

## ORIGINAL ARTICLE

# Effect of Text Messaging-based Psychiatric Nursing Program on Quality of Life in Veterans with Post-Traumatic Stress Disorder: A Randomized Controlled Trial

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### ABSTRACT

**Background:** Recurrent post-traumatic stress disorder (PTSD) can devastate the life of a veteran. Despite the widespread use of mobile learning technology in health care and nursing, few studies have examined its potential in PTSD patients and the effect on quality of life (QoL). The present study aimed to investigate the effect of a text messaging-based psychiatric nursing program on QoL in veterans with PTSD symptoms.

**Methods:** A single-blinded, randomized, controlled trial was conducted at the outpatient clinic of Sadr Hospital in Tehran (Iran) from January 2014 to October 2015. A total of 98 veterans with PTSD who referred to the outpatient clinic of the hospital were initially assessed for eligibility to participate in the study. Based on the inclusion criteria, 66 veterans were recruited in the study and randomly allocated to a control group (n=33) and an intervention group (n=33). Due to the lost to follow-up, 9 participants (control=4, intervention=5) were excluded from the analysis phase. The intervention group received psychiatric support via short text messages for 6 months, whereas the control group received the routine hospital care. The self-rating scale for PTSD (SRS-PTSD) and the short form 36 (SF-36) were used to evaluate the severity of symptoms and the QoL, respectively. The results were analyzed using the SPSS software (version 18.0) with the Chi-square test, Fisher's exact test, independent sample *t* test, and paired sample *t* test.  $P < 0.05$  was considered statistically significant.

**Results:** A significant improvement in PTSD ( $P=0.001$ ) and QoL ( $P=0.001$ ) was observed in the intervention group compared to the control group. Moreover, the recurrence frequency in the intervention group was significantly lower ( $P=0.03$ ).

**Conclusion:** The text messaging-based psychiatric nursing program reduced the severity of symptoms in veterans with PTSD and improved their QoL.

**Trial Registration Number:** IRCT2013101214983N1

**KEYWORDS:** Post-traumatic stress disorder, Psychiatric nursing, Quality of life, Veterans

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## INTRODUCTION

According to the diagnostic and statistical manual of mental disorders (DSM-5), post-traumatic stress disorder (PTSD) is a condition caused by exposure to a traumatic event and exhibits four symptom clusters (re-experience, avoidance, negative changes in cognition and mood, and hyperarousal for a minimum of 1 month after observing the functional impairment.<sup>1</sup> The onset of the PTSD symptoms occurs within the initial few months after exposure to a traumatic event. In 25% of the PTSD patients, the symptoms may recur within 6 months post-hospital discharge.<sup>2</sup> The prevalence of PTSD has been reported among the veterans of various military conflicts; Vietnam war: 2-17%,<sup>3</sup> USA-Iraq war: 4-17%, UK-Iraq war: 3-6%,<sup>4</sup> and Croatian war of independence: 16%.<sup>5</sup> Among the Iranian war veterans, the reported prevalence of anxiety disorders, symptoms due to chemical warfare PTSD, and PTSD symptoms due to other war injuries was 8.4%, 40%, and 28%, respectively.<sup>6,7</sup>

Nowadays, mobile-learning technology has been widely used in healthcare and nursing education. The same technology can be applied to war veterans to examine the impact of tele-psychiatric assessment on the severity of PTSD and quality of life (QoL).<sup>8</sup> The use of mobile phones allows the patients to establish a long-term and close contact with a health care provider without being stigmatized.<sup>9</sup> There are reports that the use of short messaging service (SMS) encourages patients with a mental illness to actively continue with the treatment even post-hospital discharge.<sup>10</sup> Considering the fact that most patients do not receive adequate guidelines on self-care during routine care,<sup>11</sup> SMS is a low-cost technology utilized to promote self-care.<sup>12</sup> According to some reports, the use of SMS in healthcare has risen by 68%.<sup>13</sup> It has been used to encourage lifestyle changes such as smoking cessation, healthy eating habits, and physical activity. It is also used to promote adherence to treatment in patients with depressive disorder,<sup>14</sup> and with human immunodeficiency virus (HIV),<sup>15</sup> as well as monitoring the symptoms of asthma,

