

SPECIAL ISSUE ARTICLE

Effectiveness and influencing factors of online education for caregivers of patients with eating disorders during COVID-19 pandemic in China

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Abstract

Objective: The goals were twofold: To estimate the depression and anxiety levels among caregivers of patients with eating disorders (ED) in China during the COVID-19 pandemic when compared with a control group, and to assess whether an online education program was effective in decreasing the anxiety and depression of the caregivers of patients with ED, and associated factors.

Method: Caregivers of patients with ED ($n = 254$) and a comparison group of non-ED caregivers ($N = 254$) were recruited at baseline. Additionally, caregivers of patients with ED were invited into a free 4-week online education program, with an additional online group as support. Depression and anxiety levels were assessed at baseline and after the intervention.

Results: Caregivers of patients with ED showed significantly higher levels of depression and anxiety than the comparison group of non-ED caregivers. The online education program showed no significant effect on decreasing depression and anxiety levels of caregivers of patients with ED overall. Caregivers who had older loved ones and not living with them were more likely to decrease their depression levels. Caregivers of patients with longer illness duration were less likely to decrease their anxiety levels.

Discussion: These results showed that caregivers of ED patients suffered more serious psychological distress during the pandemic. A more structured and intensive online intervention with a limited number of participants might be required to address caregivers' distress in post-COVID-19 China.

KEYWORDS

caregivers, COVID-19, eating disorders, online intervention

1 | INTRODUCTION

A novel coronavirus named by WHO as Corona Virus Disease 2019 (COVID-19) emerged in China in December

2019, and started to spread to many other countries at an unprecedented speed, becoming a worldwide pandemic (Cheng & Shan, 2020; Li et al., 2020; Phan et al., 2020). Up to May 20, 2020, the cumulative reported number of

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people diagnosed as COVID-19 in China had been more than 80,000, and the total number worldwide had exceeded 4,900,000. The Chinese government had implemented lockdown and social distancing policy in the whole country to suppress the transmission of the virus and had achieved great effectiveness. However, the measure had a significant impact on the access to medical resources of many individuals who have chronic diseases, including those with mental disorders.

Eating disorders (ED) are serious psychological disorders related to disordered eating behaviours and cognition, mainly affecting adolescents and young adults (Erzegovesi & Bellodi, 2016). The COVID-19 poses additional stress on individuals with ED (Fernández-Aranda et al., 2020). For someone with an eating disorder, physical isolation and limited access to food may enhance the complexity of their illness, and their disturbed nutritional status may increase their risk of viral infection (Touyz, Lacey, & Hay, 2020). A recent qualitative study showed that the COVID-19 pandemic and lockdown would not only heighten psychological distress and symptoms of ED patients but also have adverse impacts on the ED patients' caregivers (Clark Bryan et al., 2020). The caregivers would raise more concern over the provision of professional supports for their children or adolescents with ED, and face more challenges around their wellbeing.

The burden and distress of caregivers of ED patients have long been reported (Adelman, Tmanova, Delgado, Dion, & Lachs, 2014). Studies have shown that parents or caregivers of patients with ED are under various pressures, both psychologically and economically (Hillege, Beale, & McMaster, 2006; Zabala, Macdonald, & Treasure, 2009). Caregivers of ED patients have explicitly expressed their need for more practical and emotional support (Vintró-Alcaraz et al., 2018). During the COVID-19 pandemic, the primary problem that families of people diagnosed with an eating disorder met is limited access to medical resources, including difficulties in going to hospitals, getting medication, and maintaining treatment as before, especially for out-patients. This disrupted state would aggravate the burden, anxiety, and depression levels of caregivers in these families, thus may weaken family function, further worsening the ED symptoms of the children or adolescents.

