Adjustments to amputation and artificial limb, and quality of life in lower limb amputees

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CHAPTER 5

Factors affecting quality of life in lower limb amputees

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ABSTRACT

Objective: To identify important background and amputation related factors which affect quality of life (QoL) in lower limb amputees, and to compare QoL profile of amputees' to that of the general population.

Methods: A cross-section of lower limb amputees 18 years and above from a rehabilitation center, a limb fitting center and several limb fitting camps were interviewed (n=605). Structured questionnaires included patient's background and amputation characteristics, and MOS Short-Form Health Survey (SF-36) for assessing QoL. SF-36 was administered to a general adult population using purposive sampling (n=184).

Results: SF-36 PCS and MCS scores were found to be significantly lower for amputees when compared to those in the general population. In this study, employment status, use of assistive device and prosthesis, comorbidities, phantom limb pain and residual stump pain were found to predict both PCS and MCS scores significantly, and explained 47.8% and 29.7% of the variance respectively. Time since amputation and age accounted for additional 3% of the variance in PCS scores.

Conclusions: The abovementioned factors should be addressed in order to ensure holistic reintegration and participation, and enable the amputees to regain or maintain QoL. Prospective longitudinal studies are recommended to systematically study the change in QoL over time and to assess its determinants.

Clinical relevance: Proper appraisal of abovementioned factors in the rehabilitation programme would assist in establishing a treatment protocol, which would adequately address QoL in amputees.

Keywords: Rehabilitation, lower limb amputation, quality of life

INTRODUCTION

Amputation leads to a permanent disability and brings a dramatic change in the life and function of the individual. This changed situation is experienced more by the lower limb amputees than by the upper limb amputees.[1] The incidence of lower limb amputation is also higher than that of the upper limb.[2] In developed countries, vascular complications are the major contributors to lower limb amputations,[3-5] whereas in developing countries, traumatic accidents are the major cause of amputation.[5] Vascular complications and diabetes are burgeoning health issues in developing countries,[6] and diabetic ulcers are precursors of lower limb amputation.[7, 8]

Limitations in body structure and function due to amputation affect the activity level, and thereby, the participation of the individual in the society.[9] Additionally, personal and environmental factors play important roles in determining outcomes after amputation and also long term functioning of amputees.[9, 10] Psycho-social support has already been demonstrated as an important determinant for adjustment to amputation.[11]

Mobility is considered as an important rehabilitation goal,[12-15] but, there are additional factors which also affect the functioning and well-being of amputees. Therefore, quality of life (QoL) is increasingly being recognized as an important outcome for rehabilitation programs,[16, 17] and also as an indicator to assess adjustment to prosthesis.[18] QoL has mainly been used to compare the efficacy of interventions, such as limb salvage procedure vs. amputation,[19-22] or to compare amputees and other diseased populations.[23] There is a relatively limited number of studies[1, 24, 25] primarily focusing on analyzing the multitude of factors influencing QoL in amputees.

The purpose of this study was to identify the important background and amputation related factors, which may affect QoL in lower limb amputees. Additionally, the amputees' QoL profile was compared to that of the general population to ascertain the impact of amputation on QoL.

METHODS

Participants and data collection

Lower limb amputees 18 years and above visiting a rehabilitation center (All India Institute of Physical Medicine and Rehabilitation) and a limb fitting center (Bhagwan Mahaveer Viklang Sahayata Samiti) in Mumbai, and several limb-fitting camps based

in and around Mumbai were included in the study. This cross-sectional study was conducted during 2005-2006 following convenience sampling. The QoL study in the general adult population was conducted in Mumbai, suburbs and a village (Nera, Raigad district) in its vicinity in 2006 following purposive sampling. This data was used to compare QoL profiles of general and amputee populations.

