ORIGINAL ARTICLE

The Effect of Internet-delivered Mindfulness Stress Reduction Combined with Acceptance and Commitment Therapy on Health Anxiety and Quality of Life of Caregiver of Patients Infected by COVID-19: A Randomized Clinical Trial

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ABSTRACT

Background: Coronavirus disease-19 (COVID-19) is a widespread disease all over the world that has caused many psychological complications such as health anxiety (HA) and low quality of life (QOL). Mindfulness-based approaches could improve these complications. Therefore, this study aimed to investigate the effect of Internet-delivered mindfulness stress reduction combined with acceptance and commitment therapy (IMSR-ACT) on QOL and HA of caregivers of patients infected by COVID-19.

Methods: In this randomized clinical trial, 72 people from Golpayegan city, Iran, who had a patient with COVID-19 in their family were selected from March to June 2020. A caregiver with a score above 27 on the Health Anxiety inventory (HAI-18) was selected using simple random sampling. Participants were assigned in the intervention or control group by permuted block random allocation. The intervention group was trained by MSR and ACT techniques for 9 weeks accomplished via WhatsApp. All participants completed the QOLQuestionnaire-12 (SF-12) items and HAI-18 before and after completing IMSR-ACT sessions. The data were analyzed through SPSS-23 software, using Chi square, independent and paired t-test, and analysis of covariance, and P-value<0.05 was considered as significant.

Results: The results showed that the intervention group compared to the control group had a significant decrease in all subscales of HAI after the intervention including worry about consequences (5.78±2.66 vs. 7.37±1.34, P=0.004) and awareness of bodily sensation or changes (8.90±2.77 vs. 11.75±2.30, P=0.001), worry about health (10.94±2.38 vs. 13.09±1.92, P=0.001), and total score of HAI (25.62±4.93 vs. 32.25±3.93, P=0.001). Also, the intervention group compared to the control group had better QOL after the intervention in general health perceptions (3.03±0.96 vs. 2.43±0.95, P=0.01), mental health (7.12±2.25 vs. 6.34±1.85 and P=0.01) and mental component summary) 16.78±3.75 vs. 15.43±3.05, P=0.01), physical component summary (16.06±2.66 vs. 15.19±2.25, P=0.01), and total score of SF-12 (32.84±5.39 vs. 30.62±4.34, P=0.004).

Conclusion: Internet-delivered MSR combined with ACT could improve the HA and QOL of caregivers with patients infected by COVID-19. Thus, it can used in other similar situations for now and future. Also, it seems to be a useful approach for caregivers of the other illnesses.

Trial Registration Number: IRCT20180909040974N5

Keywords: Mindfulness, Internet-based intervention, Quality of life, Health anxiety, Coronavirus

INTRODUCTION

Coronavirus disease-19 (COVID-19) was first detected in December 2019 in Wuhan, China, and its main symptoms included fever, dry cough, and shortness of breath.[1] Almost all countries have been affected by the virus. USA, India, and France had the highest number of deaths due to Covid-19 in the world; Iran is also ranked 18th in this list.[2] Traumatic events such as COVID-19 can change the lifestyle and affect the quality of life (QOL) adversely. It reduces people's feeling of security, increases fear of death, and affects the mental health. Questions related to the pandemic with no definite answers; exposure to controversial information about the disease; decreased social relations; financial conditions, domestic violence, children studying at home; restriction about doing activities outside home; and recommendations about prohibitions such as home quarantine can adversely affect the individuals' QOL and their mental health.[3, 4] The studies have shown that individuals quarantined at home reported higher anxiety and lower QOL levels.[5, 6]

Symptoms such as anxiety, depression, fear, stress, sleep problems and post-traumatic stress disorder symptoms were seen more frequently during the COVID-19.[7] Also, another study showed that psychological impact of this disease was mostly anxiety and depression experienced by both medical workers and the general public.[8] Health anxiety (HA) is one of the outcomes of COVID-19 pandemic.[9] Bodily sensations are often cues for anxiety or emotional distress in persons with problems with HA.[10] A study among Iranians showed corona disease anxiety was higher in women. People who follow the news of COVID-19 a lot had more anxiety. People aged 21-40 and those who have a family member or close friend with COVID-19 also had high levels of corona disease anxiety.[11]

