

# The effect of tai chi exercise on quality of life in hemodialysis patients

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## ABSTRACT

**Background:** Today, despite remarkable advances in the care of hemodialysis patients, the quality of life (QOL) for these patients is still unsatisfactory. Although previous reports confirmed the effect of exercise on the well-being of renal patients, less than 50% of end-stage kidney patients participate in a regular sports program. Tai chi is a slow and gentle exercise that is suitable for people with chronic illnesses and those with severe intolerance of exercise. Therefore, this study aimed to determine the effect of tai chi exercise on the QOL of hemodialysis patients.

**Materials and Methods:** This was a quasi-experimental study conducted in a single group and in two steps. Twenty-five hemodialysis patients, admitted to hospitals in Isfahan, Iran, were selected, and their QOL was compared before and after intervention in two domains of satisfaction and importance. Convenience sampling was used. The sampling was convenience. The subjects were trained in the intervention through a single session of tai chi exercise class for one hour weekly, for 12 weeks, with a training compact disc (CD) that helped the patients to exercise at least twice a week at home. Data were collected by the completion of a demographic characteristics form and a researcher-made QOL questionnaire adopted from Ferrans and Powers Quality of Life Index Dialysis Version and the Kidney Disease Quality of Life-Short Form (KDQOL-SF) questionnaire by the researchers. The data were analyzed by a paired *t*-test through SPSS software version 18.

**Results:** Data analysis showed that there was a statistically significant difference in health and functioning ( $P < 0.001$ ), socioeconomic ( $P < 0.001$ ), and psychospiritual ( $P < 0.001$ ) dimensions, and the family dimension had  $P = 0.002$  in the satisfaction domain and  $P = 0.008$  in the importance domain; the total score of quality of life in both domains was  $P < 0.001$ .

**Conclusions:** According to the research findings, tai chi exercise improves the QOL score significantly in all dimensions, and adding tai chi classes to the rehabilitation program of hemodialysis patients can have a positive effect including an improved QOL for them. Therefore, this study supports the results of other research studies that showed positive effects of tai chi on QOL.

**Key words:** End-stage renal diseases, hemodialysis, Iran, quality of life, tai chi

## INTRODUCTION

Hemodialysis, peritoneal dialysis, and renal transplantation are among kidney (renal) replacement methods. Hemodialysis, peritoneal dialysis, and renal transplantation are among Renal Replacement Therapy (RRT). Statistics show that at the end of year 2005, 1.9 million people underwent these methods as the most common methods of treatment (hemodialysis: 68% in the world and 52.7% in Iran).<sup>[1]</sup> Although these

methods play a major role in the increase of survival among these patients, like other treatment methods, they lead to complications for the patients despite their great benefits. Therefore, despite longer lives of patients as a result of hemodialysis, post-treatment tensions can be a problem.<sup>[2]</sup> The common tensions in these patients include weakness, lack of control for patients on the disease and treatment, limitations of therapeutic diets, changes in body image, financial problems, loss of job, and sexual problems.<sup>[3-5]</sup> Their low quality of life (QOL) is significantly as a result of the physical and mental problems of these patients.<sup>[6]</sup> Thanks to a great progress in the treatment of these patients,<sup>[7]</sup> basic changes have occurred in their lifestyle,<sup>[2]</sup> but their low QOL is still a major problem for them.<sup>[7]</sup>

Nowadays, promotion of QOL is generally one of the major goals in the treatment of chronic diseases<sup>[8]</sup> and has multidimensional and complicated aspects that include subjective and objective elements with dimensions of physical, emotional, social, and mental welfare. Each of these elements can be considered in two domains of

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satisfaction and importance with a reciprocal interaction.<sup>[4]</sup> This concept is more noted among end-stage renal failure patients,<sup>[9]</sup> specially for hemodialysis patients,<sup>[4]</sup> as renal failure patients suffer from psychoemotional problems and low QOL.<sup>[10]</sup> It is logical to consider that QOL of hemodialysis patients is a product of the interaction between the disease outcomes, personal characteristics, adaptive behavior, social support, and quality of medical care.<sup>[11]</sup>

