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Quality of life after lower extremity amputation due to diabetic foot ulcer: the role of prosthesis related factors, body image, self-esteem and coping styles

ABSTRACT

Objective: The purpose of this study was to identify clinical and psychosocial factors that predict an individual's subjective quality of life after having a lower limb amputation secondary to diabetic foot ulcer.

Methods: Study sample comprised 65 patients who underwent amputation because of an infected diabetic foot ulcer. Short Form 36 (SF-36), The Trinity Amputation and Prosthesis Experience Scale (TAPES), Coping Attitudes Evaluation Scale (COPE), Multidimensional Scale of Perceived Social Support (MSPSS), Rosenberg Self-Esteem Scale (RSES) and Amputee Body Image Scale (ABIS) were evaluated through questionnaires. Stepwise linear regression analysis was conducted to assess the factors predicting quality of life.

Results: Quality of life was negatively correlated with depression, anxiety, body image, activity limitation and dysfunctional coping strategies; positively correlated with perceived social support, satisfaction with prosthesis, self-esteem and problem focused coping style. Regression analysis showed that satisfaction with prosthesis and existing schemas that body perception, problem-focused coping strategies, dysfunctional coping strategies, self-esteem were factors with the highest predictive power for the physical component of quality of life, while body perception, problem-focused, and dysfunctional coping strategies were the strongest predictors for the mental component of quality of life.

Conclusion: Impaired body image and self-esteem, less usage of problem-focused and high usage of dysfunctional coping strategies, in addition low satisfaction with the prosthesis were strongest predictors for poor quality of life. The factors associated with better quality of life after the amputation were investigated in this study and this may support future development of post-amputation rehabilitation strategies for lower limb amputees.

Keywords: Amputation, diabetes, coping strategies, body image, self-esteem

Diyabetik ayak ülseri nedeniyle alt ekstremitte amputasyonu sonrası yaşam kalitesi: Protezle ilgili faktörler, beden imgesi, benlik saygısı ve başa çıkma stillerinin rolü

ÖZET

Amaç: Bu çalışmanın amacı, diyabetik ayak ülseri nedeni ile alt ekstremitte amputasyonu sonrası bireyin öznel yaşam kalitesini öngören klinik ve psikososyal faktörleri tespit etmektir.

Yöntem: Çalışma örnekleme enfekte diyabetik ayak ülseri nedeniyle amputasyon uygulanan 65 hastayı içermektedir. Ölçüm aracı olarak Kısa Form 36 (SF-36), Trinity Amputasyon ve Protez Deneyim Ölçeği (TAPES), Başa Çıkma Tutumlarını Değerlendirme Ölçeği (COPE), Çok Boyutlu Algılanan Sosyal Destek Ölçeği (ÇBASDÖ), Rosenberg Benlik Saygısı Ölçeği (RBSÖ) ve Ampute Vücut İmajı Skalası (AVIS) uygulanmıştır. Yaşam kalitesini öngören faktörleri değerlendirmek amacı ile kademeli doğrusal regresyon analizi kurulmuştur.

Bulgular: Yaşam kalitesi, depresyon, anksiyete, beden imgesi, aktivite kısıtlaması ve disfonksiyonel başa çıkma stratejileri ile negatif; algılanan sosyal destek, protez memnuniyeti, benlik saygısı ve problem odaklı başa çıkma tarzı ile pozitif olarak koreleydi. Regresyon analizi, protez memnuniyeti ve beden algısı, probleme odaklı başa çıkma stratejileri, disfonksiyonel başa çıkma stratejileri, benlik saygısı şemalarının yaşam kalitesinin fiziksel bileşeni için en yüksek yordayıcı güce sahip faktörler olduğunu; beden algısı, probleme odaklı ve disfonksiyonel başa çıkma stratejilerinin ise yaşam kalitesinin mental bileşeni için en güçlü yordayıcılar olduğunu göstermiştir.

Sonuç: Bozulmuş beden imajı ve benlik saygısı, sorun odaklı baş etme stratejilerinin düşük kullanımını ve disfonksiyonel başa çıkma stratejilerinin yüksek kullanımı, ayrıca protezden düşük memnuniyet kötü yaşam kalitesi için en güçlü belirleyicilerdir. Bu çalışmada amputasyon sonrası daha iyi yaşam kalitesi ile ilgili faktörler araştırıldı ve bu gelecekteki alt ekstremitte amputasyonu için amputasyon sonrası rehabilitasyon stratejilerinin gelişimini destekleyebilir.