The many effects that COVID-19 has on the psychological state and QOL of individuals indicate the need for psychological interventions. It has been demonstrated that these interventions can reduce emotional distress, promote positive health habits, and enhance the immune responses for patients with cancer as for infectious diseases (such as chronic hepatic B and HIV) can improve the anxiety control, QOL of patients, and pain management.[12, 13]

One of the best psychological interventions for improvement of anxiety and QOL is mindfulness-based therapies (MBT). Mindfulness Stress Reduction (MSR) and Acceptance and Commitment Therapy (ACT) are the most effective and usable therapies in MBT area. Many studies showed the effect of MSR and ACT on anxiety,[14, 15] HA,[16, 17] and symptoms and QOL various diseases and their caregivers.[18, 19]

Although in COVID-19 pandemic using Internet-based therapies increased, before this period, there was evidence of the effectiveness of psychological treatments such as cognitive behavior therapy (CBT), Internet-delivered CBT (ICBT), ACT and Internet-delivered ACT (IACT) for HA.[17, 20, 21]

These studies were administered on patients, and there are a few studies that examined psychological treatments for their caregivers. On the other hand, the studies on caregivers of the patients with various illnesses focused on chronic situations such as cancer, dementia, chronic and contagious situations.[22, 23] Furthermore, some constructs related to illnesses such as HA have been studied in the patients not their caregivers.

The techniques in MSR focused on decreasing anxiety and stress (such as body scan, mindful sitting) and increasing the attention to the present moment (such as doing daily activity with attention and pleasure). These therapeutic components could improve the HA and QOL. On the other hand, some concepts such as acceptance of internal experiences such as anxiety and its related thoughts could be covered by ACT techniques as well as commitment to doing the behaviors related to improving the HA and QOL. Therefore, it seems that combination of mindfulness and ACT has more advantages for the people caring patients with COVID-19.

On the other hand, Internet-delivered

treatment has several advantages such as independence of geographical distance to the clinic, fewer or no scheduled appointments, less interference with patients' daily life, and possibly less perceived stigma.[24] In this regard, the use of publicly available applications such as WhatsApp for MBT and ACT has increased.[25] This application is one of the most popular messaging applications in the world; in the COVID-19 pandemic, it was used more than the platforms in Iran. WhatsApp has flexibility and useful features to text, call, and send video, audio, links, location, document, and pictures and to form learning groups. It means it is the most potential technology to support teaching goals.[26]

This study aimed to evaluate the effect of Internet-delivered MSR combined with ACT on HA and QOL in caregivers of people infected by COVID-19.

Methods

This randomized clinical trial was done from March to June 2020. Participants were caregivers who had a patient with COVID-19 in their family and were in home quarantine, followed up and screened for COVID-19 according to the protocols in the health center of Golpayegan city, Iran. Since the beginning of COVID-19, all people could register their initial symptoms in the system of the Ministry of Health; in the case of suspicious symptoms, the experts of the health centers would contact them. Also, all the patients who were identified through the Polymerase chain reaction test were registered in the list of the Ministry of Health, and the health centers followed up the condition of the patients and their caregivers by telephone. Two experts of Golpayegan Health Center followed up patients with COVID-19, checked the condition of their caregivers, completed the Health Anxiety inventory-18 (HAI-18) for them and the inclusion/exclusion criteria of the study. If the conditions were met, they entered the caregivers into a list. Then, the participants were selected by simple random sampling. The inclusion criteria included being a caregiver with

a patient with COVID-19 (moderate intensity and without the need for hospitalization), having a score above 27 on HAI-18 and being informed, having no major psychiatric disorders (such as psychotic disorders, mood disorders, substance use disorders) based on a psychiatric clinical interview, not having severe and chronic medical conditions (such as cancer, cardiovascular diseases, cerebral vascular accident), and having a smart phone and ability to work with virtual networks such as WhatsApp. Exclusion criteria were not attending IMSR-ACT sessions and not doing homework, and infection with COVID-19 with severe symptoms requiring hospitalization or quarantine or leading to a person's inability to do IMSR-ACT practices.