In the past, the outcome of treatment among end-stage renal failure patients was based on biochemical parameters, survival techniques, and mortality, but in recent years, more attention is being paid to the health of these patients based on their QOL; so, these patients desire to increase their QOL in addition to their demand for appropriate medical treatment. Therefore, appropriate QOL is not only an important clinical issue but one of the major goals of treatment as well.<sup>[5]</sup> MacClellan *et al.* suggest that QOL is as an independent indicator for the estimation of the possibility of hospitalization and danger of death in hemodialysis patients.<sup>[12]</sup> Meanwhile, some studies indicate the effect of low-cost methods like sports to lower the signs of mortality in these patients.<sup>[3]</sup>

On the other hand, hemodialysis patients are very weak compared to even healthy individuals with a sedentary life. This weakness is the main reason for the limitation in their physical function, which can be amended through sports interventions to some extent.<sup>[13]</sup> Based on the Surgeon General's Report on Physical Activity and Health the general reports of surgeon concerning physical activities and health, hemodialysis patients benefit from sports such that their mental health, as a result of sport, reduces negative emotions such as depression and anxiety and promotes the mental health and social functioning of patients, their families, and friends, as well as their QOL.<sup>[14]</sup> Many researchers have reported a significant decrease in anxiety and depression and promotion of QOL due to sports activities among these patients. Sport exercises can potentially reverse negative effects of dialysis<sup>[13]</sup> and promote rehabilitation of these patients.<sup>[15]</sup>

Nowadays, despite great focus on sports among these patients, they have a very low level of physical activity compared to healthy individuals.<sup>[14]</sup> The importance of sports programs for end-stage renal patients has been frequently studied in the past 25 years,<sup>[16]</sup> but the precise specifications of this optimal training regimen or regimens this diet therapy based on the characteristics of patients and their needs are not clear, and further investigations are needed on the effect of sports interventions on survival and QOL of these patients.<sup>[13]</sup> Meanwhile, there are obscure points on the effect of interventions such as tai chi (a branch of qigong) focusing on concentration of movement, body

consciousness, and breathing with the goal of preservation of health and modification of specific problems.<sup>[17]</sup>

Qigong is a Chinese sport including breathing and mental sports combined with physical movements.<sup>[8]</sup> Tai chi chuan is one of the qigong methods,<sup>[18]</sup> which is a complete and joyful sport and can be used for all individuals even those who have depleted the energy sources of their body.<sup>[19]</sup> This is a very simple, safe, and useful sport, which can be played alone or as a group activity.<sup>[20]</sup> Weather conditions do not limit this sport, and it can be done in a limited space.<sup>[19]</sup> This sport is taught more easily compared to other sports and does not need a special tool or expensive equipment.<sup>[21]</sup> There are no physical or mental limitations to learn<sup>[22]</sup> this, and patients can continue it on their own after learning. It is recommended for those who are afraid of injuries and negative effects of other sports<sup>[21]</sup> and those who cannot tolerate sports activities,<sup>[23]</sup> as well as chronic patients, as they are encouraged to do these exercises based on their limitations so as not to injure themselves.<sup>[24]</sup> Despite the great benefits of this sport, the known points about the association between QOL and tai chi are limited.<sup>[25]</sup> Studies on patients with breast cancer, fibromyalgia, cardiac failure, diabetes, and chronic obstructive pulmonary disease (COPD) playing tai chi have been already conducted, but there is no agreement on the frequency of this sport performed in a week, the style used,<sup>[26]</sup> and duration and the degree of tai chi,<sup>[20]</sup> as it may vary from six weeks to one year, one to three days a week, 20-60 minutes, and 9-108 different movements. To the best of knowledge of the researchers of this study, only one study has been conducted on the effect of tai chi on quality of sleep in the elderly in Iran.<sup>[27]</sup> The effect of tai chi on the QOL of hemodialysis patients has been studied in two studies (one on the promotion of physical function and another on the promotion of mental function).<sup>[13]</sup>