Anahtar Sözcükler: Amputasyon, diyabet, baş etme stratejileri, beden imgesi, benlik saygısı

Introduction

Diabetic foot ulcers are often considered as a complication that requires long periods of challenging treatment, and also that causes anxiety due to the possibility of amputation (1). Although it is known that the psychological status of mobile amputees was better than that of the diabetic foot ulcer patients, extremity amputation remains an important medical issue and the psychosocial adaptation of individuals after extremity amputation is significantly difficult (2). It is generally accepted that lower extremity complications due to diabetic foot ulcer negatively affect one's quality of life and make a person prone to psychiatric symptoms (1,3,4). Depression and anxiety symptoms that emerge after amputation have been reported to make significant contributions to a reduced quality of life (5). In addition, it is reported that although depression and anxiety are relatively high up to 2 years post-amputation, they appear to decline thereafter to general population norms (6).

After amputation, patients can experience a distorted body image, decreased self-esteem, social isolation and increased dependency on others (7). During the post-amputation period, perceived social support, adaptation to the prosthesis, amputation type, presence of phantom and stump pain, self-esteem and body image issues are among the factors reported to significantly affect quality of life and psychosocial functionality (8,9). Different coping strategies have been shown to have different outcomes on adaptation after amputation. Problem-focused strategies are associated with positive psychosocial adaptation (10), while emotion-focused and passive strategies are associated with negative psychosocial outcomes (11).

We believe that evaluating and detecting the conditions negatively affecting individuals' quality of life after amputation are important in ensuring appropriate rehabilitation practices. Our first hypothesis was that having stump and phantom pain, additional medical disease, the level and type of prosthesis would have an impact on quality of life. Secondly, we assumed that depression and anxiety scores, body image, self-esteem, coping methods, perceived social support, as well as post-prosthetic activity restriction and satisfaction with prosthesis, which are among the prosthetic factors, will be factors associated with the quality of life. According to this hypothesis, we predicted that people with

high depression and anxiety scores, distorted body image, low self-esteem, and poor perceived social support would have lower quality of life. In addition, we thought that the quality of life of patients who had activity restriction after the prosthesis and were not satisfied with the prosthesis would be worse. We hypothesized that the use of problem-focused coping methods will affect the quality of life positively and the use of emotion-focused and dysfunctional coping methods negatively. In the past, various published studies have evaluated the post-amputation period difficulties. These studies typically included individuals who underwent amputation for various reasons. Considering the fact that individuals with diabetic foot ulcers have a homogenous group with similar characteristics and also the quality of life of this group is lower than the normal population due to the nature of the disease, we aimed to evaluate the factors affecting the quality of life of individuals who underwent lower extremity amputation due to diabetic foot ulcer. We investigated the effects of clinical variables, perceived social support, coping attitudes, self-esteem, body image and prosthesis adaptation on the quality of life of these patients.

Method

Participants

Patients who were followed up from the prosthesis clinics were invited to participate in study with consecutive methods for 6 months. In total, 65 patients who underwent amputation because of an infected diabetic foot ulcer were included to study and face-to-face interviews were performed by the psychiatrists who conducted the study and orthopedic specialists who performed clinical follow-up. Measurements were applied 1–8 years (median 3 years) after prosthesis insertion. All prosthesis used by patients are of the same type, all prosthesis are socket type. The exclusion criteria was to have mental retardation, serious mental conditions that would prevent participants from interviewing and filling the scales (eg, serious psychotic disorder, bipolar disorder, organic mental disorder) and level IV and above physical illnesses according to ASA Physical Status Classification System (12). The sample size was calculated using the G-power 3.1 program by the Heinrich Heine Universität, Düsseldorf. A total of 64 participants were needed for a large effect size of 0.30, a significance level of

0.05, a verification power (1- β) of 0.8, and 10 predictive variables (depression, anxiety, body image, self-esteem, perceived social support, problem focused-emotional focused and dysfunctional coping mechanisms, activity restriction, satisfaction with prosthesis). Ten independent variables which are predicted to have an impact on quality of life were determined in the light of the literature that previously investigated factors affecting quality of life.

