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Functional and psychosocial status of Haitians who became users of lower extremity prostheses as a result of the 2010 earthquake

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Abstract

The January 12, 2010 earthquake devastated Port-Au-Prince, the capital of the Republic of Haiti, and its surroundings. Among the 300,000 injured, 1,200 to 1,500 people underwent traumatic / surgical amputations. The purpose of this study was to describe the functional and psychosocial impact of prostheses users who suffered a traumatic lower-limb amputation after the earthquake of 2010 in Haiti. We recruited 140 participants in collaboration with a large health care organization in Port-au-Prince from October 2011 to May 2012. Participants underwent an evaluation of physical impairments and completed questionnaires translated into Haitian Creole. The Trinity Amputation and Prosthesis Experience Scale (TAPES), and the Locomotor Capabilities Index (LCI) were used in this study. The questionnaires were administered verbally in Haitian Creole by a trained staff. We conducted descriptive statistics and t-tests using SPSS for data analysis. Participants had a mean age of 34.9 ± 12.0 ; 51.4% were women; 48.6% were transfemoral amputees. The mean of TAPES general adjustment (3.65 ± 0.59) and adjust to limitation (3.67 ± 0.86) were higher than the score for the social adjustment (2.58 ± 0.49). The LCI showed over 90% of subjects were physically independent in self-care; fewer were independent walking on

uneven ground or inclement weather (69%). The relatively poor social adjustment is consistent with the literature that describes limited acceptance of people with physical disabilities in Haitian society. Prostheses users in Haiti would benefit from a health delivery infrastructure that also addresses the psychosocial reintegration of individuals with physical disabilities.

INTRODUCTION

The January 12, 2010 earthquake devastated Port-Au-Prince, the capital of the Republic of Haiti, and its surroundings. The 7.0 Richter scale earthquake caused a large number of casualties and deaths. The estimated number of casualties was 300,000 including 1200 to 1500 traumatic or surgical amputations¹. Prior to the earthquake, there was only one public provider of prosthetic and orthotic devices and related rehabilitation services. This facility was severely damaged by the earthquake. The international response to the disaster in Haiti was intense and contributed to the saving of lives immediately after the earthquake. However, this response also overwhelmed a weak Haitian medical infrastructure and resulted in fragmented interventions and poor coordination and documentation of care¹. Surgical amputation and follow-up rehabilitation services by several nongovernmental organizations (NGOs) helped a sizable population of individuals faced with limb amputations to obtain basic follow-up care. Prostheses were provided by NGOs who came to help in the fabrication of prostheses and training of technicians in prosthetic and orthotic fabrication. Traumatic loss of limbs in natural disasters and wars can be catastrophic for individuals with sudden limitations in functional activities, mobility, and social adaptations. Prior to the earthquake of January 2010, it was recognized that rehabilitation services in Haiti for people with amputations was insufficient to meet the prevalent needs². It has been reported that within six months of the earthquake 600 patients received limbs from the various providers, an astonishing accomplishment in view of the magnitude of the disaster³. However, the status of prosthetic users in the post-earthquake environment in Haiti is not well known. The purpose of this study was to describe the functional and psychosocial status of a subgroup of Haitian adults who underwent lower-limb amputation due to the 2010 earthquake and who are current users of unilateral lower-limb prostheses.

LITERATURE REVIEW

Trauma due to natural disasters, wars, and accidental events often results in surgical interventions such as amputations, fasciotomies, and external fixation of fractures⁴. It has been established that in the management of natural disasters, coordination of services from short-term life-saving measures to long-term rehabilitation services and follow-up is very important to insure the continuity of care and better outcomes⁵. In low- and middle-income countries (LMIC) faced with disasters, limb amputation post-operative care and rehabilitation services as well as psychological support are critical to provide individuals with the needed functional abilities for a better quality of life^{3, 5, 6}. In prospective studies of the humanitarian response to the earthquake in Haiti, several factors are identified as impediment to better long-term outcomes for the injured^{1, 3, 5}: 1) the destruction of a health care system that was already weak and insufficient for the population¹; 2) a massive increase in NGOs without previous knowledge of the terrain prior to the earthquake who came to