Hence, HA was a primary outcome and QOL was a secondary outcome; sample size was calculated 32 people in each group based on a previous study[27] for HA (considering $\alpha=0.05$ and $1-\beta=0.8$), S1=4.04, S2=2.96, and d=2.5. Given the possible drop out, 36 people in each group were assigned. Calculation formula was:

$$N = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 * (S_1^2 + S_2^2)}{d^2}$$

After informed consent, the participants were divided randomly into two groups (intervention and control) by random allocation software in such a way that they were assigned by permuted block random allocation, and each block included 4 participants. The control group received the necessary follow-up and education about COVID-19 and prevention and medical treatment methods by telephone. In the intervention group, in addition to the usual training, IMSR-ACT based on "Face COVID-19» protocol of Hariss[28] for one session per week (a total of 9 sessions) was performed by a clinical psychologist trained for ACT and MSR (via WhatsApp social network). The content validity of the protocol was evaluated by 8 expert psychologists in ACT and mindfulness field; The content validity index (CVI) and content validity ratio (CVR) showed the suitable validity of the protocol (CVI=0.84 and CVR=0.99).

The contents of each session are displayed in Table 1. To maintain the confidentiality and non-disclosure of the participants' personal information to each other due to disease stigma, we used the WhatsApp broadcasting option (that sends information individually and privately to all participants). Because MBSR and ACT included homework and worksheets for recording each training session, the intervention group instructor communicated with each participant during the treatment sessions and reviewed the worksheets of the participants and answered their questions.

The participants completed the Short Form of QOL Questionnaire (SF-12) and HAI-18 before and after completing the IMSR-ACT sessions. The questionnaires were completed electronically (by sending the link of each questionnaire to the participants' WhatsApp software) and followed up by phone. Therefore, the authors or trainer did not have any information about allocation of the questionnaires. Neither the assessor who evaluated the questionnaires nor the person who analyzed the data were aware of the group membership of the participants.

SF-12 which was designed in 1996 by Warr, Kasinski and Keller includes eight subscales of physical function (PF, 2 items), physical role (PR, 2 items), physical pain (PP, 1 item), general health (GH, 1 item), energy and fatigue (E&F, 1 item), social function (SF, 1 item), emotional role (ER, 2 items), and mental health (MH, 2 items). SF-12 has a physical component summary (PCS, 6 items) - which is the sum scores of PF, PR, PP, and GH- and a mental component summary (MCS, 6 items)- which is the sum scores of E&F, SF, ER and MH.[29] Some items of SF-12 have two options, and some have multiple-choice answers. The total score ranges from 12 to 48, and the higher scores indicate better QOL. War et al. (1996) were the first to examine the validity and reliability of this scale. The Cronbach's alpha calculated for PCS and MCS was 0.89 and 0.76, respectively. The converge construct validity of PCS and MCS of SF-36 was reported by War et al. as 0.91 and 0.91, respectively, using evaluation of their correlation with PCS and MCS subscales of short-form health survey 36 (SF-36).[29] Montazeri et al. (2009) examined the validity and reliability of the Persian version of this scale. They used the test-retest method to check the reliability. The reliability of PCS and MCS was 0.73 and 0.72, respectively. They reported construct validity of SF-12 subscales using confirmatory factor analysis between 0.89 to 0.91.[30] In the present study, the reliability (Cronbach's alpha) of PCS, MCS, and total SF-12 was obtained 0.88, 0.81, and 0.79, respectively.

HAI-18 is used to measure HA. It was designed by Salkowskis and Warwick in 2002 and consists of 18 questions. The first 14 questions consist of four options from which individuals select the one that best describes their mental state. The last four questions are intended to measure mental state in the

Table 1: Outline of the mindfulness-based stress reduction combined with acceptance and commitment therapy sessions