heart diseases,<sup>16</sup> and PTSD.<sup>17</sup>

Veterans with PTSD have a lower QoL, reduced daily physical functioning, a higher level of depression, higher suicide risk, and risk of an early death.<sup>3</sup> It has been reported that some sub-scales of the SF-36 (physical role, pain, general health perceptions, and emotional role) were related to the severity of PTSD.<sup>18</sup> Another study reported that the QoL of the veterans with PTSD was poorer than non-PTSD veterans in terms of social functioning, mental health, and physical role.<sup>19</sup> The stigma of PTSD has been suggested to have a negative impact on the likelihood of seeking support and a decreased usage of health care services<sup>20</sup> whereby only 36% of such patients received follow-up care.<sup>21</sup> Additionally, non-adherence to medications has reduced the chance of recovery, which in turn has led to the recurrence of PTSD and lower QoL of the veterans.<sup>22</sup>

It is believed that self-care management is an effective paradigm in healthcare and can improve the knowledge and QoL of patients while respecting their autonomy. Additionally, it reduces public expenditure.<sup>23</sup> It is reported that self-care educational programs can reduce the disease burden and re-hospitalization, improve adherence to medication, and encourage the therapists to broaden their knowledge on psychotherapy.<sup>24</sup> To date, only one study in Iran has used the SMS method, with a successful outcome. SMS was used to control blood glucose levels in pre-diabetic pregnant women.<sup>25</sup> However, the effect of text messaging-based psychiatric nursing on the QoL in PTSD patients has not been investigated yet.

Educational interventions provide patients with the necessary skills to manage their health status and minimize health consequences.<sup>26</sup> A previous study that evaluated intervention using text messaging-based psychiatric nursing, also considered psychiatric training in addition to efficient medication, social relationship, control of daily activities, and peer support.<sup>27</sup> Nonetheless, there is still a lack of information on the effectiveness of text

messaging-based psychiatric intervention on the patients with a chronic psychiatric illness in Iran. Although many nursing programs have used mobile learning technology in clinical and laboratory settings,<sup>28</sup> limited studies have evaluated the effects of mobile learning using SMS; let alone its effect on the QoL in patients with PTSD. Hence the present study aimed to investigate the effect of text messaging-based psychiatric nursing on the severity of symptoms and QoL in veterans with PTSD.

## MATERIALS AND METHODS

A single-blinded, randomized, controlled trial was conducted at the outpatient clinic of Sadr Hospital (Tehran, Iran) from January 2014 to October 2015. The hospital is a highly specialized psychological treatment center for Iranian war veterans. A total of 98 veterans with PTSD who referred to the outpatient clinic of the hospital were initially assessed for eligibility to participate in the study. The inclusion criteria were war veterans diagnosed with PTSD, age <65, reachable by mobile phone, ability to read SMS, discharged from the hospital within 2 weeks to 1 month, and no participation in any concurrent psychiatric telenursing care program. Due to the scarcity of patients with PTSD only, those with dual diagnosis (e.g. depression, substance dependence) were also included in the study. The exclusion criteria were any symptoms of cognitive impairment and severe psychological problems that could hinder using SMS. Accordingly, 32 patients who did not meet the criteria were excluded from the study.

The sample size was determined in accordance with a retrospective study by Rosenheck and Fontana.<sup>28</sup> In their study, 36.6% of the veterans with PTSD relapsed 180 days after the incident. Based on the following formula (assuming the probability before ( $\pi_A$ ) and after ( $\pi_B$ ) the intervention of 0.5 and 0.2, respectively) a sample size of 21 per group was calculated ( $\pi_A=0.5$  and  $\pi_B=0.2$ ) at 95% significance level ( $\beta=0.2$ ), where  $\phi=4$ ,  $\pi_{discordant}=0.5$ .