help in dealing with medical emergencies created by the earthquake; and 3) an initial lack of coordination among agencies and the government, which resulted in fragmented interventions and lack of planning for long-term needs of the injured. As a result of musculoskeletal injuries, it is currently well documented that 1,200 to 1,500 amputations were performed in the days and up to 5 weeks after the earthquake^{1, 5, 6}. However, records of surgical interventions and the need for that intervention are not standardized and accessible in many cases¹. Based on the lack of standardization and lack of coordination of services immediately after the earthquake, the functional outcomes were not primary considerations in numerous cases. Scarcity of documentation of patients before and after the amputation affects the ability to assess systematically the immediate or long-term outcomes for these individuals.

It is well recognized, based on many studies that traumatic amputations in developing and developed countries result in profound changes in the quality of life of individuals⁷. Several factors affect the quality of life after amputation: pain, drastic changes in functional abilities, psychosocial adjustment to loss of a body part, and impact on employment. In surveys of traumatic leg amputations in developed countries such as the United Kingdom (UK)⁸ and the United States⁹ showed that a multidisciplinary team approach is fundamental to positive outcomes in physical capabilities and psychosocial adjustment of individuals with limb amputations. Functional mobility following lower-limb amputation is one of the primary goals of rehabilitation. In addition, quality of life of prosthesis users is also an important aspect of rehabilitation. To assess the rehabilitation intervention, many assessment tools are available. Researchers have used performance tests and ambulation activities to assess functional limitation, energy expenditure and long-term use of the prosthetic device by patients⁹. Patient-centered measures using questionnaires and interviews have been used to assess the quality of life and psychological adjustment to lower limb amputation^{7, 8}.

In post-earthquake Haiti, the assessment of functional abilities and psychosocial adjustment to lower-limb prosthetic use need to be documented. The circumstances surrounding amputation due to traumatic events and the lack of purposeful coordination of services in Haiti make the assessment of functional and psychosocial adjustment challenging. To our knowledge, only one study has reported functional satisfaction and psychological adaptation for individuals with limb amputations and limb preservation after the Haiti earthquake in 2010⁶. In this study, functional satisfaction was addressed by one question according to a four-point scale (not satisfied, poorly satisfied, satisfied, very satisfied), and did not measure functional abilities. Their findings specifically for lower-limb prosthetic users were limited because they did not assess functional abilities and their sample was heterogeneous.

Assessment measures specific to prosthetic users were developed to evaluate functional and psychosocial outcomes. The Trinity Amputation and Prosthesis Experience Scales¹⁰ (TAPES), a self-reported questionnaire, is designed for limb prosthetic users. The TAPES is a valid assessment that captures functional capabilities and psychosocial adjustment¹¹. The Locomotor Capability Index¹² (LCI), a valid and reliable self-reported measure, focuses on basic and advanced locomotor abilities of individuals when using their prosthesis.¹³ To understand the functional capabilities and psychosocial adjustment of lower-limb prosthetic users in Haiti, more studies are needed. The purpose of this study was to describe the

functional and psychosocial status of a subgroup of Haitian adults who underwent lower-limb amputation due to the 2010 earthquake and who are current users of unilateral lower-limb prostheses.

METHODS

A survey design and a gross screening examination were used to achieve the purpose of this study. The questionnaires were administered from October 2011 to June 2012 verbally to individuals who had a unilateral lower-limb amputation as a result of the earthquake of January 2010.