Ethical considerations

All participants gave written informed consent to the research. Ethical approval for this study was obtained from the Regional Ethical Committee in University of Health Sciences Erenköy Mental Research and Training Hospital, Istanbul, Turkey.

Outcome measures

Sociodemographic variables were evaluated with a data form that was prepared specifically for this study.

Short Form 36 (SF-36): SF-36 was used to assess the patients' quality of life and to measure an individual's state of health based on 8 dimensions. The eight dimensions comprise physical function, pain, role limitations due to physical problems, general perception of health, role limitations due to emotional problems, social function, energy/vitality and mental health. For each parameter, higher scores indicate a better health state (13). Two summary measures were further calculated from the item scores using the procedures recommended by the developers: a Physical Component (PCS) and a Mental Component (MCS) score (14). The first four dimensions of the scale form part of PCS score and the last four dimensions comprise the MCS score (15). The reliability and validity study of the scale in the Turkish population was conducted by Koçyiğit et al. (16).

The Trinity Amputation and Prosthesis Experience Scales (TAPES): TAPES is a multifactorial assessment tool for lower limb amputees fitted with prosthesis, it was developed by Gallagher and MacLachlan (17). It is a 54-item self-report questionnaire comprising nine factor analytically derived subscales assessing three dimensions of psychosocial adjustment (general

adjustment, social adjustment, and, adjustment to limitation), three dimensions of activity restriction (functional restriction, social restriction, and athletic activity restriction), three dimensions of prosthesis satisfaction (weight satisfaction, functional satisfaction, and esthetic satisfaction). In addition, phantom and residual limb pain experiences and other medical problems unrelated to the amputation are assessed. In this study, TAPES was used to evaluate the activity restriction after prosthesis, satisfaction with the prosthesis, residual stump and phantom pain. The reliability and validity study of the TAPES in the Turkish population was conducted by Topuz et al. (18).

Coping Attitudes Evaluation Scale (COPE): COPE was used to assess patients' coping attitudes, developed by Carver et al. (19). The reliability and validity study of the COPE in the Turkish population was conducted by Ağargün et al. (20). COPE is a 60 item scale with 15 subscales. Five of these 15 subscales represent problem-focused attitudes: active coping, planning, suppression of competing activities, restraint coping, and seeking of instrumental social support; five represent emotion-focused coping attitudes: seeking of emotional social support, positive reinterpretation, acceptance, humour and turning to religion; and the remaining five subscales represent dysfunctional coping attitudes: focus on and venting of emotions, behavioral disregard, substance use, denial, and mental disregard (19,21). Carver et al.(19) stated that it is not a very appropriate approach to divide coping strategies into only problem focused and emotion focused. They criticized the researchers for viewing factors other than problem-focused coping as variations on emotion-focused coping, and stated that the nature of this diversity would seem to deserve further scrutiny. In addition, while developing the COPE scale, they stated that some of the strategies that have been included in emotion focused coping strategies so far are more incompatible and that it is appropriate to consider them as dysfunctional coping methods (19). Therefore, in our study, we evaluated coping methods under three groups as problem focused, emotion focused and dysfunctional coping strategies (22,23).

Multidimensional Scale of Perceived Social Support (MSPSS): The MSPSS is a 12-item scale measuring three sources of perceived support, namely, family, friends, and significant other. It is a brief, easy to administer self-report questionnaire which contains twelve items rated on a seven-point Likert-type scale with scores ranging from 'very strongly disagree' (1) to 'very strongly agree' (7).

The MSPSS has proven to be psychometrically sound in diverse samples and to have good internal reliability and test-retest reliability, and robust factorial validity (24). The reliability and validity study of the MSPSS in the Turkish population was conducted by Eker (25).

Rosenberg Self-Esteem Scale (RSES): The RSES scale, which was developed by Rosenberg (26), consists of 12 subcategories. Only the first subscale including 10 items was used in this study to assess general personal self-esteem. Each item is rated on a four point Likert scale from 0 (strongly agree) to 3 (strongly disagree), producing a cumulative score from 0 to 30, whereby high mean scores (computed) indicate high self-esteem (26). The reliability and validity study of the scale in the Turkish population was conducted by Cuhadoroglu et al. (27).

