Determination of Quality of Life for Adult Patients with Limbs Loss

Hussein H. Atiyah, PhD*
Widad K. Mohammed, PhD**

الخلاصـــة:

الهدف: تهدف الدراسة إلى تحديد نوعية حياة المرضى البالغين فاقدي الأطراف وإيجاد العلاقة بين ميادين نوعية الحياة والمعلومات الشخـصية الديموغرافية والطبية.

المنهجية: أجريت دراسة وصفيّة في مركز بغداد للأطراف الصناعية، مركز السلام للتأهيل الطبي، مركز الغـدير للتأهيـل الطبـي ومركـز التأهيل الطبي وأمراض المفاصل للفترة من أيلول 2007 إلى نيسان 2008. شملت عينة البحث (200) مريضاً من فاقدي الأطـراف اختيـرت بطريقة غرضية (غير احتمالية). صُمّمت استمارة استبانة لغرض الدراسة وجُمعت المعلومات من خلالها بطريقة المقابلة. تمّ تحليل البيانات من خلال أسلوب الإحصاء الوصفي (التكرار، النسبة المئوية والوسط الحسابي الموزون) والأسلوب الإحصائي الاستنتاجي (مربع كاي، الإنحـراف المعياري ومعامل الارتباط).

النتائج: وقد أظهرت نتائج الدراسة أنّ معدل عمر معظم فاقدي الأطراف (46.15) سنة وأغلبهم من الذكور الساكنين في المنـاطق الحـضرية ومتزوجون يعيشون في عوائل مفردة وخريجي الدراسة الابتدائية من المتقاعدين ودخلهم الشهري لا يكفي رغم أنّهم يسكنون في منازل ملك. أنّ أغلب المرضى فاقدي الأطراف تغيرت وظيفتهم بعد فقدان الأطراف وقلّت ساعات عملهم وأغلبهم تمّ فقدان طرفه بمُدّة اقل من خمـس سـنوات ولطرف سفلي واحد وبمستوى تحت الركبة وأكثرهم يمشي بالعكاز وانّ الشدة الخارجية أهم سبب شائع في فقدان الأطراف. وعلى كـل حـال، فإنّ اغلبهم يزورون مراكز التأهيل الطبي ويحصلون على فائدة من العلاج الطبيعي.

التوصيات: أوصت الدراسة بإجراء برنامج تثقيفي لفاقدي الأطراف حديثا حول العلاج الجسمي (البدني) والعلاج المهنـي (الحرفـي) وكـذلك إجراء دراسات تشتمل على عينة كبيرة الحجم حول تكيّف المرضى مع فقدان الأطراف.

Abstract:

Objective: The study aimed to determine quality of life domains for adult patients with limbs loss and to identify the association between quality of life domains and demographic characteristics and medical information.

Methodology: A descriptive study was carried out at Baghdad artificial limb center, Al-Salam medical rehabilitation center, Al-Ghadeer medical rehabilitation center and the rheumatoid and medical rehabilitation center for the period from September 2007 to April 2008. A purposive "non- probability" sample of (200) patients with limbs loss. Questionnaire form was constructed for the purpose of the study. Data were collected through the application of the questionnaire and interview technique. Data were analyzed through descriptive statistical approach (frequency, percentage and mean of score) and inferential statistical approach (chi-square, standard deviation and correlation coefficient).

Results: The findings of the study have revealed that most of patients with limb loss are with mean age (46.15) years, mostly males, living in urban residence, married, living in nuclear family and primary school graduate with retired occupation, but insufficient monthly income in spite of living in owned house. Most of the patients with limb loss have changed their jobs and reduced the hours of working. Most of them have lost their limbs for (1- 5) years with unilateral lower limb and below-knee; walking with crutches and the trauma was the most common cause of limb loss. However, most of them visit rehabilitation centers and get benefits from rehabilitation.

Recommendations: The study recommended that educational program for newly limb loss for physiotherapy and occupational therapy and further studies can be conducted on large sample size about adaptation of the patients with limbs loss.

Key words: Quality of Life, Limbs Loss.

Introduction:

Limb loss generally refers to the absence of any part of an extremity (arm or leg) due to surgical or traumatic amputation and congenital or malformation of limbs [(1)].

Limb loss can occur due to trauma (accident), infection, diabetes, vascular disease, cancer and other diseases [(1)].

Disabilities like limb loss can affect persons' quality of life, because limb loss and its associated disorders can bring a big change into persons' life.