Procedure

This study was conducted in collaboration with a large nonprofit health care organization in Port-au-Prince, Haiti from October, 2011 to June, 2012. This organization was established and continues to be operated by Haitian physicians and is focused primarily on infectious diseases. However, the organization became a first responder immediately after the earthquake and provided space for rehabilitation services immediately after the earthquake and during the course of the study. The rehabilitation division was staffed by one physiatrist, one orthopedic surgeon, and four rehabilitation technicians trained on site. Approval was obtained from the Institutional Review Board (IRB) of Florida International University and the IRB of the health care organization in compliance with the Haitian Health Ministry prior to recruitment of participants.

Informed Consent and instruments were all translated in Haitian Creole and translated back in English as required by the IRB. Translation from English to Haitian Creole was done by a physical therapist, two physical therapy students, and a nurse fluent in Creole. Review of the translation was done during several meetings with the Haitian staff to define the accuracy of certain terms in Creole and the original intent of the questionnaire. This process was followed by a back translation in English which was compared with the original English versions of the questionnaires.

Training of Staff

The training of the interviewers was a significant component of the study. All staff members were trained to complete an examination that would certify their understanding of ethical standards for a study involving human subjects. This training is a standard practice of the health care organization.

Several procedures were implemented to minimize inconsistencies in the data collection. Each staff was trained on how to conduct the interview and administer only one specific questionnaire. One individual was responsible for going over the informed consent with each participant. The most experienced staff was trained to administer the Locomotor Capabilities Index; one staff member was trained to administer the TAPES; one field worker for recruitment was trained to interact with the amputee population in the vicinity of the health care site and other agencies who were seeing lower-limb prosthetic users. The training of the staff was critical for the reliability of the data collection. The verbal administration of the questionnaires was essential because of the high rate of illiteracy in

Haiti. The first 50 interviews were recorded by audio tapes and reviewed by the principal investigator for accuracy and assessment of the staff's performance in administering the questionnaires. After the first 50 reviews, minor adjustments were made and 1 recording was made for every 10 interviews. A series of assessments were administered; however, for the purpose of this study, we only presented the TAPES and the LCI.

Participants

Participants (n=150) were recruited throughout Port-au-Prince by a trained field worker who sought out and spoke with individuals with amputations in various settings including permanent and temporary residences (including tents), prosthetic and orthotic clinics of NGOs, and through word of mouth among amputees. Individuals who met the criteria for inclusion in the study (n=140) were invited to participate. Criteria for inclusion in the study were 1) a history of a unilateral lower-limb amputation due to injuries or traumatic amputation resulting from the January 12, 2010 earthquake, 2) reported regular usage (4–12 hours) of lower-limb prosthesis, and 3) age of at least 18 years at the time of the study. Potential participants were provided a free physical examination by a physiatrist, who also served as the project coordinator on site. Potential participants who required rehabilitation services were seen on site and those requiring prosthetic repair or adjustment were given referrals to the appropriate clinics known to provide these services.

Instruments

Trinity Amputation and Prosthesis Experience Scale (TAPES)¹⁰—The TAPES is an instrument designed to assess the personal experience and adjustment to lower-limb amputation and prosthesis use by amputees. This instrument was shown to be valid and reliable in English and when translated into Farsi (Persian)^{14–16}.

The TAPES consists of three domains: psychosocial adjustment, activity restriction, and satisfaction. 1) Psychosocial adjustment domain rated by five-point scale (strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree) is composed of three subdomains (general adjustment, social adjustment, and adjustment to limitation) with a total of 15 questions. A higher score indicates higher level of adjustment. 2) Activity restriction domain rated by three-point scale (limited a lot, limited a little, not limited at all) is considered as a unidimensional construct¹¹ with a total of 12 questions. A higher score indicates higher level of restriction. 3) Satisfaction domain is originally rated by five-point scale (very dissatisfied, dissatisfied, neither dissatisfied nor satisfied, satisfied, very satisfied), but in this study the translated version of TAPES uses a four-point scale (very dissatisfied, dissatisfied, neutral, very satisfied). The satisfaction domain measures satisfaction with prosthesis in functional and aesthetic aspects with a total of eight questions. A higher score indicates higher level of satisfaction.