Many studies have explored potential effective ways to help caregivers of patients with ED. Interventions based on self-help (Goddard et al., 2011), psychoeducation (Uehara, Kawashima, Goto, Tasaki, & Someya, 2001), skills training (Goodier et al., 2014), and group intervention (McEvoy et al., 2019) have shown efficiency in reducing caregivers' distress, expressed emotion, anxiety, and increasing self-efficacy. However, in

the pandemic situation, the form of treatment has to transform from traditional face-to-face to online through the internet with smartphones or computers. According to previous studies, most people have a positive attitude to online therapy for eating disorders, and this form of therapy can achieve a relatively satisfactory ED symptom reduction (Barakat, Maguire, Smith, Mason, & Touyz, 2019; Linardon, Shatte, Tepper, & Fuller-Tyszkiewicz, 2020). Because of its effectiveness and low-cost features, online intervention could be an optimal alternative way to implement interventions to caregivers of patients with ED.

Considering there are few ED treatment providers in China and the demands and needs of caregivers of people with ED increased significantly during the COVID-19 pandemic, we decided to conduct a free 4-week online education program for caregivers of people with ED that included four lectures on skills needed to deal with ED related problems. As family functioning has been recognized as an important factor in ED progress and family-based therapy (FBT) has been shown an ideal intervention of ED (Cerniglia et al., 2017; Lock, 2018), the contents of lectures were based on chapters in the guided self-help manual of Lock et al. (Lock & Le Grange, 2014), which was translated into Chinese and published in August 2019. The manual has a theoretical basis for family-based treatment and has been used as reading material in a previous parental guided self-help study (Lock, Darcy, Fitzpatrick, Vierhile, & Sadeh-Sharvit, 2017). We hypothesized that in China, the caregivers of patients with ED experienced more depression, anxiety, higher perceived stress, and lower level of social support during the COVID-19 pandemic. The online education program could help decrease their anxiety and depression levels. Considering that online education is a relatively novel intervention form in China, we also hypothesized that some caregivers might not benefit from this program. This study aims to assess depression and anxiety levels among caregivers of patients with ED in China, and assess whether an online education program, as a low-cost, safe, and convenient form of intervention, is effective in decreasing the anxiety and depression of these caregivers in the context of the serious pandemic. Moreover, the influencing factors of effectiveness would be explored to provide guidance for future work.

2 | METHODS

2.1 | Study design

The present study consisted of a cross-sectional baseline study for comparing levels of depression and

anxiety between caregivers of patients with ED and comparison group, followed by a longitudinal study for investigating intervention effect and influencing factors in caregivers of patients ED. This study was supported by the ethics committee of Shanghai Mental Health Center.

2.2 | Participants

Primary caregivers of patients with ED were recruited through recommendations from Shanghai Mental Health Center Eating Disorder Treatment Center and online recruitment advertisements. Age, gender, and years of education matched controls were recruited during the same period through an online advertisement for baseline comparison. The inclusion criteria of caregivers of patients with ED included: (a) having at least one child or adolescent with currently diagnosed with anorexia nervosa (AN), bulimia nervosa (BN), binge eating disorder (BED), or other specified feeding and eating disorders (OSFED) by psychiatrists based on DSM-5 criteria; (b) Being the primary caregiver of his or her child or adolescent. The inclusion criteria of the comparison group of non-ED caregivers included: (a) having at least one child or adolescent; (b) Being the primary caregiver of his or her child or adolescent; (c) The child or adolescent had no any diagnosis of current or past mental disorders based on DSM-5 criteria. A total of 284 caregivers of patients with ED expressed their interest and completed the screening questionnaire attached to the online advertisement. After excluding participants who did not meet the inclusion criteria, 254 caregivers of patients with ED were recruited to the online education program. 1,163 caregivers of healthy individuals were also recruited from advertisements and completed the screening questionnaire. After excluding 78 caregivers who were not eligible, 1085 caregivers entered this study as members of the comparison group. All participants provided online informed consent to participate in the study.