Step 1	Training the mindfulness in daily life such as eating, walking, showering, etc. and record these activities in the designed worksheets; Focus on what is in your control.
Step 2	Record your thoughts and feelings in related worksheets.
Step 3	Pay attention to your body; Body scan training and record every time you do this exercise on the related worksheet
Step 4	Attention to what you do; Sitting meditation training and record them on the worksheet
Step 5	Committed action
Step 6	Acceptance and willingness.
Step 7	Identify your values and goals in 10 areas (parenting, friendship, health care, etc.) and record in the worksheets.
Step 8	Identify the resources.
Step 9	Disinfect and distancing

face of severe illness. It has three subscales included worry about health (WAH), worry about consequences (WAC), and awareness of bodily sensation or changes (ABS). All questions are scored 0–3, with higher scores indicating greater HA. The total score ranges from 0 to 54.[31] The reliability of the first version of HAI using test-retest reliability was reported 0.90, and its reliability using Cronbach's alpha coefficient was reported from 0.70 to 0.82 by Salkowskis and Warwick. They reported a construct validity of 0.63 for HAI using evaluation of its correlation with Illness Attitude Scale.[31] The construct validity of the Persian version of HAI-18 was reported 0.75 using evaluation of its correlation with Ahwaz hypochondriasis test, and its reliability was reported 0.75. Also, the Cronbach's alpha for WAH, WAC, and ABS was reported 0.59, 0.60, and 0.70, respectively.[32] In the present study, the reliability (Cronbach's alpha) of WAH, WAC, ABS, and total HAI-18 was obtained 0.79, 0.83, 0.78, and 0.79, respectively.

Of the 72 participants, finally the data of 32 people in each group were entered into the statistical analysis. Figure 1 shows CONSORT Flow Diagram of the study. All analyses were performed using SPSS software version 23, and a $P < 0.05$ was considered statistically significant; Chi square and paired samples t- test, independent samples t-test, and analysis of covariance (ANCOVA) were used. Also, the normality of the distribution was confirmed using Kolmogorov-Smirnov test and checking the kurtosis and skewness of the data distribution and $P > 0.05$.

This research followed the Helsinki declaration of ethical principles in medical research on humans.[33] The study was approved by ethics committee of Isfahan University of Medical Sciences (ethical code: IR.MUI. REC.1399.441). Ethical issues were considered including obtaining written informed consent, maintaining anonymity and confidentiality, and explaining the right to withdraw from the study at any time without affecting the
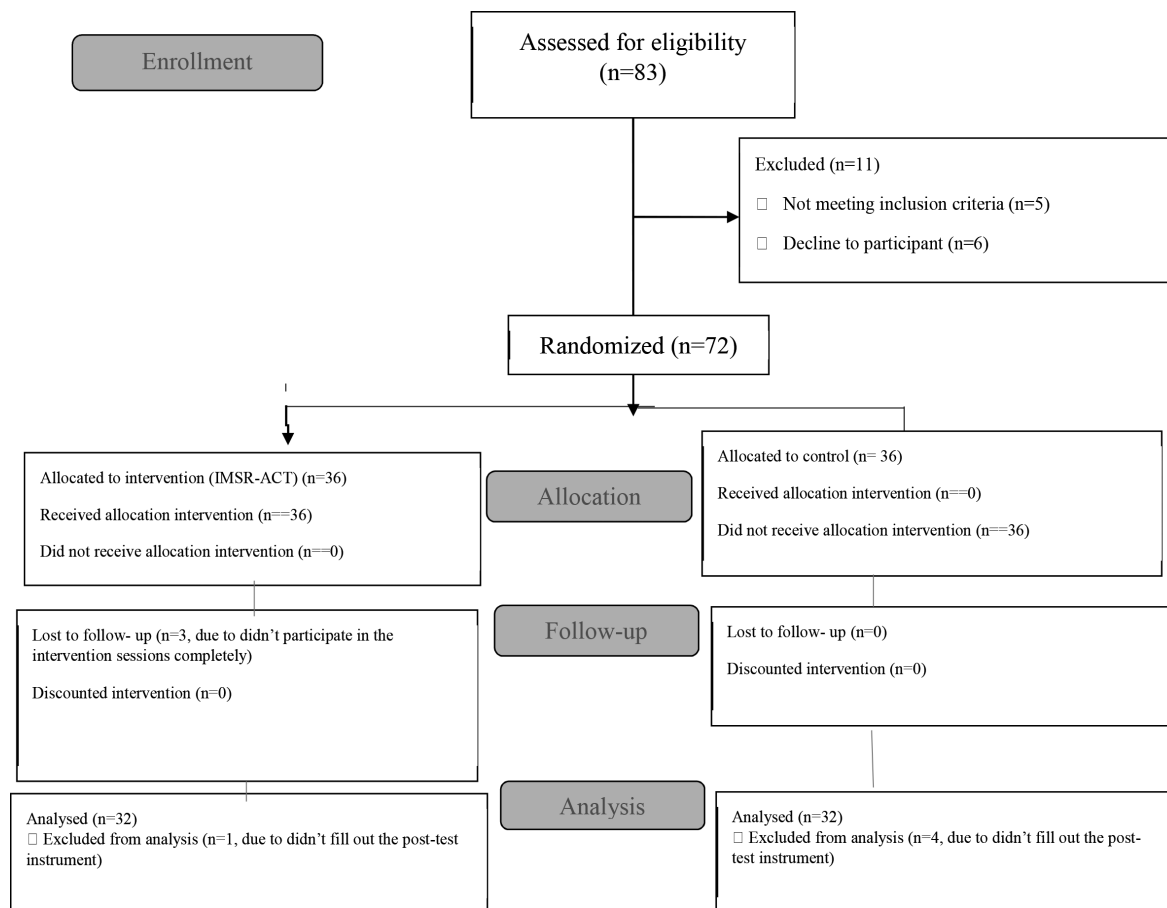