There are (310) patients who had been operated, limbs amputation obtained from the

* Instructor, Adult Nursing Department, College of Nursing, University of Baghdad.
** Assistant Professor, Head of Adult Nursing Department, College of Nursing, University of Baghdad.

records of surgical theater in Medical City Directorate (Baghdad Teaching Hospital (170) patient and Surgical Specialized Teaching Hospital (140) patient) during 2007 only.

Ministry of Health reported that (2170) artificial limbs were provided to artificial limb centers in Iraq, except the Kurdistan region during 2007 only.

Iraq is facing a hidden healthcare and social crisis over the soaring number of amputation, largely of lower limbs, necessitated by the daily explosions and violence gripping country. In the north of Iraq, the Red Crescent Society and director general for health services in Mosul have told US forces that there is a requirement for up to 3.000 replacement limbs a year. If that estimate is applied across the country, it suggests an acute and looming long-term health challenge that has been largely ignored by the world [(2)]. Objectives of the study: (1) to determine quality of life domains for adult patients with limbs loss, (2) to identify the relationship between quality of life domains and demographic characteristics such as age, gender, marital status, educational level and occupation, and medical characteristics such as type of amputation, type of device and causes of amputation.

Methodology:

A descriptive study for determination the quality of life for adults with limbs loss. The study was carried out during the period of May 17th, 2007 to February 2008.

The setting of the study included the following:-

a-Baghdad Artificial Limb Center.

b-Al-Salam Medical Rehabilitation Center.

c-Al-Ghadeer Medical Rehabilitation Center.

d-The Rheumatoid and Medical Rehabilitation Center.

A purposive "non-probability" sample of (200) patients with limbs loss was carried out of the four centers in Baghdad City.

A questionnaire was designed and constructed by the researcher to measure the variables underlying the study. Such construction was employed through review of literature and related studies. The questionnaire consisted of (3) parts:

Part I: Demographic Information Sheet.

Part II: Medical Information concerning the study sample.

Part III: Quality of life domains:

a- Physical domain.

b- Psychological domain.

c- Level of independence domain.

d- Social relationship domain.

e- Environmental domain.

f- Spiritual/Religion/Personal Beliefs domains.

The content validity of the instrument was established through a panel of (20) experts.

A purposive sample of (20) patient with limbs loss was selected from the out patients in Baghdad Artificial Limb Center. The pilot study was conducted from September 16th, 2007 to October, 14th 2007.

Test-retest reliability was determined through the computation of Pearson Correlations for the scales. Coefficients for the (6) domains of quality of life. (r=0.91) for the quality of life domain of the total scales.

The data were collected through the utilization of developed questionnaire and the interview technique.

The researcher used the appropriate statistical means in the data analysis which include the following

1. Descriptive data analysis: this approach was performed through the determination of: (Frequencies, Percentage, Mean, and SD).
2. Inferential data analysis: this approach was performed through the determination of. (Mean of score, Chi-Square (χ^2) test and Pearson correlation coefficient).

Results:

Table 1. Distribution of demographic characteristics of (200) patients with limbs loss

No	Variables	Frequency	percent	Cumulative percent
1	Age (years)			
1.1	18-27	16	8	8
1.2	28-37	30	15	23
1.3	38-47	72	36	59
1.4	48-57	46	23	82
1.5	58-67	29	14.5	96.5
1.6	68 and above	7	3.5	100
	Total	200	100	
	Mean= 46.15			
2	Gender	Frequency	percent	Cumulative percent
2.1	Male	168	84	84
2.2	Female	32	16	100
	Total	200	100	
3	Residence	Frequency	percent	Cumulative percent
3-1	Urban	159	79.5	79.5
3-2	Rural	41	20.5	100
		200	100	
4	Marital status	Frequency	percent	Cumulative percent
4.1	Single	23	11.5	11.5
4.2	Married	160	80	91.5
4.3	Divorced	7	3.5	95
4.4	Widowed	5	2.5	97.5
4.5	Separated	5	2.5	100
	Total	200	100	
5.	Level of education	Frequency	percent	Cumulative percent
5.1	No read and write	6	3	3
5.2	Read and Write	22	11	14
5.3	Primary	59	29.5	43.5
5.4	Intermediate	47	23.5	67
5.5	Secondary	27	13.5	80.5
5.6	Institute	20	10	90.5
5.7	College and above	19	9.5	100
	Total	200	100	
6	Occupation	Frequency	percent	Cumulative percent
6.1	Government officer	33	16.5	16.5
6.2	Free job	57	28.5	45
6.3	Retired	82	41	86
6.4	Housewife	20	10	96
6.5	Unemployed	8	4	100
	Total	200	100	