Amputee Body Image Scale (ABIS): The ABIS is a 5-point Likert-type self-assessment scale that contains 20 questions. Items in the scale query perceptions and experiences of the individual regarding her/his own body. High scores represent a distortion of body image (28). The reliability and validity study of the ABIS in the Turkish population was conducted by Safaz et al. (29).

Patient Health Questionnaire–Somatic, Anxiety, and Depressive Symptoms (PHQ-SADS): Somatic, anxiety and depressive symptoms of the patients were assessed with the PHQ-SADS evaluation form. The PHQ-SADS is a self-report questionnaire, consists of a Patient Health Questionnaire (PHQ-9) subscale that assesses nine domains of major depressive disorder and General Anxiety Disorder-7 (GAD-7) subscale that rates seven basic symptoms of anxiety (30). The reliability and validity study of the PHQ-SADS in the Turkish population was conducted by Yazici Gülec et al. (31).

Data analysis

The mean, standard deviation, median, and the lowest and highest frequency and percentage values were used for descriptive statistics of the data, and the distribution of the variables was analyzed with the Kolmogorov–Smirnov test. Factors affecting quality of life after having a lower limb amputation were screened in the literature and these factors have been examined in this study. The Mann–Whitney

U test was used to analyze the differences in quality of life for categorical independent variables that stump pain, phantom pain, level of the prosthesis used and comorbid medical diseases. Spearman correlation analysis was used to assess the relationship between qualitative independent data. Stepwise linear regression analysis was conducted to assess the factors predicting the quality of life. In all models where the MCS and PCS scores were treated as dependent variables, factors correlated with quality of life were treated as independent variable. The analyses were performed with the SPSS 22.0 package.

Results

Sixty five patients were included in the study, and 41.5% were women. 9.2% were single, 78.5% were married, 12.3% were either divorced or widowed. 38.5% of patients were primary school graduated, 35.4% were middle school, 26.2% were high school. Tables 1 and 2 reports clinical data and descriptive statistics for the quality of life assessments. When the norm values in the quality of life domains were evaluated for Turkish population (32), all domains in our study were below the average. (Table 2).

Comparative analysis (The Mann–Whitney U test) was first established statistically, and the patient group was divided into two groups as those with and without phantom and stump pain, and it was investigated whether there was a significant difference between these groups between PCS and MSC scores. There was a significant difference between PCS and MSC scores of groups, the PCS and MCS scores of patient group suffering from stump and phantom pain were significantly lower than those of patient group without such pain ($p \leq 0.01$). Then, the patient group was divided into two groups according to the level of the prosthesis, the PCS and MCS scores of the group using a prosthesis fitted above the knee were found to be significantly lower than those of the group using a prosthesis fitted below the knee (transtibial amputation) ($p < 0.01$). In addition, 40% of patients had comorbid medical disease. The PCS ($p = 0.011$) and MCS ($p = 0.006$) scores showed significant differences between groups with and without a comorbid disease, and the life quality scores of the group with comorbid medical diseases were lower.

After comparison analysis, correlation analysis (spearman analysis) was established for numerical variables. No significant correlations were found between ages, duration of diabetes diagnosis, years of using prosthesis, and the PCS and MCS scores ($p > 0.05$). It was observed that there was a negative correlation between PHQ-9 and also GAD-7 scores and PCS - MCS scores separately. Higher depression scores was associated with lower PCS and MCS scores ($p < 0,001$). Similarly, PCS and MCS scores showed a decrease as anxiety scores increased ($p < 0,001$). When the relationship between body image and quality of life was examined, it was observed that there was a negative correlation, higher ABIS scores was associated with lower PCS and MCS scores ($p < 0,001$). In addition, it was found that perceived social support and self-esteem scores correlated positively with quality of life scores. Higher MSPSS scores ($p < 0,001$) and RSES scores ($p < 0,001$) associated with higher PCS and MCS scores. In addition, as the activity limitation increased, quality of life was negatively affected. A significant positive correlation was noted between the total score for prosthesis satisfaction and the quality of life ($p < 0,001$). No significant correlations were found between the emotion-focused coping score and the quality-of-life subscales ($p > 0.05$). In contrast, it was observed that quality of life scores were positively correlated with problem focused coping strategies scores ($p < 0,001$) and negatively related with dysfunctional coping strategies scores ($p < 0,001$). The quality of life was better with increasing use of problem focused coping strategies, while further use of dysfunctional coping strategies was associated with poor quality of life (Table 3).