$$\phi = \frac{\pi_A (1 - \pi_B)}{\pi_B (1 - \pi_A)}$$

$$\pi_{Discordant} = \pi_A (1 - \pi_B) + \pi_B (1 - \pi_A)$$

$$n_{pair} \geq \frac{(z_{1-\frac{\alpha}{2}}(\phi + 1) + z_{1-\beta}\sqrt{(\phi + 1)^2 - (\phi - 1)^2\pi_{Discordant}})^2}{(\phi - 1)^2\pi_{Discordant}}$$

Although 21 participants were needed per group, considering the probability of lost to follow-up, we recruited the remaining 66 patients. The participants were randomly allocated to a control group (n=33) and an intervention group (n=33). The allocation sequence was generated using a computer-generated list of random numbers by an independent researcher. The sequence was coded to prevent possible identification errors and kept in a secure place. During the intervention, 9 individuals discontinued their participation since they were unreachable by phone (the phone was either switched off or there was no network signal). Subsequently, data analysis was performed on 57 participants (control group=29, intervention group=28). The intervention group participated in the psychiatric nursing program via SMS for 6 months, whereas the control group received the routine psychiatric care from the clinic (Figure 1). All participants received multiple drugs (e.g. selective serotonin reuptake inhibitors) and psychological consultations. The medication dosage was not altered in the course of the study.

The self-rating scale for PTSD (SRS-PTSD), SF-36, and a demographic data form were used as data collection instruments. Demographic characteristics were categorized into 12 variables including age, level of education, marital status, employment status, depression history, sleep problems, a sense of loneliness, family problems (lack of family support as a psychiatric issue), anxiety for lack of support, willingness to communicate (interest in talking to others, making friends, and in participating in communities), living conditions (alone/with family), and substance dependence. All domains were completed through interviews; however, variables such as recurrence rate, substance dependence, and depression were retrieved from the hospital records.