Yang-style tai chi is the simplest among the five main tai chi styles and is a form of complementary medicine, which looks similar to aerobic exercises<sup>[23]</sup> and is an efficient treatment option for body and mind. This style facilitates physiologic and mental aspects for better treatment.<sup>[28]</sup> This focuses on prevention of the disease and its new complications or worsening of the existing disease.<sup>[29]</sup>

With regard to the recent advances concerning treatment of chronic renal diseases,<sup>[11]</sup> prognosis and QOL of patients is not yet satisfactory.<sup>[14]</sup> Nurses can promote QOL of patients through patient education and planning special programs such as sports programs.<sup>[26]</sup> There is no unique regular, safe, and constant sports program for these patients. High acceptance of tai chi in various studies shows that it can be considered as a regular and constant sport for these

patients. Therefore, the researchers aimed to define the effect of tai chi on the total score of QOL as well as health, socioeconomic, psychospiritual, and familial functions of hemodialysis patients referring to selected hospitals in Isfahan.

## MATERIALS AND METHODS

This is a quasi-experimental two-step one-group before-after intervention study with convenient sampling to investigate the effect of the independent variable of tai chi sport on the dependent variable of the QOL of hemodialysis patients. The researchers selected the subjects from all patients referred to the hemodialysis wards of Al-Zahra, Nour Ali Asghar, and Hojjatieh hospitals in Isfahan. The researchers selected the subjects by convenient sampling.

The subjects included patients aged between 20 and 70 years, with at least three months of hemodialysis, interested in participating, filling the questionnaire and attending sports classes, being able to move independently and with a physical condition certified by a physician to play the sport, with no myocardial infarction or surgery in the past six months of the study, no cardiac arrhythmia, uncontrolled hypertension, unstable angina, acute respiratory diseases, uncontrolled acute diabetes, no signs of abnormal left ventricular function, neural defects accompanied with movement limitations,  $K \geq 5.5$  Mm before dialysis,  $KT/V < 1.2$ , limitation or prohibition of physical activity, rheumatoid disease or mental disorders, regular sport activity of at least three times a week, membership at tai chi classes, or those using complementary medicine simultaneously. The exclusion criteria were patients canceling the research and sports classes or those who were absent more than two sessions out of 12 sessions of training classes, and those practicing tai chi less than three times a week due to any reason (physical, psychological, mental, psychosocial, crisis problems, etc). There was a total of 25 patients attending the study till the end.

Data-collection tool was a questionnaire made by the researchers with the help of the Ferrans and Powers QOL Index Dialysis Version and the Kidney Disease Quality of Life-Short Form (KDQOL-SF) questionnaire whose questions were modified to Iranian culture and were filled through questioning. The subjects were asked some questions concerning the satisfaction of patients and about the level of importance they considered for each question. The frame of this questionnaire was based on the Ferrans and Powers QOL Index Dialysis Version with a total of 34 questions in each domain. In the first section of the questionnaire, the questions were about health and performance ( $n = 14$ ), socioeconomic ( $n = 8$ ),

psychospiritual ( $n = 7$ ), and familial ( $n = 5$ ) domains based on a six-point Likert scale ranging from “completely satisfied” (score 5) to “completely dissatisfied” (score 0). In the second section, the questions were scored from “not important” (score 0) to “very important” (score 5) and included 62 questions in each part (total of 124 questions). This tool measured four dimensions of QOL, health, and functioning (21 questions), socioeconomic (10 questions), psychospiritual (23 questions), and familial (eight questions) in two domains of satisfaction and importance. To make the questions more understandable, in the domain of satisfaction with health and functioning, 10 six-point Likert-scale questions on signs of the disease were scored from “not existing” (score 5) to “very many” (score 0). Total score of QOL was calculated by multiplying the total score in each dimension by 100 and then by dividing that to the number of questions multiplied by 5 (score of the patient in each dimension of health and functioning was divided by 105, in psychospiritual by 50, and in familial by 40, and the total score by 310).