2.3 | Materials

At baseline, eligible caregivers of patients with ED and comparison group completed the respective online questionnaires for the two groups. For both groups, the demographic information about the caregivers including age, gender, and years of education, as well as the information about their children or adolescents like age and gender, were collected. Additionally, caregivers of patients with ED also reported their children's diagnostic category and the duration of illness. The psychological characteristics

of the two groups at baseline were measured by the following instruments:

2.3.1 | The Patient Health Questionnaire (PHQ-9)

The PHQ-9 is a 9-item self-report questionnaire being widely used to measure depression and depressive symptoms severity (Kroenke & Spitzer, 2002). The participants were asked to rate the items on a scale of 0 to 3 based on the corresponding situation in the last 2 weeks and the total score represents depression severity. The PHQ-9 has shown good reliability in the Chinese population (W. Wang et al., 2014).

2.3.2 | The Generalized Anxiety Disorder questionnaire (GAD-7)

The GAD-7 is a 7-item self-report questionnaire (Spitzer, Kroenke, Williams, & Löwe, 2006). Each item scales 0 to 3 and the total score reflects the extent to which the participants have been feeling nervous or anxious in the last 2 weeks. The GAD-7 has shown good reliability and validity in Chinese population (He, Li, Qian, Cui, & Wu, 2010).

2.3.3 | The Perceived Stress Scale (PSS)

The PSS is a 10-item questionnaire used to estimate the individual stress levels during the last month. The items in the PSS scale 0 to 4 so that the total score ranges from 0 to 40. Higher scores indicate a higher level of stress. The PSS has been translated into Chinese by Wang et al. and has shown high reliability in Chinese population (Z. Wang et al., 2015).

2.3.4 | The Social Support Rating Scale (SSRS)

The SSRS is a 10-item self-report questionnaire developed by Xiao et al (Xiao & Yang, 1987). The SSRS examines the subjective and objective social support and the use of social support of participants. The SSRS has been used in Chinese caregivers and has shown high score reliability (L.-J. Wang, Zhong, Ji, & Chen, 2016).

For the caregivers of ED patients, the PHQ-9, GAD-7 were reassessed at the end of the education program. The participation in the program was also investigated. Considering that during the pandemic, many people with

eating disorders were unable to return home from schools in other cities because of the lockdown, which may have an impact on the effectiveness of the intervention, we also investigated whether the caregivers lived with their children or adolescents during the program. Additionally, to measure the subjective acceptance and satisfaction of our program in caregivers of patients with ED, we designed five items as a program feedback survey in the post-intervention measurement. The items measured to what extent the program helped caregivers learning skills to help their children or adolescents, learning knowledge about ED, getting psychological support, feeling more confident in front of their children or adolescents, and whether they are willing to attend programs like this in the future, and five options were provided (1 = no help at all, 3 = not sure, and 5 = very helpful). Caregivers who rated 4 or 5 were considered subjectively satisfied with this program and think it helpful.

2.4 | Procedure

The study started in early March 2020 and lasted for 4 weeks. After completing the online screening questionnaire, the links to the baseline online questionnaires were made into QC codes and delivered to eligible caregivers of the two groups through E-mail or WeChat. Then caregivers of patients with ED were invited into a WeChat group. The online education program lasted for 4 weeks and a total of four ED related lectures for caregivers were given through the Zoom software. All participants were taught to download and use the Zoom software. The information of each lecture was shared in the WeChat group 3 days before it began. The lectures were delivered by different therapists each time at a frequency of once a week. The four therapists served in Shanghai Mental Health Center and all had at least 3 years of experience in working with patients with ED. In each lecture, a specific topic on skills dealing with children or adolescents' ED (e.g., psychological preparation, communication with children, behaviour management, and cooperation with professional teams) was discussed and explained by the therapist for 1 hr, followed by a 30-minute question-and-answer session. During the question-and-answer session, the caregivers were invited to send their questions to the chat box, and the therapist who gave the lecture, along with another psychiatrist specialized in ED, would answer the questions. After each lecture, participants were invited to write down their thoughts on the lecture and their experience in fighting against ED. The representative manuscripts from the participants were selected, edited, and included in a series of articles named "Defeating ED". Additionally, we collected questions from participants

about their confusion in helping and managing their children or adolescents with ED, and then submitted them to psychiatrists and psychologists specialized in ED. The answers were collated into an article and included in a series named "Question and Answer". Articles in "Defeating ED" and "Question and Answer" were posted to the WeChat group weekly. Besides, participants were encouraged to share their experiences fighting with ED and support each other through the WeChat group during the time of the whole education program. The procedure of this education program and the contents of each lecture are presented in Figure 1.