Independent effects of the predictors associated with quality of life according to correlation analysis were examined using a multivariate regression model. In two separate analyzes in which PCS and MCS scores are dependent variables, PHQ-9, GAD-7, MSPSS, ABIS, RSES, problem focused and dysfunctional coping strategies, activity restriction and satisfaction with prosthesis were taken as independent variables. Regression analysis showed that the PCS scores of patients were significantly correlated negatively with ABIS scores ($\beta = -0.34, p = 0.01$) and dysfunctional coping strategies ($\beta = -0.43, p < 0.001$), positively with satisfaction with the prosthesis ($\beta = 0.27, p = 0.01$), RSES scores ($\beta = 0.27, p < 0.001$) and problem-focused coping strategies ($\beta = 0.23, p = 0.01$), and the combination of these factors explained 78% of the variability of the patients' PCS scores. The regression model for

the MCS scores included negatively with ABIS scores ($\beta=-0.32$, $p=0.01$), dysfunctional coping strategies ($\beta=-0.47$, $p<0.001$) and positively with problem-focused coping strategies ($\beta=0.31$, $p<0.001$), and these three significant variables explained 80% of the variance observed in the patients' MCS scores (Tables 4, 5).

Discussion

The present study was designed to investigate the factors affecting the quality of life of patients with extremity amputation following complications arising from diabetes mellitus. Our results were consistent with those of previous studies conducted in this field (33) and revealed that both the physical and mental quality of life after lower limb amputation were lower compared to the normal population (32). The results of our study were found to support our first hypothesis, the presence of stump and phantom pain, additional medical diseases, and the level of prosthetics were found to be factors related to quality of life. In our second hypothesis, we have seen that many aspects of our study are supported by the results. It was observed that depression and anxiety scores, body perception, self-esteem, perceived social support, problem focused and dysfunctional coping strategies, post-prosthetic activity restriction and prosthetic satisfaction were related to quality of life. According to our results, the only factor that does not support our hypothesis is that emotion focused coping strategies are not related to the quality of life. Regression analysis was established to observe the predictive effects of these related factors and body image, problem-focused and dysfunctional coping strategies, self-esteem and satisfaction with the prosthesis were all observed to significantly affect the physical component of quality of life. Furthermore, body image, problem-focused, and dysfunctional coping strategies were assessed as the factors with the highest predictive power for the mental component of quality of life.

Firstly, it was observed that patients with stump and phantom pain had lower quality of life. In the literature, in addition to studies showing that phantom pain and stump pain are not an important determinant for the quality of life (34), there are also studies that argue that these two pains have important effects on both physical and mental quality of life (35,36). It is known that stump pain

causes activity restriction as a result of negative effects on mobility and rehabilitation (6). We think that this activity restriction, which is an important factor for life quality, may explain the importance of stump pain on quality of life. In addition, phantom limb pain in some patients may gradually disappear over the course of a few months to one year if not treated, but some patients suffer from phantom limb pain for decades (37). The average prosthesis use period of our sample group is three years, and also in our study, no relationship was found between the prosthesis use year and quality of life. This result suggests that phantom pain may have an impact on the quality of life even after years after the prosthesis. We think that the negative effect of phantom pain on quality of life in patients with long-term prosthesis use can be evaluated as an important data in the rehabilitation process. In our study, it was found that the patients who had transtibial amputation had better quality of life than higher-level amputations and this result is compatible with the literature data (38). The patients with transtibial amputation level are much more mobile than the patients with transfemoral amputation level and crutch use rates are higher in patients who have had transfemoral amputation (39,40). This is probably one of the reasons why the results of individual domains of the quality of life had significantly higher values in the people with transtibial amputations compared to the ones with higher level of amputation.