As a result, a score between 0-100 was calculated for each dimension as well as the total QOL score so that not only was scoring easy to understand for everybody, but the score of QOL in each dimension was also comparable despite different number of questions. The total obtained scores from QOL were classified into five groups of 81-100 as “completely appropriate”, 61-80 as “relatively appropriate”, 41-60 as “average”, 21-40 as “relatively inappropriate”, and 0-20 as “completely inappropriate”. Content validity and internal consistency methods were adopted to check validity and reliability of the data-collection tool with Cronbach’s alpha of 95 and 91% in the two domains of satisfaction and importance, respectively. The data, collected by filling the questionnaire once at the entrance and once after 12 weeks post intervention, were analyzed by descriptive statistics [mean, standard deviation (SD)] and inferential statistics through SPSS version 11. The researchers paid close attention to ethical considerations during all the steps of the research.

In the present study, the subjects qualified to be included in the research were selected, and the questionnaire of QOL was filled for them after explanation of the study and taking their informed written consent. Then, the second researcher (female), accompanied by a male colleague, trained by a trainer of this sport under the supervision of Isfahan Vosho Association, taught the subjects and tai chi, and assumed responsibility of the education of the male and female patients in two separate gender groups. Vital signs of the patients (blood pressure, pulse, and respiration) were checked by the researcher before commencement of the physical exercises.

The severity of exercise varied among the subjects in each session based on their personal health and physical fitness, and the patients were asked to gradually increase the speed of the movements during the sessions. The class lasted for one hour and included warming up (some qigong techniques) for 10 minutes, tai chi exercises for 40 minutes, and cooling down similar to the warm-up exercises for 10 minutes.

The classes were held once a week for 12 weeks on scheduled days (through co-ordination between the patients and Al-Zahra hospital). As programming the attendance of the patients in sports programs, especially on days of dialysis is very difficult, the patients were given an educational compact disc (CD) to practice the already-learned exercises at least twice a week at home. The researcher followed up the practice of the patients at home through phone calls. The forms taught included three forms out of six introductory Yong-style forms named as form one (Part the Wild Horse's Maneon Both Sides), form two (Twist Step), and form three (wavy hands like clouds).form one (separating wild horse mane), form two (brush knee and step swing), and form three (wavy hands like clauds).

## RESULTS

Finally, 25 patients attended the present study with a mean age of 50.4 (SD:10.5) years, mean body mass index (BMI) of 23.7 (SD:2.6), and length of the dialysis treatment of 37.7 (SD:27) months. Their mean QOL score before and after intervention in the two domains of satisfaction and importance in the various dimensions and total score of QOL were calculated and have been presented in Table 1.

**Table 1: Comparison of QOL mean scores in various dimensions and total QOL before and after intervention in two domains of importance and satisfaction**

Quality of life score		Before intervention		After intervention		t-paired statistical test	
		Mean	SD	Mean	SD	T	P
Health and functioning	Satisfaction	54.01	15.2	70.7	10	6	<0.001
	Importance	46.9	13.5	54.8	19.6	4.2	<0.001
Socioeconomic	Satisfaction	39.1	16.5	53.1	17.6	5.8	<0.001
	Importance	50.9	11.9	63.04	14.5	5.7	<0.001
Psychospiritual	Satisfaction	42.8	12.1	62.7	12.8	7	<0.001
	Importance	51.2	12.06	66.5	13.2	5.7	<0.001
Family	Satisfaction	59.3	20.4	67.8	19.3	3.4	0.002
	Importance	65.8	13.9	70.6	15.6	2.9	0.008
Total quality of life	Satisfaction	48.1	10.6	64.5	10.9	7.07	<0.001
	Importance	51.6	9.2	62.5	13.8	5.8	<0.001

SD: Standard deviation

As observed in the table, these patients had the highest level of satisfaction in the family dimension before intervention and the lowest satisfaction in the socioeconomic dimension. The subjects had the highest level of importance in the family dimension and the lowest level of importance in the dimension of health and functioning. After intervention, the subjects had the highest satisfaction in the dimension of health and functioning and the lowest satisfaction in the socioeconomic dimension, and the highest level of importance in the family dimension and the lowest in the socioeconomic dimension.