Locomotor Capabilities Index (LCI)¹²—The LCI is a self-report measure of ambulatory skills with the prosthesis on. The LCI consists of 14 tasks commonly encountered in everyday life. It has been reported to be a valid, reliable, and sensitive instrument¹³ and has been translated into several languages. The LCI assess two domains: basic activities and advanced activities, with four-point rating scale (“no-0”, “yes, if someone

helps me-1”, “Yes, if someone is near me - 2”, and “Yes, alone, with ambulation aids - 3”), and each domain contains seven items. Higher scores indicate better locomotor capability.

Data Analysis

Data were analyzed using SPSS version 18¹⁷. Descriptive statistics and t-test were conducted to examine the research questions.

RESULTS

Participants' demographic information is presented in Table 1. Participants ranged in age from 18 to 64, with an average age of 34.9 years (SD = 11.97). Seventy-two of the participants were females (51.4%) and 68 were males (48.6%). Type of amputations is presented in Table 2. The average time that participants had their current prosthesis was 13.3 ($\pm$ 6.48) months.

Trinity Amputation and Prosthesis Experience Scales (TAPES)

1) Psychosocial adjustment domain—The paired t test showed that the mean of general adjustment subdomain and the mean of adjustment limitation subdomain were significantly higher than the mean of social adjustment subdomain ($p < 0.001$). The TAPES subdomain scores are presented in Table 3. In general adjustment subdomain, 93.5% of subjects agreed or strongly agreed with the statement “[Overall] I am doing OK with the artificial limb,” and 93.3% agreed or strongly agreed with the statement “I have gotten used to wearing an artificial limb.” In contrast, in the social adjustment subdomain, 91.2% of subjects disagreed or strongly disagreed with the statement “I don’t mind people asking about my artificial limb,” and 81.3% disagreed or strongly disagreed with the statement “I don’t care if somebody looks at my artificial limb.” In adjustment to limitation subdomain, an approximately equal number of participants agreed and disagreed with the statements in this subdomain. For example, 46.2% of participants agreed or strongly agreed “being an amputee means that I can’t do what I want to do,” while 49.1% of participants disagreed or strongly disagreed with this statement.

2) Activity restriction domain—The activities that were most often cited as limited a little or a lot were “climbing several flights of stairs (88.8%) and walking 100 meters (91.8%). Capabilities for “maintaining friendships” was perceived as limited a little or a lot by 84.2% of respondents and “visiting friends” was cited by 66.3%. However, 89.6% of subjects perceived that their ability to “go to work” was not limited at all.

3) Satisfaction domain—No significant difference was found between the aesthetic satisfaction subdomain and functional satisfaction subdomain. The highest dissatisfied areas regarding the prosthesis were color and weight (28.5% and 26.4 % respectively).

4) Comparison between transtibial and transfemoral prosthetics users—Transtibial prosthetics users showed significantly higher scores in general adjustment, adjustment to limitation, and functional satisfaction than transfemoral prosthetic users

($p=0.01$, 0.01 , and 0.03 respectively). In contrast, scores for social adjustment, activities restriction, and aesthetic satisfaction did not differ between these two groups (See Table 4).

Locomotor Capabilities Index (LCI)

Scores on the LCI can be computed for both basic and advanced activities; as might be expected, scores were significantly lower for advanced activities (15.5 ± 4.4) relative to basic activities (19.1 ± 2.7) ($p < 0.001$). The LCI showed over 90% of subjects were physically independent in self-care (bathing, dressing, eating, eliminating); fewer were independent while walking on uneven ground or in inclement weather (69%). The scores of LCI for basic and advanced activities did not differ between transtibial and transfemoral groups (see Table 4).

DISCUSSION

This study describes the functional and psychosocial status of Haitian adults who underwent lower-limb amputation due to the 2010 earthquake and who are current users of unilateral lower-limb prostheses.