One of the most important factors affecting the functional and life quality results of amputee rehabilitation is compatible with the patient's prosthesis (41). Patient dissatisfaction with the artificial limb can create major problems for the individual on a physical, psychological and social level, and can directly impact health-related life quality (42). Individuals using a suitable prosthesis can regain their mobility more quickly and are more likely to successfully adapt to the amputation (43). Their self-confidence increases as they gain functional independence and their adaptation to their social environment and working life are also affected positively (44). Similar to our work, Matsen et al. (45), found that quality of life in people with a lower-extremity amputation correlated with the comfort, function, and appearance of the prosthesis. In addition, in literature, a positive correlation has been determined between prosthesis satisfaction and quality of life and positive adaptation to extremity loss (6,46). In their study, Asano et al. (5) found that problems with prosthetics after lower limb

amputation are an important predictive factor for quality of life. In our study, satisfaction with the prosthesis was measured using three subscales as functional satisfaction, aesthetic satisfaction and weight satisfaction. Prosthesis satisfaction which include these three areas was found to be correlated with both physical and mental quality of life scores, but predictive just for the physical component. There was no study investigating the predictive power of quality of life for physical and mental components separately in literature but the importance of mobility on physical functioning has been reported in other studies (5,47). When the important effect of prosthesis satisfaction on mobilization is taken into consideration, it is thought that its predictive power on the physical component may be related to this situation. Considering that a prosthesis is a means of replacing a natural limb, the importance of patient satisfaction with their prosthesis is, of course, of utmost importance (7).

Loss of a limb causes emotional stress and it inevitably requires examining the patient's capacity to cope with this stressful situation (48). Problem-focused coping was also found to be a major predictor of psychological and physical quality of life in our study. There are similar results to our findings in the literature. Pereira et al. (49) showed that the satisfaction with life was positively associated with active and planning coping in their study with sixty-three individuals with lower limb amputation due to Diabetes and Peripheral Vascular Disease. In our study, emotion focused coping methods were found to be unrelated to the quality of life, without supporting our hypothesis. In contrast, limited number of studies in the literature showed that emotion focused and passive strategies have been associated with poor psychosocial outcomes (50). We think that the reason for this is that the coping methods used in the literature are problem-oriented and emotion-oriented, and in our study, the coping assessment tool used also included dysfunctional strategies. These dysfunctional coping methods include some of the methods that are routinely evaluated in emotional coping methods, but are more incompatible. We think that the negative relationship of emotion focused coping group in the literature with psychosocial adjustment and quality of life may be related to these incompatible coping strategies that we evaluated as dysfunctional coping strategies group. In the study by Desmond and MacLachlan (50), which evaluated three coping strategies, namely, problem solving, seeking social support, and avoidance, avoidance was found to be associated with poor psychosocial adaptation to

amputation. Similarly, in our study, dysfunctional coping strategies were similar in effect to the non-adaptive nature of avoidance-type coping, and it was found to be a negative predictor for the physical and mental components of quality of life. International literature has already documented that coping strategies focused on active resolution are more effective in the decrease of the level of restriction in physical activities and in the adjustment to amputation (51,52). Coping strategies are important not only to minimize the negative effects of having a lower extremity amputation but also for the psychological well-being of the individual (53). In the light of this information, which is also parallel to our results, we think that evaluating coping mechanisms as an important parameter especially in the rehabilitation program may have positive effects on patients' quality of life and general well-being.

Emotions created by the division of the body cause a distorted body image that means faulty and negative feelings about body image, and decreased self-esteem (7,54). It is well known that our way of perceiving our bodies has a major effect on our social lives, psychological and physical states, and the overall quality of our lives (55). When individuals' perceptions of their bodies are distorted after amputation, they experience greater difficulties with the body movements required for daily activities and struggle to accept their new body image; this can lead to rejection of the prosthesis and difficulties in functional adaptation (56). It has been stated that the deterioration in the body image perception of the amputated person may affect their lives physically, socially and psychologically as they do not comply with the aesthetic perception accepted by the majority of the social media and society (57). In the study by Holzer et al. (9) found that body image was distorted in the patients who underwent amputation and their physical and mental component of quality of life was negatively affected. In our study, it was observed that the perception of body image was an important predictive factor for both physical and mental quality of life. Similar to our results, Rybarczyk et al. (8) stated that body image is an independent predictor of quality of life. Helping amputees to successfully integrate into society requires that their amputation-associated body image distortions are addressed during rehabilitation, and understanding the impact of body image is critical for appropriate rehabilitation interventions (8).

