultant nephrologist in University of Malaya Medical Center (UMMC), Kuala Lumpur, Malaysia whose main clinical expertise involve management of kidney transplantation at pre-, peri- and post-operative per iod.