The Institutional Review Board of one of the co-author's institute in India approved the study. Subjects were provided with information on the study and signed consent was requested. Face-to-face interviews in amputees and in general population were performed by three and two trained interviewers respectively. In total, 622 amputees were included in the study; 360 (58%) from limb fitting centre, 99 (16%) from rehabilitation centre and 163 (26%) from camps, out of which, 17 were excluded from the study. The reasons were non-willingness to participate (8), hearing or speech impairment (4), mental incapacities (3) and other reasons (2). 186 people were included in the study in the general population, out of which two people did not participate. The reasons were lack of time (1) and being psychologically disturbed due to death of a family member (1).

Questionnaires

Questionnaires were administered to collect the patient's background and amputation characteristics, and to assess QoL. Amputation characteristics included reason for amputation, amputation level, skin-problems of the stump, stump-pain, and phantom-limb sensation, as these have been found to be important factors determining health outcomes in lower limb amputees.[24-27]

QoL was measured using MOS Short-Form Health Survey (SF-36).[28] The SF-36 is a multi-purpose short-form health survey consisting of 36 questions, and has been used as an outcome measurement instrument to assess QoL in amputees.[19-22] SF-36 measures health status in eight dimensions: physical functioning (PF), role limitations due to physical health problems (RP); bodily pain (BP); general health perceptions (GH); vitality, energy and fatigue (VT); social functioning (SF); role limitations due to emotional problems (RE); and general mental health covering psychological distress and well-being (MH).

The first four dimensions of the SF-36 stated above contribute more to the Physical (PCS), and the last four dimensions contribute more to the Mental (MCS) Component Summary scores,[29] where a higher score implies a better QoL. The PCS and MCS scores are statistically easier to interpret due to smaller confidence intervals, lower

floor and ceiling effects, and fewer statistical tests required, thus lowering Type I error.[30] Moreover, PCS and MCS scores provide a comprehensive approach for application of results in clinical decision making.[31]

Statistical analyses

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS version 15). Descriptive statistics were performed for background and amputation characteristics. Cross-tabulations were used to summarize the prevalence of different amputation-related factors and comorbidities as per amputation level. Bilateral and other (hip/pelvis/foot/ankle) amputees were excluded from further statistical analyses due to their lower representation.

The PCS and MCS scores were obtained from the eight SF-36 scales using correlated (oblique) physical and mental health factor model.[32, 33] Forward stepwise multivariate linear regression[34] analyses were performed for PCS and MCS scores using several background and amputation related factors. In total, four background variables (age, sex, comorbidities and employment status) and nine amputation-related variables (time since amputation, cause and level of amputation, stump skin problem and stump pain, phantom limb sensation and phantom pain, assistive device and use of prosthesis) were entered into the initial regression analysis. Binary coding was done for each level of the categorical variables to enable forward regression.[35] The regression procedure resulted in a parsimonious model based only on the factors which achieved statistical significance ($p<0.05$).

QoL scores of amputees were compared to those of the general population to assess the impact of amputation on QoL. The PCS and MCS scores were compared between the amputees and general population using one-way between-groups analysis of covariance (ANCOVA) with the four background variables (age, sex, comorbidities and employment status) entered as covariates. Bonferroni's[36] adjusted alpha level of 0.025 was used to determine statistical significance.

RESULTS

Descriptive statistics of background and amputation-related variables are presented in Table 1. Mean age of the study population was 43.7±15.0 years. 60% of the comorbidities were related to diabetes, 16% related to hypertension, 19% related to musculoskeletal/neurological and 24% related to pulmonary/cardiac/gastrointestinal /renal/vision insufficiencies. There were 381 (63%) traumatic amputations, 135 (22%)

Table 1: Background and amputation characteristics of the study population

Study variables	N	%	Mean (SD)
Background			
Age	605		43.7 (15.0)
Sex			
Male	530	88	
Female	75	12	
Residence			
Village	169	28	
Town/City	181	30	
Metropolitan	255	42	
Marital Status			
Single	117	19	
Married	436	72	
Others	52	9	
Education			
No schooling	118	18	
High school	428	71	
University	57	9	
Missing	2	1	
Employment Status			
Employed	291	48	
Non employed	314	52	
Comorbidities*			
Diabetes	117	60	
Hypertension	31	16	
Musculoskeletal/Neurological	38	19	
Others	47	24	
Amputation			
Years since amputation	605		9.9 (10.3)
Amputation cause			
Trauma	381	63	
Diabetes/Vascular	135	22	
Others	88	14	
Missing	1	1	
Amputation Level			
Above/through knee	151	25	
Below knee	410	68	
Other**	15	2	
Bilateral	29	5	