Studies have also indicated that self-perception and evaluating one's body is a significant source of self-esteem (58). Although many studies show that self-esteem decreases after amputation (7,28), few studies show the relationship between self-esteem and quality of life. In the study investigating the relationship between self-esteem and quality of life, a weak correlation was reported between these two variables (9). In contrast, we observed that decreased self-esteem was a significant predictor of the poor physical component of quality of life. In a study on patients undergoing mastectomy, a procedure that similarly leads to the feeling of division of one's body, self-esteem was also reported to be decreased and this was a significant predictive factor for impaired health-associated quality of life (59). Cognitive Behavioral Therapy (CBT) was introduced as a method to increase the adaptation of individuals to chronic health states. CBT is advocated to help patients recognize and adjust their distorted thinking patterns and non-productive behaviors by focusing on their emotional, cognitive and behavioral responses (60). Studies have shown that CBT is effective in improving self-esteem, body image, and quality of life among patients with chronic diseases (61,62). In a recent study, the healing effect of CBT on self-esteem and quality of life among amputee elder individuals was examined, self-esteem and life quality were shown to be significantly improved among these individuals (60).

There are some limitations of our study. First of all, this study was cross-sectional in nature; therefore, it was not possible to establish cause-effect relationships. There is no longitudinal follow-up before and after amputation and also non amputee diabetic foot patients were not included in the study as a comparison group. Secondly, in addition to amputation, the effect of diabetes mellitus on the quality of life should be taken into consideration and all negative effects on quality of life are unlikely to be attributed to amputation. Comorbid medical and psychiatric disorders were not considered as a confounding factor on outcome. However, in this study, the effect of medical diseases and also psychiatric burdens such as depression, anxiety and somatization on the outcome was examined. However, it was observed that these burdens had no predictive power on the outcome.

Conclusion

In conclusion, the results of study emphasize the significance of multiple physical and psychosocial aspects in the successful adaptation of patients after amputation. In this study, which investigated the variables affecting the quality of life of individuals with the application of biopsychosocial approach to the individuals in orthopedic practice, it was shown that the existing schemas of patients as coping styles, self-esteem and body perception have a greater impact on the outcome rather than their physical variable and psychological burdens such as depression and anxiety. Furthermore, the importance of multidisciplinary evaluation of patients is evident, both during amputation, which is a traumatic process, and during rehabilitation. We suggest that the rehabilitation process after amputation should be a multifactorial process including physical functional adaptation and psychosocial schemes.

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Tables

Table 1. Descriptive statistics of clinical features, RSES, ABIS, MSPSS, GAD-7, PHQ-9 and TAPES scores ($n = 65$)

	Median	Mean±SD	%	n-
Age	58,0	57,8 ± 7,6		
DM duration (Year)	8,0	9,4 ± 4,9		
GAD-7 (Anxiety)	6,0	6,0 ± 4,7		
PHQ-9 (Depression)	8,0	8,7 ± 6,8		
RSES (Self-Esteem)	18,0	18,7 ± 5,4		
ABIS (Body Image)	56,0	56,2 ± 12,1		
MSPSS				
MSPSS Family	22,0	21,1 ± 6,1		
MSPSS Friends	19,0	18,2 ± 6,8		
MSPSS Others	16,0	16,9 ± 6,6		
MSPSS Total	58,0	56,2 ± 17,6		
Prosthetic Duration (Year)	3,0	3,6 ± 2,04		
Prosthesis type				
Under the knee			48	73,8
Over the knee			17	26,2
Having stump pain			16	24,6
Having phantom pain			17	26,2
TAPES Part 1				
Activity restriction	24,0	23,3 ± 5,9		
Satisfaction with the prosthesis	35,0	33,3 ± 8,4		

SD: Standard deviation, DM: Diabetes Mellitus, PHQ-9: Patient Health Questionnaire-9, GAD-7: General Anxiety Disorder-7, ABIS: Amputee Body Image Scale, RSES: Rosenberg Self Esteem Scale, MSPSS: Multidimensional Scale of Perceived Social Support, TAPES: Trinity Amputation and Prosthesis Experience Scales, PCS: Physical component summary, MCS: Mental component summary

Table 2. Descriptive statistics of COPE and SF-36 scores ($n = 65$)

Median	Mean±SD
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COPE

Problem Focused Coping	57,0	56,2 ± 8,5
Emotion Focused Coping	56,0	56,6 ± 7,4
Dysfunctional Coping	56,0	53,3 ± 10,9