Table 1. (continued)

7	Family type	Frequency	percent	Cumulative percent
7-1	Nuclear	146	73	73
7-2	Extended	54	27	100
	Total	200	100	
8	Monthly income	Frequency	percent	Cumulative percent
8.1	Sufficient	14	7	7
8-2	Barely sufficient	61	30.5	37.5
8-3	Insufficient	125	62.5	100
	Total	200	100	
9	House ownership	Frequency	percent	Cumulative percent
9.1	Ownership	149	74.5	74.5
9-2	Renter	42	21	95.5
9-3	Sharing	9	4.5	100
	Total	200	100	

This table shows that the distribution of age indicated that the majority of the group was (38-47) year old with 72 (36%). Most of the study sample was male (84%) and living in an urban residence (79.5%). Although, most of them were married (80%) and were primary graduate (29.5%), the majority of the study samples was retired (41%) and live in nuclear family (73%). Most of them with insufficient monthly income (62.5%), but they live in owned houses (74.5%).

Table 2. Distribution of change job after limbs loss of (200) adult patients

List	Change job after limb loss	Frequency	percent	Cumulative percent
1.1	Yes	113	56.5	56.5
1.2	No	87	43.5	100
	Total	200	100	

This table revealed that the majority of the study sample had changed their jobs after limb loss (56.5%).

Table 3. Distribution the effect of limbs loss on working hours

No.	Effect limb loss on working hours	Frequency	percent	Cumulative percent
1.1	Yes	182	91	91
1.2	No	18	9	100
	Total	200	100	

This table shows that limb loss had effect on working hours after for the most of the study sample (91%).

Table 4. Distribution of demographic characteristics for medical information for (200) patients with limbs loss

List	Variables	Frequency	percent	Cumulative percent
1	Duration of limb loss			
1.1	1- 5 years	120	60	60
1.2	6-10	7	3.5	63.5
1.3	11-15	1	0.5	64

Table 4. (continued)

1.4	16-20	5	2.5	66.5
1.5	21 and above	67	33.5	100
	Total	200	100	
2	**Type of limb loss**	**Frequency**	**percent**	**Cumulative percent**
2.1	Unilateral upper extremity	16	8	8
2.2	Unilateral lower extremity	173	86.5	94.5
2.3	Bilateral lower extremity	8	4	98.5
2.4	Double	3	1.5	100
	Total	200	100	
3	**Level of amputation**	**Frequency**	**percent**	**Cumulative percent**
3.1	Above elbow	6	2.96	2.96
3-2	Below elbow	12	5.91	8.87
3-3	Above knee	43	21.18	30.05
3.4	Below knee	142	69.95	100
	Total	203	100	
4	**Type of devices**	**Frequency**	**percent**	**Cumulative percent**
4-1	Crutch	82	41	41
4-2	Wheelchair	28	14	55
4-3	Prosthesis	75	37.5	92.5
4-4	Walk without device	15	7.5	100
	Total	200	100	
5	**Causes of limb loss**	**Frequency**	**percent**	**Cumulative percent**
5-1	Trauma	143	71.5	71.5
5-2	Disease	45	22.5	94
5-3	Congenital	7	3.5	97.5
5-4	Tumor	5	2.5	100
	Total	200	100	

This table shows that the majority of the study sample had limb loss for less than 5 years (60%), most of them had unilateral lower extremity (86.5%) and the most them was with below-knee amputation level (69.95%) from the 203 limbs amputated. The most of the study sample was walking with crutch (41%) and most of the causes of limb loss for them was trauma (71.5%).

Table 5. Distribution of period after limbs loss and going to rehabilitation center for (200) adult patients

List	Period after limb loss and going to rehabilitation center	Frequency	percent	Cumulative percent
1-1	Less than 6 months	35	17.5	17.5
1-2	6-12 month	87	43.5	61
1-3	12-18 month	66	33	94
1-4	24 month and above	12	6	100
	Total	200	100	

This table shows that the majority of the study sample was visiting rehabilitation centers in a period of (6-12 months) after limb loss and accounted for (43.5%).