As seen in the table, mean scores after intervention compared to before intervention showed a significant difference in all four dimensions. It was  $P < 0.001$  in health and functioning,  $P < 0.001$  in socioeconomic, and  $P < 0.001$  in psychospiritual dimensions, and the dimension of family showed  $P = 0.002$  in the domain of satisfaction and  $P = 0.008$  in the domain of importance, and the paired  $t$ -test showed that there was a significant increase in the total score of QOL ( $P < 0.001$ ) in the two domains of importance and satisfaction.

The difference in mean scores in all four dimensions and total score in domain of satisfaction was more compared to the domain of importance. Based on the findings, tai chi had the highest effect in the psychospiritual dimension of the satisfaction domain and the lowest effect in the family dimension of the importance domain. Mean score of QOL in the various dimensions and the total score was 40-80 after intervention which is categorized as an average or fairly appropriate QOL.

## DISCUSSION

Based on the results in the table, mean of QOL in the dimension of health and function showed a significant difference after intervention compared to before intervention in both domains, which reveals that tai chi could promote QOL of patients in this dimension. In the study by Taggart *et al.* (2003),<sup>[28]</sup> physical functioning, body ache, general health, and joyfulness of the patients suffering from fibromyalgia showed a significant difference after intervention compared to before intervention, but physical role of the patients showed only a clinical improvement and was not statistically significant. Ko *et al.* (2006)<sup>[25]</sup> indicated that the dimension of joyfulness showed a significant difference in Chinese women after 10 weeks of tai chi, but the scores of other items, especially physical functioning and pain were just reduced with no significant difference.

Liu *et al.* (2010)<sup>[21]</sup> reported a significant difference in the dimensions of general health and joyfulness in the QOL in



diabetic patients, but improvement in physical components was not significant. In the study of Lee and Woo. (2007), there was a significant difference in the physical components of QOL among the elderly in the study and control groups. In the study of Taboonpong *et al.* (2008),<sup>[20]</sup> tai chi could make a statistically significant difference in the quality of sleep and physical functioning of the elderly. Adler and Robert(2006)<sup>[24]</sup> in his study stated that the elderly in the tai chi group had an improvement in 65% of their daytime activities (physical functioning) in the study group, whereas the control group had 22% of improvement. Based on the obtained results, it can be inferred that tai chi can positively affect the physical or health and functioning dimensions of the QOL of patients such that hemodialysis patients also enjoy its benefits. Although this effect was not significant in some studies, possibly as a result of the difference in the length of the study, the tai chi style used in the research, interest of the subjects, compliance, and personal characteristics, none of these studies reported negative effects or complications due to tai chi exercises and branded tai chi as a safe and nonrisky sport. Based on the paired *t*-test, the score differences in the socioeconomic dimension were significant.

In this regard, in Taggart's study *et al.* (2003),<sup>[28]</sup> social functioning was just clinically promoted by tai chi and the difference was not statistically significant, which is not consistent with the findings of the present study. The difference can be due to the differences in the studied patients, their personal characteristics, and method of the research. Based on the obtained results, mean score of QOL in the psychospiritual dimension had a significant difference after intervention, which is in concordance with the studies of Chen *et al.* (2003)<sup>[30]</sup> on healthy people, Ko *et al.* (2006),<sup>[25]</sup> Liu and Miller *et al.* (2010), Lee *et al.* (2007),<sup>[31]</sup> and Mustata *et al.* (2005)<sup>[32]</sup> in peritoneal dialysis patients. A literature review study of Wang *et al.* (2004)<sup>[33]</sup> also showed that tai chi could diminish the pain, stress, and anxiety of individuals, and has physical and mental benefits for patients with chronic diseases, but in the study of Taggart *et al.* (2003),<sup>[34]</sup> mental health showed the lowest difference and the dimension of emotions had a significant difference.