* Includes single as well as multiple comorbidities
** Includes hip/pelvis/foot/ankle amputation levels

due to diabetic/vascular complications, and the rest 88 (14%) due to other causes, such as cancer, leprosy, etc. The average time since amputation was 9.9 ±10.3 years.

Prevalence of different amputation-related factors and comorbidities with reference to the level of amputation are presented in Table 2. Overall, only 17% of amputees

reported stump skin problems, yet 28% reported stump pain. Almost two-thirds of the lower limb amputees, mainly bilateral amputees (72%) reported phantom limb sensation. However, phantom limb pain was reported by only 22% of lower limb amputees.

Table 2: Reported prevalence (%) of amputation-related factors and comorbidities as per the level of amputation

Amputation level	Stump pain	Stump skin problem	Phantom limb sensation	Phantom limb pain	Use of assistive device*	Use of prosthesis	Limitation in walking^	Comorbidities
Above/through-knee (n=150)	26	17	69	24	41	60	33	27
Below knee (n=410)	29	18	60	21	46	68	31	34
Other** (n=15)	20	0	53	27	60	67	13	40
Bilateral (n=29)	21	17	72	14	24	69	41	17
Total~ (n=604)	28	17	63	22	44	66	32	32

* Assistive device: canes, crutches, etc.
** Includes hip/pelvis/foot/ankle amputation levels
^ Distance of 500 meters
~ Includes amputees for which none of amputation-related information was missing

Approximately one-third of amputees (32%) reported having comorbidities. Use of prosthesis was reported by 66% of amputees. Bilateral amputees were most limited in walking (41%) followed by above-knee (33%), below-knee (31%) and others (hip/pelvis/foot/ankle) (13%). Almost half of the amputees (44%) were using assistive devices such as canes, crutches, etc.

Descriptives of eight dimensions of the SF-36 are provided in Table 3. From these data, the higher order PCS and MCS scores were generated. The forward multivariate regression results revealed that for the PCS scores (Table 4), eight predictor variables were significant and explained up to 50.8% of the variance. The final regression model for MCS scores (Table 5) contained six significant variables which explained up to 29.7% of the variance. Employment status, assistive device and use of prosthesis, comorbidities, phantom limb pain and residual stump predicted both PCS and MCS

scores significantly and explained 47.8% and 29.7% of the variance respectively. Time since amputation and age accounted for the additional 3% of variance in PCS scores.

Table 3: Descriptives of SF-36 scales for amputee population

Scale	n	Mean	Std Dev	Skewness	Kurtosis
Physical Functioning (PF)	605	67.43	32.60	-0.60	-1.04
Role Physical (RP)	605	48.68	45.18	0.06	-1.81
Bodily Pain (BP)	600	85.58	27.15	-1.61	1.10
General Health (GH)	604	71.38	23.58	-1.13	0.71
Vitality (VT)	605	66.59	21.82	-0.77	0.22
Social Functioning (SF)	601	67.62	32.44	-0.49	-1.11
Role Emotional (RE)	605	50.03	46.02	-0.01	-1.85
Mental Health (MH)	605	70.38	21.42	-0.87	0.50

For the general population, the participants' age ranged from 18 to 76 years, with a mean of 37.44 years. 132 (72%) males and 52 (28%) females participated in the study (our unpublished observations). After controlling for covariates, the ANCOVA results (Table 6) revealed significantly lower ($p<0.001$) PCS and MCS scores for amputee population as compared to the general population. The adjusted PCS and MCS scores for amputees were 26.95 and 24.74 respectively, and those for general population were 38.48 and 40.74 respectively. Two of the background variables, namely age and employment status were found to significantly contribute to the PCS and MCS scores.