Table 6. Distribution of the benefits from physiotherapy for (200) adult patients with limb loss

List	Benefit from physiotherapy	Frequency	percent	Cumulative percent
1-1	Yes	181	90.5	90.5
1-2	No	19	9.5	100
	Total	200	100	

This table shows that the majority of the study sample had benefit from physiotherapy (90.5%).

Table 7. Mean of score for the total items for QoL domains (physical, psychological, level of independence, social , environmental and spiritual)

List	Domains	Always	Some-times	Never	M.S.	Severity
1	Physical domain	2503	2392	905	2.276	M
2	psychological domain	3045	2132	623	2.418	M
3	level of independence domain	1255	1121	624	2.210	M
4	social domain	1015	815	170	2.423	M
5	environmental domain	1052	1035	513	2.207	M
6	spiritual domain	967	337	96	2.622	H
7	QOL domain	9837	7832	2931	2.359	M

MS=mean of scores

This table shows that the mean of score are high on spiritual domain, and moderate on (physical, psychological, level of dependence, social and environmental domain) and the total of QOL domains.

Table 8. Association between the demographic characteristics (age, gender, marital status, education level, occupation, type of limb loss, type of device and causes of limb loss) with total score of QOL

QOL / Age	Low	Moderate	High	Total	χ^2 obs.	C.S
18-27	2	14	0	16	24.234	S
28-37	2	26	2	30		
38-47	2	49	21	72		
48-57	2	26	20	46		
58-67	3	21	5	29		
68 and above	1	4	2	7		
Total	12	138	50	20		
Df=10		χ^2 crit.=18.307		P≤0.05		
QOL / Gender	Low	Moderate	High	Total	χ^2 obs.	C.S
Male	6	117	45	168	11.824	S
Female	6	21	5	32		
Total	12	138	50	200		
Df=2		χ^2 crit.=5.991		P≤0.05		

Table 8. (continued)

QOL / Marital status	Low	Moderate	High	Total	χ^2 obs.	C.S
Single	2	17	4	23	5.88	N.S
Married	7	110	43	160		
Divorced	1	5	1	7		
Widowed	1	3	1	5		
Separated	1	3	1	5		
Total	12	128	50	200		
Df=8		χ^2 crit.=15.507		P≤0.05		
QOL / Education level	Low	Moderate	High	Total	χ^2 obs.	C.S
No read and write	0	6	0	6	12.962	N.S
Read and Write	2	14	6	22		
Primary	4	39	16	59		
Intermediate	3	34	10	47		
Secondary	2	22	3	27		
Institute	1	11	8	20		
College and above	0	12	7	19		
Total	12	138	50	200		
Df=12		χ^2 crit.=21.026		P≤0.05		
QOL / Occupation	Low	Moderate	High	Total	χ^2 obs.	C.S
Governmental officer	3	13	17	33	26.797	S
Tree job	2	48	7	57		
Retired	3	58	21	82		
Housewife	2	13	5	20		
Unemployed	2	6	0	8		
Total	12	138	50	200		
Df=8		χ^2 crit.=15.507		P≤0.05		
QOL / Type of limb loss	Low	Moderate	High	Total	χ^2 obs.	C.S
Unilateral upper	2	14	0	16	13.129	S
Unilateral lower	8	115	50	173		
Bilateral lower	1	7	0	8		
Double	1	2	0	3		
Total	12	138	50	200		
Df=6		χ^2 crit.=12.592		P≤0.05		
QOL / Type of device	Low	Moderate	High	Total	χ^2 obs.	C.S
Crutch	3	58	21	82	17.559	S
Wheelchair	2	25	1	28		
Prosthesis	5	42	28	75		
Walk without device	2	13	0	15		
Total	12	138	50	200		
Df=6		χ^2 crit.=12.592		P<0.05		

Table 8. (continued)

QOL / Causes of limb loss	Low	Moderate	High	Total	χ^2 obs.	C.S
Trauma	4	96	43	143	25.946	S
Disease	4	36	5	45		
Congenital deformity	2	4	1	7		
Tumor	2	2	1	5		
Total	12	138	50	200		
Df=6		χ^2 crit.=12.592		P≤0.05		

Df=degree of freedom, p. value=probability level, χ^2 crit.= Critical chi-square

This table indicates that there is a significant association between QOL domain and (age, gender, occupation, type of limb loss, type of device and causes of limb loss) and there is no significant association between QOL domain and (marital status and education).

Discussion:

Result of this study showed that the age of patients had ranged from (18-78) years and the majority (36%) of them was (38-47) year old with mean age of (46.15) years (Table 1).