Figure 1: CONSORT Flow Diagram of the participants in the study

process of follow-up and treatment of patient with Covid-19 were considered.

RESULTS

In the present study, the participants' mean age was 41.82±12.75. 26 participants)40.60%) were male and 38 of them (59.40%) were female. Most of them (46; 71.90%) were married and 24 (37.50%) of them had under diploma education; the others had diploma or university education. 24 participants (37.50%) were housewives, 7 (10.90%) of them were unemployed, and the others had a kind of job. The major source of information for registration in the system of health ministry in 45 people (70%) was news. The sample' demographic characteristics including age, gender, marital status, education level, etc. by group are displayed s in Table 2.

The results showed there were no significant differences in demographic variables between the intervention and control groups' sex (P=0.30), educational level (P=0.38), marital status (P=0.11), occupational status (P=0.76), number of households (P=0.39), the history of mental illness (P=0.25), the history of quarantine for COVID-19 (P=0.96), and source of information (P=0.53). Also, there were no significant differences in age variable between the two groups (P=0.95).

The total scores of HAI-18 and its subscales are shown in Table 3. It showed that in the control group there were no significant differences in the subscale of HAI-18 and its total score at pre-test compared to post-test, for HAI-18 total (P=0.96), ABS (P=0.19), WAC (P=0.85), and WAH (P=0.41). On the other hand, the intervention group had a significant

Table 2: Demographic characteristics of the participants

Variable		MBSR-ACT[a] group	Control group	P-value
Age (Mean±SD)		42.46±12.97	41.18±12.71	0.95*
Sex N (%)	Male	11 (34.38)	15 (46.88)	0.30**
	Female	21 (65.63)	17 (53.13)	
Educational level N (%)	Under Diploma	13 (40.63)	11 (34.38)	0.38**
	Diploma	7 (21.88)	12 (37.50)	
	Bachelor	12 (37.50)	9 (28.13)	
Marital status N (%)	Single	6 (18.75)	9 (28.13)	0.11**
	Married	26 (81.25)	20 (62.50)	
	Divorced	0 (0.00)	3 (9.38)	
Occupational status N (%)	Housewife	14 (43.75)	10 (31.25)	0.76**
	Employee	9 (28.13)	11 (34.38)	
	Self-employee	4 (12.50)	7 (21.88)	
	Unemployed	4 (12.50)	3 (9.38)	
	Farmer	1 (3.13)	1 (3.13)	
Number of households members N (%)	1-2	3 (9.38)	8 (25.01)	0.39**
	3	12 (37.50)	9 (28.13)	
	4	12 (37.50)	12 (37.50)	
	5-6	5 (15.63)	3 (9.38)	
Having the history of mental illness N (%)	Yes	18 (56.25)	9 (28.13)	0.25**
	No	14 (43.57)	23 (71.88)	
Having the history of quarantine for COVID-19 N (%)	Yes	30 (93.75)	22 (68.75)	0.96**
	No	2 (6.25)	10 (31.25)	
Source of information for registration in the system of health ministry N (%)	News networks	23 (71.88)	22 (68.75)	0.53**
	Online and virtual networks	8 (25.00)	10 (31.25)	
	People	1 (3.13)	0 (0.00)	