SF-36

Physical Functioning	50,0	45,3 ± 33,1
Role limitations(physical problems)	25,0	38,5 ± 40,3
Role limitations(emotional problems)	33,3	36,9 ± 41,7
Energy	50,0	49,6 ± 17,5
Mental Health	52,0	51,4 ± 16,1
Social Functioning	62,5	59,8 ± 20,3
Pain	67,5	65,7 ± 20,3
General Health Status	45,0	47,8 ± 5,5
PCS	39,1	39,3 ± 9,1
MCS	39,6	39,8 ± 8,9

SD: standard deviation, COPE: Coping Attitudes Evaluation Scale, SF-36: Short Form-36, PCS: Physical component summary, MCS: Mental component summary

Table 3. Spearman correlation analysis between PHQ-9, GAD-7, ABIS, RSES, MSPSS, COPE subgroups, Activity restriction, Satisfaction with the prosthesis scores and PCS and MCS scores

	PHQ-9	GAD-7	ABIS	RSES	MSPSS total	Problem Focused Coping	Emotion Focused Coping	Dysfunctional Coping	Activity restriction	Satisfaction with the prosthesis
PCS	r -0,51	-0,49	-0,72	0,29	0,38	0,43	-0,07	-0,56	-0,69	0,61
	p <0,001	<0,001	<0,001	<0,001	<0,001	<0,001	0,53	<0,001	<0,001	<0,001
MCS	r -0,59	-0,49	-0,61	0,53	0,48	0,57	0,04	-0,62	-0,63	0,54
	p <0,001	<0,001	<0,001	<0,001	<0,001	<0,001	0,76	<0,001	<0,001	<0,001

Spearman correlation analysis, PHQ-9: Patient Health Questionnaire-9, GAD-7: General Anxiety Disorder-7, ABIS: Amputee Body Image Scale, RSES: Rosenberg Self Esteem Scale, MSPSS: Multidimensional Scale of Perceived Social Support, PCS: Physical component summary, MCS: Mental component summary

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Table 4. Stepwise multiple regression analysis model of the variables that affect MSC scores ($p < 0.05$)

		MCS					
		Beta	t	<i>p</i>	<i>R</i> ²	<i>Adjusted R</i> ²	F
Model 1	ABIS	-5,58	-10,36	<0,001	0,63	0,62	107,40
Model 2	ABIS	-3,71	-6,23	<0,001	0,73	0,73	85,63
	Dysfunctional Coping	-3,26	-4,92	<0,001			
Model 3	ABIS	-2,27	-3,67	0,01	0,79	0,79	80,47
	Dysfunctional Coping	-3,67	-6,25	<0,001			
	Problem Focused Coping	3,09	4,41	<0,001			

Stepwise Multiple Regression Analysis, ABIS: Amputee Body Image Scale, MCS: Mental component summary

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Table 5. Stepwise multiple regression analysis model of the variables that affect PSC scores ($p < 0.05$)

		PCS					
		Beta	t	p	R ²	Adjusted R ²	F
Model 1	ABIS	-5,64	-10,07	<0,001	0,62	0,61	101,43
Model 2	ABIS	-4,01	-6,13	<0,001	0,69	0,68	69,70
	Dysfunctional Coping	-2,83	-3,89	<0,001			
Model 3	ABIS	-1,90	-2,17	0,03	0,74	0,73	57,82
	Dysfunctional Coping	-3,35	-4,85	<0,001			
	Satisfaction with the prosthesis	3,50	3,35	<0,001			
Model 4	ABIS	-2,46	-2,75	0,01	0,76	0,74	46,68
	Dysfunctional Coping	-3,30	-4,90	<0,001			
	Satisfaction with the prosthesis	3,81	3,69	<0,001			
	RSES	-2,63	-2,05	0,04			
Model 5	ABIS	-2,41	-2,81	0,01	0,78	0,76	42,14
	Dysfunctional Coping	-3,42	-5,29	<0,001			
	Satisfaction with the prosthesis	2,83	2,68	0,01			
	Self-esteem	-4,33	-3,10	<0,001			

Problem Focused	2,39	2,57	0,01
Coping			

Stepwise Multiple Regression Analysis, ABIS: Amputee Body Image Scale, RSES: Rosenberg Self Esteem Scale,

PCS: Physical components summary

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