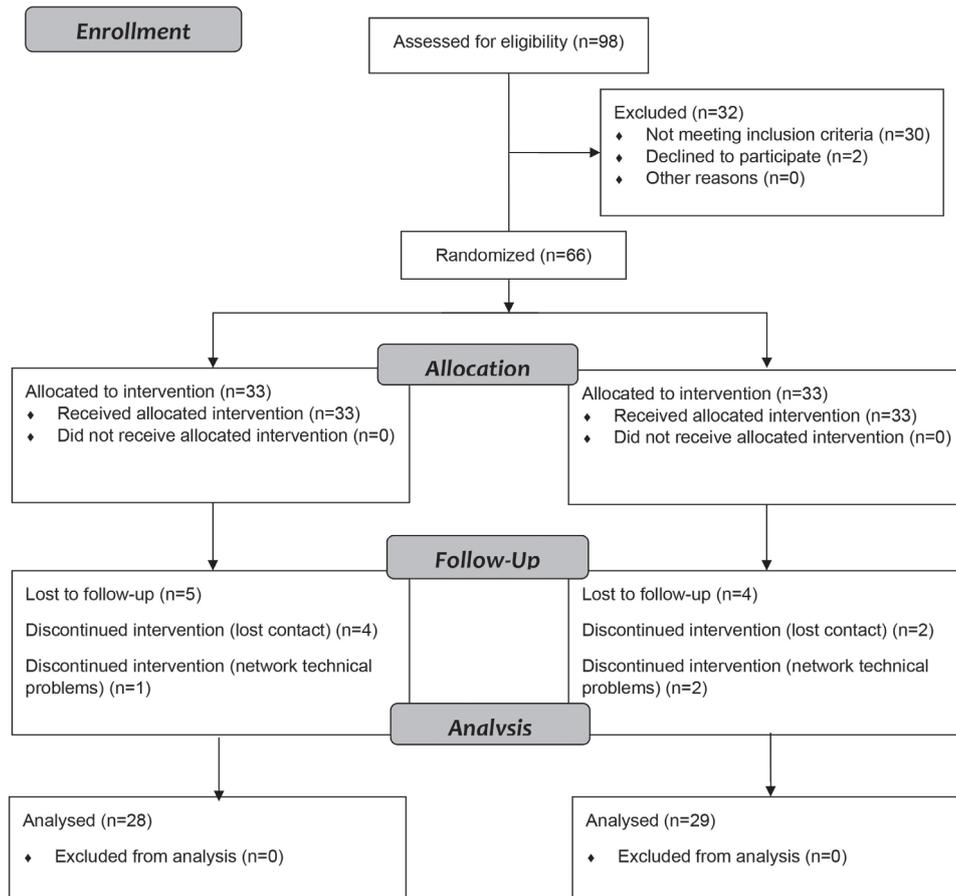


Figure 1: Consort flowchart of the participants

Gersons and Carlier (1993) examined the clinical utility of the SRS-PTSD (a 17-item questionnaire) on plane crash survivors. Based on DSM-5, the symptoms of PTSD were scaled from 0 to 2 (0=never, 1=a few/once and less than 4 times, 2=very much, almost constant, more than 4 times); higher scores corresponded to higher stress levels.<sup>29</sup> In another study, Carlier et al. (1998) reported that the SRS-PTSD questionnaire had a good internal consistency (Cronbach's alpha=0.96) and reliability. The Cronbach's alpha for re-experiencing, avoidance, and hyperarousal was 0.88, 0.88, and 0.93, respectively. They also reported a good construct validity. Moreover, the results of factor analysis with varimax rotation revealed three underlying factors which explained 57% of the variance (42%, 8%, and 7% for the first, second, and third factors, respectively). Overall, the SRS-PTSD questionnaire showed a good validity and reliability.<sup>30</sup> In a cross-sectional study

in Iran, Khodadadi et al. (2011) translated and validated the SRS-PTSD questionnaire in patients with PTSD. Its content validity was confirmed by an expert panel and its overall reliability was high ( $r=0.90$ ). Hence it was concluded that the questionnaire has a sufficient sensitivity and specificity for use in the Iranian population.<sup>31</sup> The questions related to the re-experience (6 items), avoidance (6 items), and irritability (5 items) were examined and a minimum of 6 positive answers confirmed the diagnosis of PTSD. The illness was firmly diagnosed when the patient responded positively to at least one question of the re-experience category, three questions of avoidance, and two questions of the irritability.

In 1992, Ware Jr and Sherbourne constructed the 36-item SF-36 to examine the clinical status of patients and health policy-making. They performed factor analysis and the first main component comprised 55% of

the total variance and correlated highly with all eight scales (range=0.67 for role-emotional to 0.82 for vitality, median=0.74).<sup>32</sup> Montazeri et al. (2005) administered the translation, validation, and reliability ( $r=0.77$ ) of the Persian version of SF-36 (almost all sub-scales). The results showed two main components explaining 65.9% of the variance of measures and in estimating the reliability, the internal consistency indicated alpha ranging from 0.77 to 0.9. The SF-36 consisted of 36 items scored in eight sub-scales, including physical functioning (10 items), physical role limitation (4 items), bodily pain (2 items), general health perception (5 items), vitality (4 items), social functioning (2 items), emotional role limitation (3 items), and mental health (5 items). Scores ranged from 0 to 100; the higher the mean scores the better the QoL.<sup>33</sup>

After primary interviews, a written informed consent was obtained from the participants. The questionnaires were completed by a psychologist before the intervention in each group.

The contents of the text messaging program for PTSD self-care was designed based on an extensive research of available databases, validated literature, scientific resources, a comprehensive evaluation of psychiatric nursing texts used in military organizations for PTSD veterans, and the Persian PTSD practice guideline from the Veterans Institute of Medicine. After preparing the contents, daily messages were sent to the intervention group for a period of 6 months. The program did not impose any extra cost on the participants. Each text message was written in Persian (maximum 160 characters). The messages focused on mental health improvement and the self-care needs of the patients and were prioritized based on the opinions of both experts and patients. Respect for privacy and the attractiveness of remote communication were seriously considered during the validation stage. The contents of the messages were categorized as: Welcome message and program introduction, description of PTSD symptoms, methods of

accepting and dealing with PTSD symptoms, self-control; relaxation and deep breathing skills, anxiety management skills, recurrence prevention assistance, importance of treatment adherence; methods to deal with insomnia, methods to deal with intrusive thoughts, attitude change and positive thoughts, self-confidence and sense of value; methods to deal with sleep disorders, methods to prevent suicidal thoughts, importance of proper diet and environmental changes; substance-related addiction self-care, meditation, messages on special occasions, and closing remarks messages. Below are some examples of such messages.