It can be concluded that tai chi has been effective to promote QOL in the psychospiritual dimension in both domains, and the findings of the previous studies are consistent with this fact that tai chi has the highest effect on the psychospiritual dimension or mental health.

The findings obtained also revealed the positive and significant results concerning tai chi in dimension of family, but based on these findings, the lowest effect of tai chi has been observed in this dimension. Finally, the results showed

that tai chi had the highest effect on the psychospiritual dimension of QOL. In other dimensions and concerning total score of QOL, most of the patients had an average or fairly appropriate score of QOL. Narimani (2000)<sup>[8]</sup> reported QOL scores in four dimensions in hemodialysis patients as average in physical and the psychospiritual dimension, poor in the socioeconomic dimension, and appropriate for most of the patients in the dimension of family. Generally, most of the patients had an average score of QOL. Namadi Vosoughi and Movahed Pour(2009)<sup>[35]</sup> reported that 52.1% of the patients had average QOL, which is consistent with the results of the present study.

Parker *et al.* (2003)<sup>[7]</sup> reported that patients had the lowest satisfaction with dimension of health and functioning. Mean scores obtained in the various dimensions were 21.1 (SD:4.7) for health and functioning dimension, 22 (SD:4.8) for the socioeconomic dimension, 24.5 (SD:4.4) for the psychospiritual dimension, 26.8 (SD:3.5) for the family dimension, and 22.8 (SD:4) for total score (the score ranged between 0 and 30). As observed in this study, most of the patients had a low mean score in the socioeconomic dimension and appropriate mean score in the family dimension. Most of the subjects have average QOL, which is in concordance with the findings of the present study.

In the present study, total mean scores of QOL of patients before and after intervention were compared in the two domains and showed a significant increase, revealing that tai chi has been effective to improve QOL in both domains. Riyahi *et al.* (2012)<sup>[10]</sup> showed that sports therapy for five months can significantly improve physical, socio-familial, and emotional dimensions of QOL in hemodialysis dialysis patients. But, Ling *et al.* (2003),<sup>[15]</sup> investigating the effect of a three-month tai chi exercise 3-7 times a week on end-stage renal patients with the help of KDQOL-SF, obtained no significant difference in any of the QOL dimensions.

Mustata *et al.* (2005)<sup>[32]</sup> in his study on the effect of tai chi on QOL of peritoneal dialysis patients investigating total score of QOL of patients with the Short Form (36) Health Survey (SF-36) questionnaire obtained no significant difference, although the score had increased from 52.8 to 59.9.

Meanwhile, Yeh *et al.* (2004)<sup>[36]</sup> in a study on the effect of tai chi on patients with Congestive Heart Failure (CHF), obtained a significant difference in QOL. Chan *et al.* (2004)<sup>[37]</sup> studying the effect of tai chi sport program on COPD patients showed that there was a significant difference in the study group (pursed-lip breathing and diaphragmatic breathing technique breathing sports) compared to control in the domains of symptoms signs and

QOL activity, but there was no significant difference in the domains of the effects of disease and total score of QOL.

The findings of the two latter studies, despite difference in the type of disease of the subjects, concord with those of the present study to some extent. The inconsistency in the results can be due to various factors such the adopted tool, number of the subjects, length of the study, the adopted style, convenience of intervention, sufficient motivation of subjects toward the sport, and their personal characteristics.

## CONCLUSION

The findings of the present study showed that tai chi exercise can promote QOL in various dimensions such as health and functioning, psychospiritual, socioeconomic, and family dimensions amongst hemodialysis patients. It can be used as one of the methods of complementary medicine as a simple, safe, cost-effective sport, appropriate for every age to play and to promote QOL of hemodialysis patients who cannot engage in sports activities due to their specific physical and mental condition. Although many studies show that tai chi has numerous positive effects on QOL of individuals, it is not clear if its positive effects are as a result of its nature of relaxation and meditation or its difference from other interventions, as participation in a desired group and satisfactory activities has been proved to reduce stress of individuals and has positive effects.

Investigation of the manner of its effects on QOL can be suggested for further studies.

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