a: Mindfulness- based stress reduction with acceptance and commitment therapy; *Independent t-test; ** Chi-square test.

Table 3: Comparison of health anxiety and its subscales between the intervention and control groups

Variable	Group	Pre-test Mean±SD	Post-test Mean±SD	Mean differences (95% CI)	P-value***
HAI[a]-18 total	Intervention	31.78±3.85	25.62±4.93	6.15 (4.62 to 7.68)	0.001
	Control	32.28±3.49	32.25±3.93	0.03 (-1.22 to 1.29)	0.96
	P-value	0.34*	0.001**	---	---
ABS[b]	Intervention	11.06±1.98	8.90±2.77	2.15 (1.24 to 3.06)	0.001
	Control	11.25±2.00	11.75±2.30	-0.50 (-1.26 to 0.26)	0.19
	P-value	0.96*	0.001**	---	---
WAC[c]	Intervention	7.25±1.41	5.78±2.66	1.46 (0.45 to 2.48)	0.006
	Control	7.31±1.57	7.37±1.34	-0.06 (-0.73 to 0.61)	0.85
	P-value	0.38*	0.004**	----	---
WAH[d]	Intervention	13.47±2.09	10.94±2.38	2.53 (1.61 to 3.45)	0.001
	Control	13.40±2.10	13.09±1.92	0.31 (-0.46 to 1.08)	0.41
	P-value	0.82	0.001**	------	---

a: Health Anxiety Inventory; b: Awareness of bodily sensation or changes; c: Worry about consequences; d: Worry about health; *Independent t-test, **Analysis of covariance (ANCOVA), ***Paired t-test

decrease in all subscales of HAI-18 and its total scores at post-test compared to pre-test for HAI-18 total (P=0.001), ABS (P=0.001), WAC (P=0.006), and WAH (P=0.001). Also, the intervention and control groups showed significant differences after the intervention in ABS (P=0.001), WAC (P=0.004), WAH (P=0.001), and its total score (P=0.001).

The total scores of SF-12 and its subscales are shown in Table 4, showing that the control group had no significant differences in the total and subscales score of SF-12 at pretest compared to posttest (P>0.05). The result revealed that the intervention group had more significant improvement in GH (P=0.01), MH (P=0.01), MCS (P=0.01), PCS (P=0.01), and total score of SF-12 (P=0.004) compared to the control group after the intervention. Also, the intervention group showed a significant improvement in GH (P=0.02), SF (P=0.02), E&F (P=0.004), MH (P=0.001) MCS (P=0.001), PCS (P=0.02) subscales of SF-12, and its total scores (P=0.001).

Discussion

The present study showed that the intervention group had lower WAH, ABS, WAC, and total HAI-18 compared to the control group in the post-test. Also, it revealed that the intervention group had a significant decrease in all subscales of HAI and its total after intervention. Thus,

the intervention could reduce HA in caregivers of patients with COVID-19. Several studies have highlighted this finding,[16, 17, 21] using CBT or mindfulness approaches for HA; two of them used IACT or ICBT for HA similar to the present study.[17, 21] On the other hand, this finding is not consistent to one study which showed acceptance or mindful- based treatments could not reduce worries.[34] Lack of reduction of worry in this study is consistent with the foundation of acceptance-based therapies. In these treatments, the primary aim is not necessarily to reduce worry or the other internal events, but they aimed to improve QOL in spite of the presence of the psychological symptoms. On the other hand, the above-mentioned study examined ACT on generalized anxiety disorder (GAD), in which worries are not only limited to health and illness, but also include other areas of a person's life such as work.