This result agrees with the result of the study which indicated that the mean age of the amputees was (46.1) year old [3]. One study shows that limb loss amongst (18-65) years old [4].

Patients aged 18-84 years identified from the Amputee Coalition of America registry [5].

The most of the study sample (84%) was male and (79.5%) living in urban residence (Table 1).

The result comes along with the study which stated that the landmine amputation referred to the Royal Medical Services-Jordan find that (94%) was male and (6%) was female [6].

About (87%) of all trauma-related amputation involved males [7]. It was noted that the most of the study sample living in cities of Netherlands when they study the factors related to successful job reintegration of people with a lower limb amputation [8].

The result of present study indicated that (80%) of the sample was married (Table 1).

It was stated that (93.5%) was married when he study the long-term follow-up unilateral transfemoral amputees from the Vietnam War [9].

Regarding to the educational level, the majority of the study sample (29.5%) was primary school graduate (Table 1)

It was stated that some of adults disability in the community can not read and write or have low education level [10].

The majority of the study samples (41%) was retired and (73%) live in nuclear family.

The most of them (62.5%) has insufficient monthly income, but (74.5%) live in owned houses (Table 1).

The researchers' point of view is that the government referred the patients with limb loss to retired in Iraq.

In Iraq, the male is responsible for the family's monthly income, specially with nuclear family and few salary from retired that lead to insufficient monthly income in spite of ownership house (The researcher).

It was reported that the income of adults disability less than from the other adults not disability [10].

Severe injuries were significantly associated with worse medical, personal and occupational outcomes [11].

The results revealed that the majority of the study sample (56.5%) had changed their jobs after limb loss (Table 2).

It was found that (66.6%) had changed their jobs after limb loss [12].

Unfortunately, limb loss had effected working hours of the highest numbers of the sample (91%) (Table 3).

This result agrees with the study which found that lower extremity amputation exemplify the detrimental physical and psychosocial health status which lead to reduce the working hours [13].

The majority of the study sample (60%) had limb loss from (1- 5) years (Table 4).

During the past 5 years, Iraq has dealt with increasing casualties with penetrating trauma inflicted by a wide variety of war, missiles, landmines and gunshots (the researcher).

Most of the study sample (86.5%) has unilateral lower extremity and most of them has below-knee level of amputation (69.95%) from the 203 limbs amputated (Table 4).

Lower extremity (LE) is high level from the other type of amputation [14].

It was found that (92) lower limb amputation were performed in 87 patients were (57 below knee, 33 above knee, 2 hip disarticulations) [15].

The results of the present study revealed that the most of the study sample (41%) was walking with crutches (Table 4).

It was reported that the person with limb loss can walk by use crutches after training [10].

The most of the study sample (71.5%) lost their limbs because of trauma (Table 4)

It was stated that one hundred and sixteen patients with lower limb amputation that the causes of amputation were trauma (49), peripheral vascular disease (29) and others (38) patient [16].

The majority of the study sample visit the rehabilitation centers for a period of (6-12 months) after limb loss who accounted for (43.5%) (Table 5).

This result disagrees with the study which mentioned that after a further healing phase of 6 weeks, rehabilitation with an exoprosthesis took only 2 weeks, after which time, the patient was able to walk without walking aid and returned to work [17].

The most of the study sample (90.5%) has benefit from rehabilitation (Table 6).

Appropriate physical therapy, occupational therapy and counseling all play pivotal roles. Thorough knowledge of these issues helps to increase the likelihood of a successful outcome and to keep morbidity to a minimum [18].

The mean of score Quality of life domain is high on spiritual domain and moderate on (physical, psychological, level of dependence, social and environmental domain) and the total of QoL domains (Table 7).

This result agrees with that study which noted that the score of quality of life domain was moderate after lower limb amputation [19].

The results of the study indicate that there is a significant association between QoL and (age, gender, occupation, type of amputation, type of device and causes of amputation) and there is no significant association between QoL and (marital status and education) (Table 8).

There is a significant difference between QoL and (age, gender, occupation, type of amputation, type of device and causes of amputation) that mean the effect of limb loss on QoL on one of general information more than the others. There is no significant differences between QoL and (marital status and education) (the researcher).

Recommendations:

Based on the early driven conclusion, the study recommended the following:

1. Educational program for newly limb loss for physiotherapy and occupational therapy.
2. Further studies can be conducted on large sample size about adaptation of the patient with limb loss.