- I can. The feeling of anxiety can cause me no harm. This feeling will end soon. I can take control rather than let anxiety overtake me.

- At an appropriate time, sit or lie down, make yourself comfortable and relax, close your eyes, breathe deeply and slowly, and relax your muscles. Imagine that you can see the colors of the rainbow and everything feels fresh.

As requested by the participants, messages were sent at 6 P.M. to avoid working hours (8 A.M. to 4 P.M.). The participants were advised to get some rest before 6 P.M. to relieve the daily work-related stresses. Exercise instructions were given for muscle relaxation and deep breathing, as well as recommendations to review the messages at an appropriate time. The participants and their family members were provided with a list of mobile phone numbers (the author, clinical psychiatry nurse, a medical informatics specialist with a nursing background, and the hospital psychiatrist) to facilitate direct communication on a need basis. Additionally, on monthly basis, the clinical psychiatry nurse proactively contacted the participants in the intervention group to follow-up on their attitude toward the text messages, to confirm further participation, and to establish an atmosphere of mutual trust and respect. During the final week of the intervention, a set of text messages was sent to inform them about the cessation of the program. The messages were sent by the

medical informatics specialist via a dedicated internet-based instant messaging system with a delivery receipt feature. During the same period, the participants in the control group received the routine psychiatric care from the clinic that included mental support and initial treatment (e.g. medication, education, anger management, relaxation, and effective social relationship). Both groups could freely visit the physician or psychiatrist throughout the study.

All screening results and collected data were assigned a unique identification number and the participants' personal health information was treated confidentially. Post-test was performed one week after completing the intervention in both groups. The demographic characteristics of both groups were reported using frequency distribution and descriptive statistics, including measures of central tendency and dispersion. The results were analyzed using the SPSS software (version 18.0). The Chi-square test and Fisher's exact test were used to determine the homogeneity of the variables. The Mann-Whitney U test was used to evaluate the frequency of recurrence of the variables. Confounding variables were not adjusted in the statistical analysis. The independent sample *t* test was used to identify the differences in the PTSD symptoms between the two groups. The independent sample *t* test and paired sample *t* test were used to examine the groups in terms of QoL.  $P < 0.05$  was considered statistically significant.

The study was approved by the Research Ethics Committee, Tehran University of Medical Sciences, Tehran, Iran in October 2013 (code: 92-02-28-23508-99591).

## RESULTS

The age of the participants ranged from 42 to 61 years with the mean age of  $48.41 \pm 3.62$  years (control group) and  $47.29 \pm 3.57$  years (intervention group) ( $P = 0.24$ ,  $t = 1.18$ ). The majority of the participants were married 52 (91%). Other important demographic characteristics were disability 27 (47.37%),

unemployed 19 (33.33%), junior high school education 17 (29.82%), and substance dependent 15 (26.32%). Sleep problems and depression were very common among the veterans 42 (73.68%) and 56 (98.25%), respectively. At baseline, the two groups had no significant differences in demographic characteristics (Table 1).

A significantly lower mean frequency of PTSD recurrence was observed in the intervention group compared to the control group ( $2.40 \pm 0.09$  versus  $1.20 \pm 0.44$ ) ( $P = 0.02$ ). While in the control group 4 (40%) had three recurrences, in 4 (80%) of the patients in the intervention group the recurrence rate was once only. After the intervention, PTSD mean score were significantly lower in the intervention group than that of the control group ( $26.32 \pm 4.48$  versus  $30.48 \pm 4.00$ ,  $P = 0.001$ ) (Table 2).