2.5 | Statistical analysis

All statistical analysis was performed with R 3.6.3 software (R Core Team, 2020). To control the possible influence of participants' age, gender, and years of education, the propensity score matching (PSM) method was used to find the best match between the two groups based on the above three variables. The nearest neighbour matching program was used in this process. The match ratio was set at 1:1 to get balanced samples between caregivers of adolescents with ED and controls. The baseline differences between caregivers of patients with ED and controls in demographic information and psychological characteristics were estimated by students *t*-test or chi-square test as appropriate. A Paired *t*-test was used to analyze the changes in PHQ-9 and GAD-7 scores before and after the education program among caregivers of patients with ED. To explore the potential influencing factors on anxiety and depression changes, the caregivers of patients with ED were divided into response group and non-response group based on whether his or her PHQ-9 or GAD-7 decreased by 50%. Binary logistic regression analysis (stepwise method: backward) was performed to explore the potential factors influencing the outcomes. Significance was assigned as $p < .05$.

3 | RESULTS

The PSM method yielded 254 matched samples from the original 1,085 caregivers in the comparison group. All caregivers of patients with ED have only one child with ED. The demographic and psychological characteristics of the participants are summarized in Table 1. The gender of participants was mainly female in both caregivers of ED patients ($n = 214$, 84.3%) and comparison group ($n = 213$, 83.9%). For children and adolescents, female was also the dominant gender in patients ($n = 241$, 94.9%) and healthy individuals ($n = 241$,