References:

1. Douglas, B.: **The UK Limb Loss Information Center**, Core Ware Limited, UK, 2007, P.1.

2. Peter, B.: **Amputation Bring Crisis to Iraq**, Guardian Co., UK, 2007, P.1.

3. Whyte, A. and Niven, C.: Variation in Phantom Limb Pain: Results of a Diary Study, **Pain-Symptom-Manage. Journal**, 2001, 22 (5), P.P.947-53.

4. Vinker, S.; Ram, R.; Nakar, S. and Kitai, E.: Community Care of Diabetic Patients in the Family Practice, in Specialized Diabetic Clinics or in Cooperation?, **Harefuah Journal**, 2004, 143 (5), P.P.355-8.

5. Pezzin, L.; Dillingham, T.; Mackenzie, E.; Ephraim, P. and Rossbach, P.: Use and Satisfaction Satisfaction with Prosthetic Limb Devices and Related Services, **Arch-Phys-Med-Rehabil. Journal**, 2004, 85(5), P.P.723-9.

6. Al-Worikat, A.: Landmine Amputees Referred to the Royal Medical Services-Jordan, **Prosthet-Orthot-Int. Journal**, 2001, 25 (2), P.P.108-12.

7. Pezzin, L.; Dillingham, T. and MacKenzie, F.: Rehabilitation and the Long-term Outcomes of Persons with Trauma-related Amputations, **Arch-phys-Med-Rehabil. Journal**, 2000, 81(3), P.P.292-300.

8. Schoppen, T.; Boonstra, A.; Groothoff, J.; Van-Sonderen, F.; Goeken, L. and Eisma, W.: Factors Related to Successful Job Reintegration of People with a Lower Limb Amputation, **Arch-Phys-Med-Rehabil. Journal**, 2001, 82(10), P.P.1425-31.

9. Dougherty, P.: Long-term Follow-up of Unilateral Transfemoral Amputees from the Vietnam War, **Trauma Journal**, 2003, 54 (4), P.P.718-23.

10. WHO: Training in the Community for People with Disabilities, Guide for School Teachers, Janiva, Swiss, 1989, P.P.5,34.

11. Boyle, D.; Larson, C.; Parker, D. and Pessoa-Brandao, L.: Medical, Personal, and Occupational Outcomes for Work-related Amputations in Minnessota, **Am-Ind-Med. Journal**, 2000, 37 (5), P.P.551-7.

12. Datta, D.; Selvarah, K. and Davey, N.: Functional Outcome of Patients with Proximal Upper Limb Deficiency-Acquired and Congenital, **Clin_Rehabil. Journal**, 2004, 18 (2), P.P.172-7.

13. Peters, E.; Childs, M.; Wunderlich, L.; Harkless, L.; Armstrong, D. and Lavery, L.: Functional Status of Persons with Diabetes-related Lower-Extremity Amputations, **Diabetes- Care Journal**, 24(10), 2001, P.P.1799-804.

14. Fedorenko, V.: Risk Factors of the Lower Extremity Amputation and Mortality of Necrotic Inflammation of the Foot in Patients with Diabetes Mellitus, **Klin-Khir. Journal**, 2000, 1(3), P.P.30-3.

15. Turney, B.; Kent, S.; Walker, R. and Loftus, I.: Amputations: No Longer the End of the Road, **R-Coll-Surg-Edinb. Journal**, 2001, 46(5), P.P.271-3.

16. Haboubi, N.; Heelis, M.; Woodruff, R. and Al-Khawaja,I.: The Effect of Body Weight and Age on Frequency of Repairs in Lower-Limb Prostheses, **Rehabil-Res-Dev. Journal**, 2001, 38 (4), P.P.375-7.

17. Staubach, K. and Grundei, H.: The First Osseointegrated Percutaneous Ancher for Above-Knee Amputees, **Biomed-Tech-(Berl) Journal**, 2001, 46 (12), P.P.355-61.

18. Knetsche, R.; Leopold, S. and Brage, M.: Inpatient Management of Lower Extremity Amputations, **Foot-Ankle-Clin. Journal** , 2001, 6 (2), P.P.229-41.

19. Hofstad, C.; Linde, H.; Limbeek, J.; Postema, K.: Prescription of Prosthetic Ankle-foot Mechanisms after Lower Limb Amputation, **Cochrane-Database-Syst-Rev. Journal**, 2004, 1 (1), P.978.