In terms of QoL, as shown in Table 3, the difference between the scores in both the intervention and control groups was high; physical role limitation ( $P = 0.002$ ), physical functioning, emotional role limitation, vitality, mental, social functioning, pain, and general health ( $P = 0.001$ ). Moreover, in the intervention group, there was a significant difference in all the eight domains of QoL before and after the intervention ( $P = 0.015$ ,  $P = 0.001$ ,  $P = 0.001$ ,  $P = 0.001$ ,  $P = 0.009$ ;  $P = 0.001$ ,  $P = 0.001$ ,  $P = 0.001$ , respectively). The SF-36 score showed a significant increase in QoL in the control group (routine care) in some domains before and after the intervention. The difference was significant in the following domains: physical functioning, role emotional, vitality, mental health, and general health.

## DISCUSSION

The presented text messaging-based psychiatric nursing program significantly improved the PTSD symptoms, enhanced the QoL, and lowered the frequency of PTSD recurrence. Comparable studies reported that a remotely delivered program capable of preventing PTSD symptoms has the same impact as the routine

**Table 1:** Demographic characteristics of the control and intervention groups.

Variables	Groups	Control (N=29)	Intervention (N=28)	P value
		N (%)	N (%)	
Education	Elementary	7 (24.14)	7 (25)	0.85*
	Junior high school	10 (34.48)	7 (25)	
	High school	7 (24.14)	9 (32.14)	
	University	5 (17.24)	5 (17.86)	
Marital status	Single	1 (3.45)	1 (3.57)	0.80**
	Married	26 (89.65)	26 (92.86)	
	Divorced	1 (3.45)	1 (3.57)	
	Widow	1 (3.45)	0 (0)	
Employment status	Full-time	2 (6.90)	5 (17.86)	0.52**
	Unemployed	9 (31.03)	10 (35.71)	
	Disabled	16 (55.17)	11 (39.29)	
	Retired	2 (6.90)	2 (7.14)	
Depression history	Yes	28 (96.55)	28 (100)	0.50**
	No	1 (3.45)	0 (0)	
Sleep disorder (week)	No	2 (6.90)	2 (7.14)	0.94**
	<1	0 (0.0)	1 (3.57)	
	1-2	5 (17.24)	5 (17.86)	
	3≥	22 (75.86)	20 (71.43)	
Sense of loneliness	Yes	24 (82.76)	25 (89.29)	0.70**
	No	5 (17.24)	3 (10.71)	
Family problems	Yes	19 (65.52)	14 (50.0)	0.23*
	No	10 (34.48)	14 (50.0)	
Anxiety for lack of support	Yes	22 (75.86)	24 (85.71)	0.34*
	No	7 (24.14)	4 (14.29)	
Willingness to communicate	Yes	16 (55.17)	16 (57.14)	0.88*
	No	13 (44.83)	12 (42.86)	
Living condition	Alone	2 (6.90)	2 (7.14)	0.61**
	With family	27 (93.10)	26 (92.86)	
Substance dependence	Yes	12 (41.38)	3 (10.71)	0.09*
	No	17 (58.62)	25 (89.29)	

\*Chi-Square; \*\*Fisher's exact test

**Table 2:** PTSD scores of the veterans before and after the intervention in both groups.

Variable		Before intervention	After intervention	P value*
		Mean±SD	Mean±SD	
PTSD <sup>a</sup>	Control Group	15.75±2.99	30.48±4.00	0.001
	Intervention Group	15.78±3.17	26.32±4.48	
	P value within**	0.97**	P=0.001**	

<sup>a</sup>Post-traumatic stress disorder; \*Paired sample *t* test; \*\*Independent sample *t* test

treatments.<sup>34</sup> Interventions via SMS has been effective in improving the behavior of the participants due to its speed, low-cost, and accessibility of the messages and its psychiatric content. It is also a useful tool to improve patients' adherence to medication.<sup>35</sup> These benefits could probably have been the reason why the veterans in our study proactively read

the messages and applied its content, which in turn helped to control the PTSD symptoms.