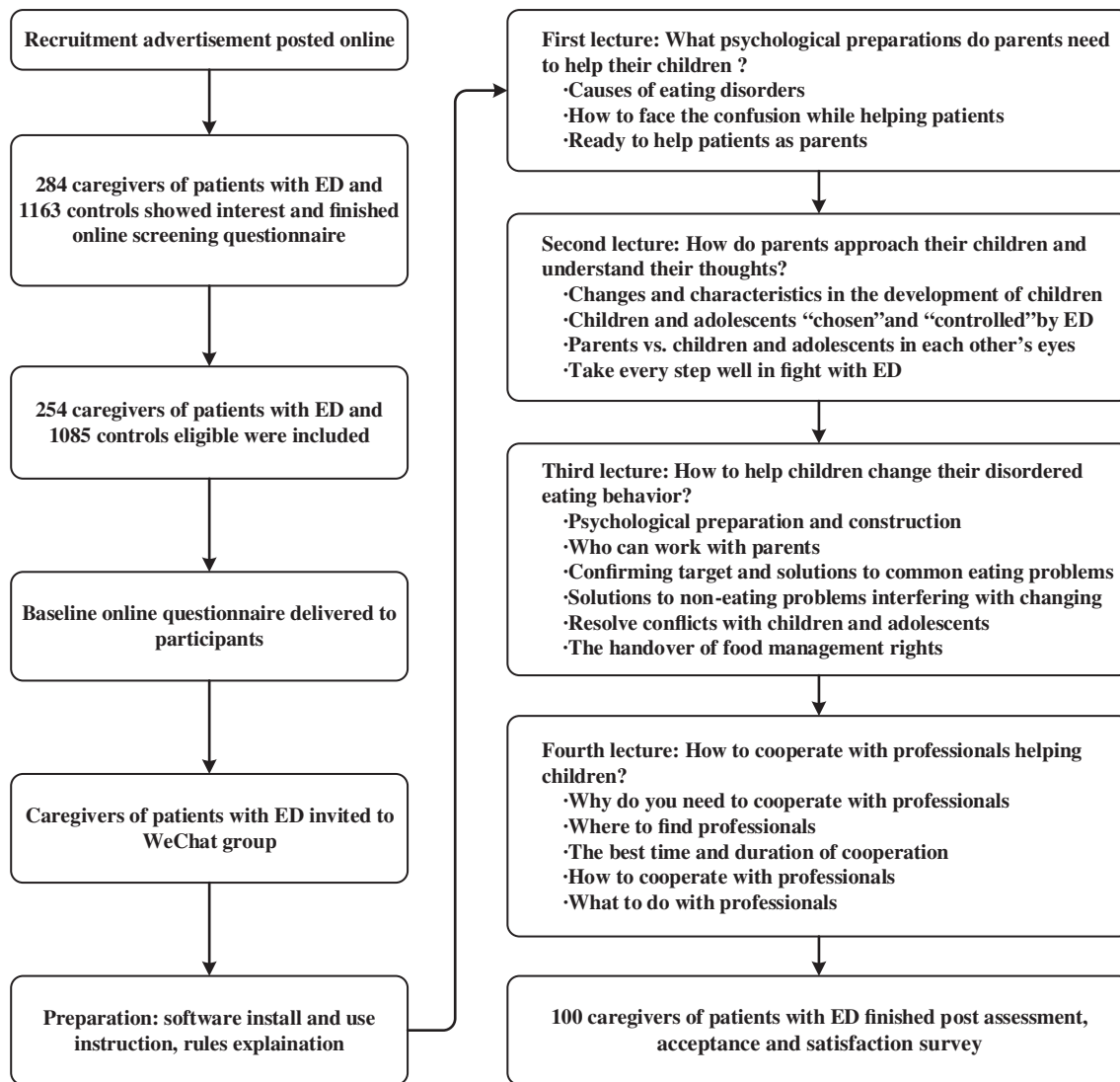


FIGURE 1 The procedure of the online education program and the contents of lectures

TABLE 1 Comparison of demographic and psychological characteristics between groups

	Caregivers of patients with ED $n = 254$		Comparison group $n = 254$		T	p
	Mean	SD	Mean	SD		
Age	47.0	4.3	46.6	4.2	0.939	.348
Years of education	14.0	3.3	13.8	3.4	0.415	.678
Patient's age	19.4	3.9	16.7	3.5	8.108	<.001***
PHQ-9	6.4	5.1	3.2	3.4	8.348	<.001***
GAD-7	5.7	4.8	2.2	3.0	9.785	<.001***
SSRS	37.9	8.0	44.4	7.1	-9.596	<.001***
PSS	16.5	6.1	12.0	5.7	8.682	<.001***

*** $p < .001$.

94.9%). The numbers of each diagnosis category in patients were: AN ($n = 164$, 64.6%), BN ($n = 53$, 20.9%), BED ($n = 22$, 8.6%), OSFED ($n = 15$, 5.9%). The median and interquartile range of illness duration of the patients

were 26 months (15~48 months). There were no significant differences between groups in age ($p = .348$), gender ($p = .904$), years of education ($p = .678$), and gender of patients with ED ($p = 1.000$). However, the age of

patients is significantly higher in caregivers of patients with ED than the comparison group ($p < .001$). For psychological characteristics, caregivers of patients with ED have significantly higher scores in PHQ-9 ($p < .001$), GAD-7 ($p < .001$), and PSS ($p < .001$), and significantly lower scores in SSRS ($p < .001$).

A total of 100 caregivers of patients with ED completed the post-assessment, conferring a dropout rate of 60.63%. Among them, 71 (71%), 19 (19%), and 10 (10%) caregivers completed all the four sessions, three sessions, and two sessions respectively. Besides, 30 (30%) caregivers reported not lived with their children or adolescents during the program. For the paired t -test between pre to post-intervention, there was no significant difference in PHQ-9 ($p = .938$) and GAD-7 ($p = .667$) changes (see Table 2).