Another feature of the current study was the shortness of the intervention protocol. However, worry- that is a cognitive component of anxiety- is very persistent. Hence, acceptance-based protocols suggested a longer period of treatment compared to classical CBT for the disorders related to worry.[35] In present study, we had only a nine- session protocol, and it was effective. This finding suggests that the controversy between the need for short-term and long-term treatment in anxiety-related disorders

Table 4: Comparison of the quality of life and its subscales between the intervention and control groups

Variable	Group	Pre-test Mean±SD	Post-test Mean±SD	Mean differences (95% CI)	P-value***
General health perceptions	Intervention	2.50±0.80	3.03±0.96	-0.53 (-0.97 to -0.08)	0.02
	Control	2.65±1.00	2.43±0.95	0.21 (-0.22 to 0.66)	0.32
	P-value	0.26*	0.01**	----	---
Physical Functioning	Intervention	4.75±1.05	4.69±1.09	0.03 (-0.43 to 0.493)	0.89
	Control	4.40±1.10	4.62±1.18	-0.21 (-0.62 to 0.18)	0.69
	P-value	0.28*	0.78**	---	---
Role limitations	Intervention	3.09±0.99	3.53±1.24	-0.43 (-0.96 to 0.08)	0.10
	Control	3.15±0.95	3.25±0.95	-0.09 (-0.58 to 0.39)	0.62
	P-value	0.91*	0.30**	---	---
Role limitations (emotional)	Intervention	2.34±0.70	2.47±0.80	-0.12 (-0.48 to 0.23)	0.48
	Control	2.37±0.71	2.47±0.80	-0.09 (-0.47 to 0.28)	0.28
	P-value	0.27*	0.62**	---	---
Bodily Pain	Intervention	4.42±0.92	4.81±0.82	-0.40 (-0.89 to 0.08)	0.10
	Control	4.67±0.82	4.90±0.81	-0.21 (-0.66 to 0.22)	0.32
	P-value	0.81*	0.48**	---	---
Social functioning	Intervention	2.87±0.97	3.59±1.29	-0.71 (-1.33 to -0.10)	0.02
	Control	3.191.23±	3.47±0.95	-0.28 (-0.84 to 0.27)	0.31
	P-value	0.52*	0.71**	---	---
Energy and fatigue	Intervention	2.87±0.97	3.59±1.18	-0.71 (-1.19 to -0.24)	0.004
	Control	3.03±1.06	3.15±1.16	-0.12 (-0.61 to 0.36)	0.60
	P-value	0.69*	0.09**	---	---
Mental health	Intervention	5.56±1.78	7.12±2.25	-1.56 (-2.20 to -0.91)	0.001
	Control	6.12±2.15	6.34±1.85	-0.21 (-0.92 to 0.48)	0.53
	P-value	0.35*	0.01**	---	---
Mental component summary	Intervention	13.65±2.92	16.78±3.75	-3.12 (-4.37 to -1.87)	0.001
	Control	14.72±3.42	15.43±3.05	-0.71 (-1.78 to 0.34)	0.17
	P-value	0.36*	0.01**	---	---
Physical component summary	Intervention	14.72±2.05	16.06±2.66	-1.34 (-2.49 to -0.19)	0.02
	Control	14.90±2.76	15.19±2.25	-0.28 (-1.21 to 0.65)	0.54
	P-value	0.01*	0.01**	---	---
SF-12 total	Intervention	28.37±3.79	32.84±5.39	-4.46 (-6.25 to -2.67)	0.001
	Control	29.62±5.04	30.62±4.34	-1.00 (-2.28 to 0.28)	0.12
	P-value	0.04*	0.004**	---	---

*Independent t-test, **Analysis of covariance (ANCOVA), ***Paired t-test

persists. Of course, this suggestion is given more in the case of disorders such as GAD, in which worry is pervasive and widespread. In terms of HA, especially at the beginning of COVID-19 pandemic, when the mode of transmission was not completely clear, the provision of information by the treatment team of health centers in the present study played an important role in reducing HA.