A lower frequency of PTSD recurrence was also observed in the intervention group. A review of comparable studies showed that contact with psychiatric nurses, in particular via SMS, was effective in reminding the participants to take their medication, thereby

**Table 3:** Comparison of the means of QoL domains in both groups before and after the intervention.

Variables	Intervention (N=28)		Control (N=29)		P value**
	Before	After	Before	After	
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
Physical Functioning	49.10±25.49	63.92±23.81	42.24±22.02	28.44±13.69	0.001
P value* within	0.02		0.003*		
Role Physical	34.82±38.69	75±44.09	27.58±36.19	37.07±46.10	0.002
P value* within	0.001		0.37*		
Role Emotional	14.28±24.72	54.76±36.53	21.83±31.21	0.00±0.00	0.001
P value* within	0.001		0.001*		
Vitality	28.75±19.98	44.46±12.57	33.27±19.00	25.34±11.15	0.001
P value* within	0.001		0.04*		
Mental Health	32.42±18.35	42.57±14.69	28.13±18.15	15.44±7.76	0.001
P value* within	0.009		0.001*		
Social Function	34.82±27.07	56.25±16.13	37.06±27.23	31.64±14.41	0.001
P value* within	0.001		0.37*		
Pain	33.92±26.21	61.69±23.58	27.5±19.95	29.56±19.14	0.001
P value* within	0.001		0.72*		
General Health	27.14±13.43	39.46±14.09	31.72±17.74	17.06±10.04	0.001
P value* within	0.001		0.001*		

\*Independent sample *t* test; \*\*Paired sample *t* test

increasing the treatment adherence rate through remote monitoring.<sup>35</sup> The positive outcome of our text messaging-based psychiatric nursing program was mainly contributed to (i) SMS reminders on the adherence to the medication regimen and non-medicinal therapies, (ii) the motivational impact of short messages on timely referral for counseling and continuation of the treatment, and (iii) the effect of our training program in increasing the awareness of the patients about the disorder to control its symptoms and reduce recurrences.

All the eight dimensions of QoL in PTSD veterans had improved in the intervention group of the present study. To a lesser extent, such improvement was also observed in the control group; indicating the effectiveness of the routine care at Sadr Hospital. In line with previous studies on QoL in PTSD patients, the participants in the present study had a low QoL prior to the intervention. A study reported on improved QoL in all domains after the intervention in the intervention group, while the control group showed similar improvements except for the physical functioning.<sup>36</sup> In contrast, another study on PTSD patients reported low physical and

mental functioning on the SF-36 scale without affecting their QoL.<sup>37</sup>

The design of the proposed intervention in the present study was based on increasing patients' awareness and reminders to consider alternative treatment approaches. For example, alternatives such as psycho-education, training exercises, muscle relaxation, breathing exercises, and more non-medicinal therapies. Such design led to improved autonomy, self-management, and mental and psychological aspects of QoL in our patients. In a previous study, the relationship between PTSD symptoms and QoL was highlighted.<sup>38</sup> In another study, successful treatment of PTSD symptoms also led to improved QoL.<sup>39</sup> As demonstrated in the present study, daily educational text messages to PTSD patients improved their adherence to the educational and care protocols (e.g. sleep and depression) and subsequently minimized the recurrence of the symptoms. The participants showed improved physical functioning and QoL by learning self-management of the PTSD symptoms.

The public stigma of PTSD illness due to the lack of knowledge has been highlighted in a study. They reported that knowledge positively correlated with social support

and negatively correlated with the level of stigmatization of this mental illness. In fact, knowledge of PTSD was an important factor affecting the veterans' return to normal life.<sup>40</sup> In the present study, we found that awareness of PTSD disorder increased through psycho-educational intervention, which had an effect on the physical and psychological components of QoL as well.

The main limitation of the present study was the small sample size. However, this limitation was outweighed by the effectiveness of the text messaging-based psychiatric nursing program (i.e. simplicity, low costs, and accessibility for all patients).

## CONCLUSION

Remote care through text messaging-based psychiatric nursing intervention reduced the severity of symptoms and recurrence of PTSD. It simultaneously improved the QoL and care outcome in psychiatric settings. The proposed method is applicable to members of the armed forces (veterans with PTSD) and can be adopted as the primary prevention level across the community (health care centers) by community health nurses. Further research is required to resolve issues on the cellular phone-based healthcare text messaging in different clinical settings.

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**Conflict of Interest:** None declared.

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