Table 4: Multivariate regression of SF-36 PCS scores

Factor	B	SE (B)	Beta	ΔR^2	R^2
(Constant)	32.078	4.502			
Use of prosthesis	20.059	3.015	0.252**	0.222	0.222
Comorbidities	-15.775	2.800	-0.196**	0.131	0.353
Employment status	20.530	2.504	0.271**	0.080	0.433
Phantom limb pain	-12.812	2.861	-0.140**	0.027	0.460
Age	-0.454	0.091	-0.182**	0.026	0.486
Assistive device use	-8.768	2.719	-0.115*	0.014	0.497
Residual stump pain	-6.706	2.615	-0.080*	0.006	0.504
Time since amputation	0.291	0.135	0.079*	0.004	**0.508**

**p<0.001, *p<0.05; F(8,538) = 69.395, p<0.001

Table 5: Multivariate regression of SF-36 MCS scores

Factor	B	SE (B)	Beta	ΔR^2	R^2
(Constant)	20.051	3.788			
Employment status	23.356	2.927	0.307**	0.162	0.162
Comorbidities	-15.478	3.122	-0.191**	0.061	0.223
Assistive device use	-9.926	3.159	-0.130**	0.029	0.253
Phantom limb pain	-11.016	3.398	-0.120*	0.022	0.275
Residual stump pain	-10.055	3.127	-0.119*	0.011	0.286
Use of prosthesis	9.543	3.332	0.119*	0.011	**0.297**

**p<0.001, *p<0.01; F(6,540) = 38.209, p<0.001

DISCUSSION

People with lower limb amputation had worse QoL as compared to the general population. This finding has been corroborated in various other studies[19, 24, 37, 38] and indicates that amputation is a major life event potentially affecting QoL many years after the event. In this study, the use of prosthesis and comorbidities were found to be the most important factors influencing the physical health component of QoL, whereas the employment status and comorbidities impacted mainly the mental health component of QoL in amputees.

Table 6: Summary of ANCOVA results for SF-36 PCS and MCS scores for lower limb amputees compared to the general population

		PCS			MCS		
Source	df	F	P	η^2	F	P	η^2
Factor							
Amputee or not	1	15.514	< 0.001	0.021	26.008	< 0.001	0.035
Covariates*							
Age	1	58.681	< 0.001	0.075	12.418	< 0.001	0.017
Employment status	1	130.556	< 0.001	0.153	90.648	< 0.001	0.111
Error	723						

* Only significant covariates presented

Almost half of the amputees (52%) were unemployed at the time of the study, out of which 80% reported having been employed prior to the amputation. Out of this

group, 82% reported loss of employment as a direct consequence of amputation. This suggests that amputation has a significant impact on employability, and should be addressed by vocational rehabilitation and other means.

Employment prospects can further get limited due to lack of academic training and qualifications.[39] In the current study, 71% of amputees had a high school academic training and around 9% had university education. Finding a less physically demanding job due to lack of appropriate educational qualifications mandatory for such jobs, might be an impediment for the amputees.

Two-thirds of the study population comprised male amputees. Similar higher prevalence of amputation among males has been observed in other studies.[40, 41] Unemployment status of male members can have a direct implication on the family's income and its living standard, since traditionally, in India, the male member is the primary earning member of the family.[42, 43] This might explain the important role of employment status in determining QoL in amputees, as unemployment may be a distressing situation for an individual and potentially affect his mental functioning as observed in this study. Asano et al. have also reported the significant impact of employment on QoL.[25]

Use of prosthesis was found to affect the physical health component more positively than the mental health component of QoL. The importance of mobility on physical functioning has also been reported in other studies.[24, 25, 44, 45] Use of assistive device (such as canes, crutches, etc.) had a negative impact on both PCS and MCS scores. The use of assistive device has been studied by Hagberg and Branemark[37], however its impact on QoL has not been reported. Use of assistive device might indicate an increase in the limitations experienced by amputees, and could be attributed to the lack of appropriate infrastructure. Social acceptance of the use of assistive device, delayed proprioception[46] and lack of amputees' confidence in prosthesis[47] might be additional precursors to the use of assistive device. This brings forth the importance of patient oriented and more aggressive gait training in order to develop confidence in walking with the prosthesis and attain greater capabilities with the prosthesis on different terrains, and for performing community or work activities.