On the other hand, the nature of worry is the high anticipation of the occurrence of danger and the inability of a person to deal with it. Therefore, COVID-19 could aggravate these two characteristics of people suffering from worry and HA. Therefore, a treatment (such as IMSR-ACT) that helps people to have a correct assessment of the possibility of getting sick and its consequences and to have a correct assessment of their ability to deal with that risk will lead to a reduction of worry and anxiety.

Another possible reason for the significant difference in HA in the intervention group compared to the control group could be the Internet-based nature of the treatment; in the same line, other studies showed the benefits of Internet-delivered treatments for those suffering from HA.[17, 21] Since patients with HA have often been considered treatment-resistant, the present intervention similar

to the study that used IACT for HA[17] was an effective, feasible, and easily accessible treatment. Although that study and another research reported the negative effects during psychological treatment such as CBT or ACT treatment,[17, 36] the present study did not reveal such obvious adverse effects. These studies have discussed that the patients during the treatment period experience symptoms including hopelessness, failure, stigma, dependency, and anxiety while changing maladaptive behaviors. ACT and mindfulness therapy can facilitate the individuals' learning to face each experience more openly and without judgment. They use a series of exercises designed to train the mind to stay focused and open to everyday conditions including stressful conditions.[37] During the period of high prevalence of COVID-19, especially at the beginning of the period, reducing health care and bringing it to a normal level could be in contradiction with the usual habits of patients suffering from HA. Although it seems this condition could keep HA high, similar to the other exposure techniques, continued exposure leads to a decrease in anxiety[38] and a decrease in HA in the present study. Furthermore, reducing excessive healthy behaviors could induce interoceptive exposure (IE) with bodily symptoms and sensations (BSS) that people with HA experienced. The goal of IE is to help the individual to accept the condition more and be less distressed by the uncomfortable BSS.[10] Although in the present protocol, we did not have specific IE techniques, it seems general exposure, getting correct information and acceptance, and mindfulness practices could expose people to their BSS so that they can cause accepting of them. Therefore, the scores of ABS decreased the in the intervention group. This finding showed that the intervention group could have IE as well as in vivo exposure. On the other hand, in the present study the other adverse events such as stigma and dependency that the above studies reported had decreased. Dependency was minimized due to the lack of face-to-face

contact with the therapist. Also, the possibility of stigma had reached the lowest possible level since the treatment provisions were provided through Internet and telephone based by a public health center, and people did not visit a specific center, which indicates the presence of their mental problems.

Another possible reason for the reduction of HA in the intervention group may be the method and source of information. During the COVID-19 pandemic, especially in its early period, disease-related information was present in the media along with bias and misinformation, whereas information about how to manage the pandemic was less often covered. This condition had aggravated people's HA.[39] It points out the importance of early intervention and the provision of scientific information and the follow-up of psychological and medical training in infectious and emerging diseases to reduce the subsequent psychological problems.

In this study, the intervention group had a significant improvement in GH, SF, E&F, MH, MCS, PCS subscales of SF-12, and its total scores at post-test compared to pre-test. Also, the intervention group had more significant improvement in GH, MH, MCS, PCS, and total score of SF-12 compared to the control group. Thus, it is concluded that the intervention could improve QOL. This finding is consistent to those of other studies which showed mindfulness and ACT can decrease psychological distress and increase well-being and QOL in individuals who experience physical and psychological disorders.[18, 19, 40] Those studies reported the effect of mindfulness and ACT approaches as usual or Internet-delivered based on improving QOL of the patients and their caregivers.

The strength of this study was focus on the caregivers of people infected with COVID-19. Also, the study was conducted as an Internet-based treatment by common smart phones via a very popular platform (WhatsApp). The limitation of this study was no comparison with a gold standard treatment such as CBT. Another limitation of the study was the lack

of follow-up due to limited access to the participants after the end of the intervention sessions.

CONCLUSION

This study showed Internet-delivered MSR combined with ACT can improve the QOL and HA of people caring the patients with COVID-19. Therefore, it is suggested that this approach should be used for these people and the others in the similar possibly future situations. It is also suggested that future research should compare the intervention group with CBT with three- and six-month follow-up. Moreover, in order to check the effect of Internet-based treatment compared to face-to-face treatment, researcher is recommended that the intervention should be performed and compared in both Internet-based and face-to-face forms.

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