TABLE 2 Results of paired t -test between before and after intervention in PHQ-9 and GAD-7 scores

	Before $n = 254$		After $n = 100$		T	p
	Mean	SD	Mean	SD		
PHQ-9	6.5	5.1	6.1	4.7	0.078	.938
GAD-7	5.7	4.8	4.9	4.0	0.418	.677

The 100 caregivers of patients with ED were then divided into response group and non-response group according to their changes in score of PHQ-9 and GAD-7. For PHQ-9, the response group included 26 participants and the non-response group included 74. While for GAD-7, the response group included 20 participants and the non-response group included 80. There was no significant difference between the two groups neither in depression ($p = .123$) nor anxiety ($p = .512$) at baseline. The depression and anxiety levels of the two groups before and after intervention are presented in Figure 2. Logistic analyses were performed using the stepwise backward method. Table 3 provides the logistic regression results when the dependent variable was the response of PHQ-9. Caregivers of older patients were significantly more likely to reduce their depression level through the online education program (OR: 1.232 [95% CI: 1.013, 1.499], $p = .037$). In addition, the results showed that not living with patients was a significant factor in reducing depression level (OR: 0.132 [95% CI: 0.0310.563], $p = .006$).

The logistic regression results when the dependent variable was the response of GAD-7 are provided in Table 4. Caregivers of patients with ED whose children or adolescents had a shorter duration of illness are more likely to reduce their anxiety levels through the online

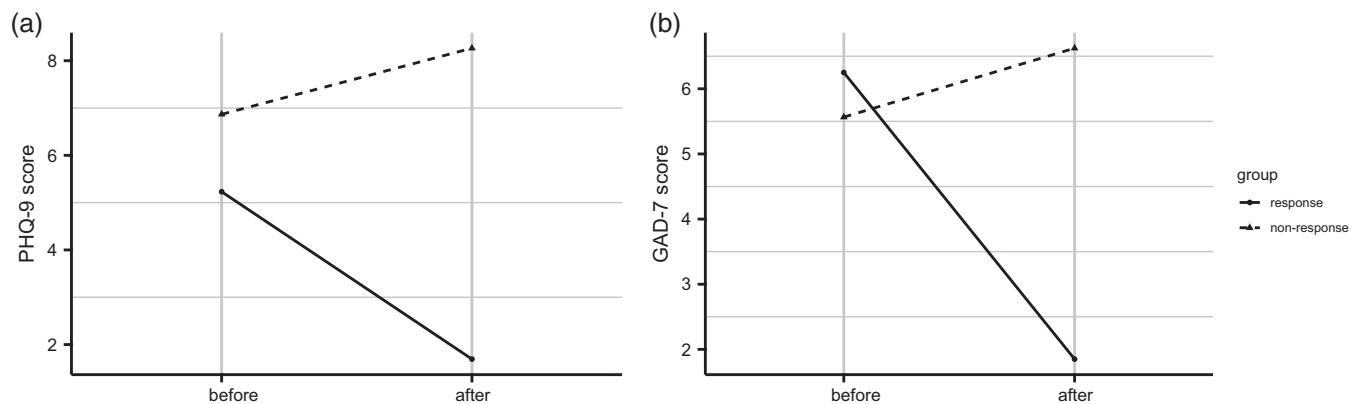


FIGURE 2 The changes in PHQ-9 (a) and GAD-7 (b) scores before and after the online education program between response group and non-response group. The grouping was based on whether the score of PHQ-9 or GAD-7 of the caregiver decreased by 50%

TABLE 3 Results of logistic regression, dependent variable: Response of PHQ-9

	β	SE	OR	p	95%CI	
Patient age	0.209	0.100	1.232	.037*	1.013	1.499
Illness duration	-0.026	0.014	0.974	.058	0.948	1.001
Live with patient	-2.208	0.742	0.132	.006**	0.031	0.563
Intercept	-0.456	2.110	0.634	.829		

* $p < .05$; ** $p < .01$.

TABLE 4 Results of logistic regression, dependent variable: Response of GAD-7

	β	SE	OR	<i>p</i>	95%CI	
Illness duration	-0.043	0.021	0.958	.041*	0.920	0.998
Intercept	-0.135	0.548	0.874	.806		

* $p < .05$.

education program (OR: 0.958 [95% CI: 0.920, 0.998], $p = .041$).