Presence of phantom limb pain affected the physical health component more negatively than the mental health component of QoL. It seems to pose a hindrance in mobility and also to have an impact on the psychological and mental state of a person. The importance of phantom limb pain towards predicting QoL has also been

emphasized in other studies.[24, 26, 44] The prevalence of phantom pain decreases with time since amputation.[24] The average time since amputation was close to 10 years in this study, which might explain the relatively lower number of persons reporting the incidence (22%) of phantom limb pain. However, this factor was still found to significantly affect both the physical and mental health components of QoL in this study. Therefore, phantom limb pain needs to be adequately addressed not only during treatment, but also after discharge.

Proper appraisal of the relevant factors in the rehabilitation program would be helpful in establishing an effective treatment protocol. Effective use of the prosthesis and employment reintegration measures would be helpful in improving the QoL in amputees. Since presence of comorbidities negatively affected both the PCS and MCS scores, proper medical attention that could address these in tandem would be beneficial.

Comparing the findings to those obtained in developed countries, despite contextual differences, such as culture and infrastructure, similar factors were found to adversely impact the QoL.[1, 24, 25] However, the role of employment status on QoL has not been predominantly reported in developed countries. This could be due to the presence of social-financial support mechanisms. Also, the lower limb amputees are generally above 65 years of age in these countries. Therefore, they would usually receive a retirement pension plan and have no financial and family liabilities.

Non-participation and non-responsiveness were low in the current study due to face-to-face administration. This mode of administration ensures data completeness, and enables appropriate interpretation of the questionnaire.[48] In the present study, this administration mode was also chosen due to the difficulty in retrieving addresses from the available patient databases, the anticipation that a considerable number of potential participants would have lower level of education, and also to circumvent the possible issue of non-response.

Since the study population was derived from a secondary source, therefore, the possibility of selection bias cannot be excluded. Recruiting patients from the primary source, such as hospital may ensure a more comprehensive patient coverage. The background and amputation characteristics were self-reported by the amputees, and not derived from the patient charts. Therefore, the chance of recall bias and subjectivity in reporting can not be excluded.

CONCLUSION

Lower limb amputees reported worse QoL as compared to the general population. The important role of employment status and the use of assistive device in determining QoL were the key findings of this study. Use of prosthesis, comorbidities, phantom limb pain and residual stump pain were found to be other important factors affecting QoL. All these factors should be addressed during the treatment phase, rehabilitation program, and after discharge in order to ensure holistic reintegration and participation of the amputees, and enable them to regain or maintain QoL. Prospective longitudinal studies are recommended to systematically study the change in QoL over time and to assess its determinants.