In our additional program feedback survey of the acceptance and satisfaction, most caregivers who finished the post-intervention measurement ($n = 100$) thought the program helpful in learning skills to help their children or adolescents ($n = 92$), learning knowledge about ED ($n = 91$), getting psychological support ($n = 95$), feeling more confident in front of their children or adolescents ($n = 86$), and all of them were willing to attend similar programs in the future ($n = 100$).

4 | DISCUSSION

To our knowledge, this is the first study exploring new intervention methods for caregivers of ED patients during the COVID-19 pandemic in China. At baseline, caregivers showed significantly higher levels of depression, anxiety, perceived stress, and lower social support. However, no significant decrease was found in depression and anxiety after the online education program. After grouping the participants according to the intervention response, we explored the potential influencing factors that may affect the effectiveness. We found that caregivers whose children or adolescents were older or not living with patients were more likely to decrease their depression level after the intervention. The caregivers of patients with shorter duration of illness were more likely to benefit from the program in terms of reducing anxiety levels. Paradoxically, those who had shown a lack of response to the education program intend to become more depressed and anxious after the online intervene (see Figure 2).

Consistent with previous studies during the non-pandemic period (Stefanini et al., 2019; Zabala et al., 2009), we found that the caregivers of patients with ED suffered more serious depression and anxiety. A systematic review on caregivers of patients also reported high anxiety and depression levels in this population (Anastasiadou, Medina-Pradas, Sepulveda, & Treasure, 2014). This suggests that whether it is during a pandemic or non-pandemic period, the distress of caregivers of patients with ED is a persistent issue that should attract extra attention (Vintró-Alcaraz et al., 2018). Our study further showed that

caregivers of patients with ED got less social support. A recent study showed that treatments addressing social support are beneficial in reducing the psychological burden on caregivers (George, Kecmanovic, Meade, & Kolt, 2020). But the relationship between social support and negative feelings needs further research. The elevated perceived stress in caregivers of patients with ED shown in this study was also reported in previous studies (Anastasiadou et al., 2014; Stefanini et al., 2019), which might play as a co-factor with depression and anxiety maintaining the illness of their children or adolescents with ED. Notably, the information we collected was from the primary caregivers, who were reported to suffer more emotional burden (Stefanini et al., 2019). During the special period of the COVID-19 pandemic, the primary caregivers may need more professional interventions to release their psychological burden and enhance their ability to cope with the complex situation.

Contrary to our hypothesis, the new form of online education program did not show significant effects on reducing depression and anxiety levels in caregivers of patients with ED, though the mean score of PHQ-9 and GAD-7 changed in the hypothesized direction. This result is similar to a recent study implementing a brief group intervention for caregivers of patients with ED (McEvoy et al., 2019), which yielded no significant difference in depression and anxiety post-intervention. The possible reason for these results, firstly, might be that we implemented a short intervention period and relatively low intervention intensity. It is possible that the intervention duration was too short to reach the maximum effect (Russell, 1987). Although the set of this program was for cost and convenience consideration, extra interventions providing more skill training or instructions might be needed to achieve better outcomes in the future. Secondly, the form of the intervention might be another reason for the null results. Though many studies investigated the outcomes of an online intervention for ED patients (Barakat et al., 2019), few focused on the online intervention for caregivers. Some participants might have had technical issues in software using, and the process of intervention delivery was affected by many uncontrollable factors including internet stability, access to devices (Waller et al., 2020). Thirdly, to maximize limited resources in an unprecedented crisis, we chose to intervene as many caregivers as possible rather than

providing age and illness duration matched intervention separately. There have been many family-involved interventions designed for different ED subtypes and patients with different ages and illness duration. For caregivers of patients with ED in different situations, different intervention strategies instead of unified ones for all participants should be taken in studies. This is a hard trade-off between quality and quantity under this special period, especially in China with a large population. As suggested by Taylor and colleagues (Taylor, Fitzsimmons-Craft, & Graham, 2020), more therapists should be trained to devote to this battle against COVID-19.