REFERENCES

1. Demet K, Martinet N, Guillemin F, Paysant J, Andre J-M. Health related quality of life and related factors in 539 persons with amputation of upper and lower limb. Disabil Rehabil 2003;25(9):480-6.
2. Kathryn Ziegler-Graham, Ellen J. MacKenzie, Patti L. Ephraim, Travison TG, Brookmeyer R. Estimating the prevalence of limb loss in the United States: 2005 to 2050. Arch Phys Med Rehabil 2008;89(3):422-9.
3. Rommers GM, Vos LDW, Groothoff JW, Schuiling CH, Eisma WH. Epidemiology of lower limb amputees in the north of the Netherlands: aetiology, discharge, destination and prosthetic use. Prosthet Orthot Int 1997;21(2):92-9.
4. Unwin N. Epidemiology of lower extremity amputation in centres in Europe, North America and East Asia. Br J Surg 2000;87(3):328-37.
5. Esquenazi A. Amputation rehabilitation and prosthetic restoration. From surgery to community reintegration. Disabil Rehabil 2004 26(14-15):831-6.
6. Hossain P, Kawar B, Nahas ME. Obesity and diabetes in the developing world - a growing challenge. N Engl J Med 2007;356(3):213-5.
7. Bal A. Diabetic foot: magnitude of the problem. J Indian Med Assoc 2002;100(3):155-7.
8. Sage RA, Pinzur M, Stuck R, Napolitano C. Amputation and rehabilitation of the diabetic foot. In: Veves A, Giurini JM, LoGerfo FW, editors. The diabetic foot 2nd ed. Totowa: NJ: Humana Press; 2006.
9. Üstün TB, Chatterji S, Bickenbach J, Kostanjsek N, Schneider M. The International Classification of Functioning, Disability and Health: a new tool for understanding disability and health. Disabil Rehabil 2003;25(11):565-71.
10. Geertzen JHB. Moving beyond disability. Prosthet Orthot Int 2008;32(3):276-81.
11. Desmond D, Gallagher P. Coping and psychosocial adjustment to amputation. In: Gallagher P, Desmond D, MacLachlan M, editors. Psychoprosthetics. London: Springer-Verlag; 2008.
12. Johnson VJ, Kondziela S, Gottschalk F. Pre and post-amputation mobility of trans-tibial amputees: correlation to medical problems, age and mortality. Prosthet Orthot Int 1995;19(3):159-64.
13. Rommers GM, Vos LD, Groothoff JW, Eisma WH. Mobility of people with lower limb amputations: scales and questionnaires: a review. Clin Rehabil 2001;15(1):92-102.
14. Miller WC, Deathe AB, Speechley M, Koval J. The influence of falling, fear of falling, and balance confidence on prosthetic mobility and social activity among

individuals with a lower extremity amputation. Arch Phys Med Rehabil 2001;82(9):1238-44.
15. Davies B, Datta D. Mobility outcome following unilateral lower limb amputation. Prosthet Orthot Int 2003;27(3):186-90.
16. Streppel KR, de Vries J, van Harten WH. Functional status and prosthesis use in amputees, measured with the Prosthetic Profile of the Amputee (PPA) and the short version of the Sickness Impact Profile (SIP68). Int J Rehabil Res 2001;24(3):251-6.
17. Ackerley SJ, Gordon HJ, Elston AF, Crawford LM, McPherson KM. Assessment of quality of life and participation within an outpatient rehabilitation setting. Disabil Rehabil 2009;31(11):906-13.
18. Gallagher P, MacLachlan M. The Trinity Amputation and Prosthesis Experience Scales and quality of life in people with lower limb amputation. Arch Phys Med Rehabil 2004;85(5):730-6.
19. Eiser C, Darlington A-SE, Stride CB, Grimer RJ. Quality of life implications as a consequence of surgery: limb salvage, primary and secondary amputation. Sarcoma 2001;5(4):189-95.
20. Hoogendoorn JM, van der Werken C. Grade III open tibial fractures – Functional outcome and quality of life in amputees versus patients with successful reconstruction. Injury 2001;32(4):329-34.
21. Tekin L, Safaz Y, Goktepe AS, Yazycyodlu K. Comparison of quality of life and functionality in patients with traumatic unliateral below knee amputation and salvage surgery. Prosthet Orthot Int 2009;33(1):17-24.
22. Zahlten-Hinguranage A, Bernd L, Ewerbeck V, Sabo D. Equal quality of life after limb-sparing or ablative surgery for lower extremity sarcomas. Br J Cancer 2004;91(6):1012-4.
23. McCutcheon T, Knepp T, Richards N, Sparks M. Comparison of quality of life of persons who have experienced amputations and persons who have had bowel resections. Gastroenterol Nurs 2005;28(3):221-6.
24. Schoppen T, Boonstra A, Groothoff JW, de Vries J, Goeken NH, Eisma WH. Epidemiologic characteristics and quality of life of lower limb amputee patients in adulthood in the Netherlands. Available from: URL: http://irs.ub.rug.nl/ppn/239868706.
25. Asano M, Rushton P, Miller WC, Deathe BA. Predictors of quality of life among individuals who have a lower limb amputation. Prosthet Orthot Int 2008;32(2):231-43.

26. Gallagher P, Allen D, Maclachlan M. Phantom limb pain and residual limb pain following lower limb amputation: a descriptive analysis. Disabil Rehabil 2001;23(12):522-30.
27. Horgan O, Maclachlan M. Psychosocial adjustment to lower-limb amputation: a review. Disabil Rehabil 2004;26(14/15):837–50.
28. Ware JE, Gandek B. Overview of the SF-36 health survey and the International Quality of Life Assessment (IQOLA) project. J Clin Epidemiol 1998;51(11):903-12.
29. Ware JE. SF-36 Health Survey Update. Spine 2000;25(24):3130-9.
30. Ware JE, Kosinski M, Bayliss MS, McHorney C, Rogers WH, Raczek A. Comparison of methods of scoring and statistical analysis of SF-36 health profile and summary measures: summary of results from the Medical Outcomes Study. Med Care 1995;33(4):AS264-AS79.
31. Chang C-H, Wright BD, Cella D, Hays RD. The SF-36 physical and mental health factors were confirmed in cancer and HIV/AIDS patients. J Clin Epidemiol 2007;60(1):68-72.
32. Wilson D, Parsons J, Tucker G. The SF-36 summary scales: problems and solutions. Soc Prev Med 2000;45(6):239-46.
33. Farivar SS, Cunningham WE, Hays RD. Correlated physical and mental health summary scores for the SF-36 and SF-12 Health Survey, V.1. Health Qual Life Outcomes 2007;5(54).
34. Norusis J. SPSS base system user's guide. Chicago: SPSS Inc.; 1990.
35. Cohen A. Dummy variables in stepwise regression. Am Stat 1991;45(3):226-8.
36. Abdi H. Bonferroni and Šidák corrections for multiple comparisons. In: Salkind NJ, editor. Encyclopedia of Measurement and Statistics. Thousand Oaks, CA: Sage 2007.
37. Hagberg K, Branemark R. Consequences of non-vascular trans-femoral amputation: a survey of quality of life, prosthetic use and problems. Prosthet Orthot Int 2001;25(3):186-94.
38. Pezzin LE, Dillingham TR, MacKenzie EJ. Rehabilitation and the long-term outcomes of persons with trauma-related amputations. Arch Phys Med Rehabil 2000;81(3):292-300.
39. Schoppen T, Boonstra A, Groothoff JW, van Sonderen E, Göeken LN, Eisma WH. Factors related to successful job reintegration of people with a lower limb amputation. Arch Phys Med Rehabil 2001;82(10):1425-31.
40. Heikkinen M, Saarinen J, Suominen VP, Virkkunen J, Salenius J. Lower limb amputations: Differences between the genders and long-term survival. Prosthet Orthot Int 2007;31(3):277-86.

41. The amputee statistical database for the United Kingdom. Edinburg: National Amputee Statistical Database; 2009.
42. Mathur A. Work participation, gender and economic development: a quantitative anatomy of the Indian scenario. J Dev Stud 1994;30(2):466-504.
43. Chandra V. Women and work-family interface: Indian context. J Asia Pac Stud 2010;1(2):235-58.
44. van der Schans CP, Geertzen JHB, Schoppen T, Dijkstra PU. Phantom pain and health-related quality of life in lower limb amputees. J Pain Symptom Manage 2002;24(4):429-36.
45. Deans SA, McFadyen AK, Rowe PJ. Physical activity and quality of life: a study of a lower-limb amputee population. Prosthet Orthot Int 2008;32(2):186-200.
46. Cotter DHG. Artificial limbs. Br Med J (Clin Res Ed) 1988;296(6630):1185-7.
47. Miller WC, Speechley M, Deathe AB. Balance confidence among people with lower-limb amputations. Phys Ther 2002;82(9):856-65.
48. Hox JJ, De Leeuw ED. A comparison of nonresponse in mail, telephone, and face-to-face surveys. Qual Quant 1994;28(4):329-44.