We also investigated the affecting factors of this online education program. We found that older patient age and not living with patients were associated with a better response. Though few studies reported the effect of child age on caregivers' distress, many showed that older ED patients are more likely to benefit from psychotherapy (Burke et al., 2017; van den Berg et al., 2019). It has been long known that living with the care recipient and a higher number of hours spent on caregiving would increase the caregiver's burden and negative emotions (Adelman et al., 2014). The difficulties of daily meal managing of their children or adolescents and communicating may serve as chronic stressors for caregivers and undermine the psychological health of caregivers. We also found that caregivers of patients with shorter duration of illness were more likely to decrease their anxiety level, indicating that caregivers of patients with longer illness duration may need extra or some other interventions. An important phenomenon in our result is that the response and non-response groups had an almost opposite trajectory of changing in depression and anxiety levels. One of the possible explanations is that the FBT based therapy was designed to gain family cooperation at the first stage, which focuses family members on the most relevant problems (Russell, 1987). Our intervention mainly involved the content of the FBT. This may cause an increase of depression and anxiety levels of a large portion of caregivers after only 4 weeks. Longer intervention duration and follow up should be adopted to investigate the effect. Another possible reason is that this form of intervention is only effective for a particular group of the population as illustrated by our results. But this conclusion needs further validation. In our post-intervention acceptance and satisfaction survey, the caregivers expressed relatively high acceptance and satisfaction to our program, also expressing a high desire to attend similar programs in the future. This supported a previous study (Linardon et al., 2020). The form of online education might be a good choice to deliver ED related knowledge on a large scale, while the structure of online intervention should be more elaborately designed.

This study had some limitations. First, we chose to intervene in caregivers of patients with ED on a large scale that does not allow for talking about personal problems and conflictive situations, which are essential efficacy factors in face-to-face therapies. Such scale also limited the application of different intervention strategies to best match caregivers. Second, and equally important, this program lasted only 4 weeks. There may not be enough time for the family-based intervention to show its effect. Third, our program had a relatively high dropout rate, which may weaken the power of statistical analysis. This level of dropout rate is also reported in some online intervention programs for ED patients (Leung, Ma, & Russell, 2013). We suspect that lacking face-to-face communication and personalized feedback may lead to low compliance. Another possible reason is that the life-threatening circumstances that lead to many survival concerns may decrease the motivation of participants to seek interventions. Besides, the program was free of charge, and this setting may contribute to the high dropout rate.

In conclusion, this is the first study exploring new interventions for decreasing the depression and anxiety levels of caregivers of patients with ED in the mist of the COVID-19 pandemic. In the future, the form of online education on a large scale might be suitable for knowledge sharing, while for intervention and therapy purposes, we may aim at implementing a longer period, a limited number of members, and structured online intervention programs as designed in the previous study (Cardi et al., 2017), with extra skills like skills based on the new Maudsley Model and dialectical behaviour therapy, which are effective methods to decrease anxiety and depression levels (Lock & Le Grange, 2015; Safer, Telch, & Chen, 2009; Treasure & Nazar, 2016; Treasure, Rhind, Macdonald, & Todd, 2015). Besides, multimedia channels and more personalized feedback are related to better internet-based therapy outcomes (Barakat et al., 2019). Though we offered online lecture and text materials for participants, which enriched the intervention forms, personalized feedback is difficult to realize through "Question and Answer" in the WeChat group. A more personalized feedback system should be established to increase the intervention effectiveness and compliance of participants.

CONFLICT OF INTEREST

The authors have no conflict to declare.

AUTHORSHIP

Jue Chen, Han Chen, and Sufang Peng: Conceived and designed this study. Mengting Wu and Lei Zhang: Recruited participants. Jue Chen, Han Chen and, Sufang

Peng: Conducted the intervention. Lei Guo: Collected the data, performed the data analysis, and finished the manuscript. Jue Chen, Zhuoying Zhu, Wei Li and, Fernando Fernández-Aranda: Reviewed and edited the article. All authors read and approved the final manuscript.

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