In this study, the TAPES showed that in the psychosocial domain, lower-limb prosthetic users had the most difficulty in social adjustment. Additionally, in the satisfaction domain of the TAPES, there was no significant difference between aesthetic and functional satisfaction from users.

Specifically regarding transtibial and transfemoral prosthetic users, we found that general adjustment, adjustment to limitation, and functional satisfaction subdomains were significantly different between these two groups with the transfemoral prosthetic users experiencing more difficulties. Interestingly, the difference between the transtibial and transfemoral group was not identified by the LCI. This may indicate that the TAPES is a more sensitive measure than the LCI in this population. As expected, transfemoral prosthetic users had the most difficulty to adjust to prosthetic use in functional aspects of their daily lives. The increased energy expenditure and biomechanical changes in ambulation for the transfemoral prosthetic user is well documented^{7, 18, 19}. However, both groups experienced the same challenges in social adjustment. The majority of the participants were concerned about people asking about their artificial limbs; they don't want to talk about their artificial limbs; they were self-conscious about limping. Studies have shown that better social adjustment is related to the satisfaction of prosthetic appearance, functional improvement with prosthesis, and low level of body image disturbance²⁰. In this sample, the body image was disturbed regardless of the level of the amputation. Our findings reinforce the concept of a comprehensive intervention in the immediate aftermath of a disaster, especially in developing countries. The rehabilitative team in the immediate and long-term phase of disaster relief should include psychological interventions to optimize best outcomes^{7, 8, 21}.

The LCI showed that restrictions were mostly confined to climbing stairs and uneven surfaces. The LCI data showed a significant level of difficulty in advanced activity of daily living such as negotiating stairs and walking on uneven ground for a majority of the individuals in this study. This particular aspect of the status for prosthetic users in Haiti

post-earthquake is particularly significant since most roads are not paved and access to homes may require stairs and walking on slopes and hills. Despite the significant functional limitation seen in advanced ambulation activities evident in the LCI questionnaire as well as in the TAPES, participants responded overwhelmingly that these limitations would not interfere with their ability to work. These findings may reflect, in a context of high unemployment, the very strong desire to work to support oneself and family²². However, the presence of a disability and the numerous environmental challenges represent a significant disadvantage for these individuals. In Haiti, the environmental barriers for individuals with disabilities are very significant in public transportation, housing, and walking surfaces. In addition, the rainy seasons usually bring in flooding and mudslides in many areas of Port-Au-Prince, which constitute a significant barrier for prosthetic users in ambulation.

Studies of psychosocial adjustment have reported specific factors that influence best outcomes for prosthetic users^{7, 23}. These studies reported the adjustment to amputation depended on amputation surgical procedure, timely prosthetic fitting, and comprehensive rehabilitation services. The surgical interventions performed in the immediate response to the earthquake in Haiti lacked a comprehensive understanding of the impact of surgical techniques used for amputation on prosthetic fitting^{1, 3, 4}. Regarding prosthetic fitting, the average waiting time for our sample was 10 months as opposed to an average of three to six months in countries with more resources^{9, 23}. Rehabilitation services were confined to physical rehabilitation and provision of prostheses in our sample. Psychological intervention was not part of the standardized intervention provided to this population. All of these factors compromise the opportunities for best outcomes.

In this study, psychosocial adjustment to the amputation and prosthetic use were significantly less than the functional aspect. These results are not different as seen in other studies regarding traumatic amputation⁸. The challenges for psychosocial adaptation for these individuals in Haiti are compounded by the lack of infrastructure to insure access, rehabilitative services follow-up, and psychological support in the long term.

Some of the limitations of this study are noted. Instead of self-report locomotion ability, a performance test might be more accurate in assessing their ambulation capacity. We did not collect education and socioeconomic status data for this study. Including this information might offer a more comprehensive picture of the participants' adaptation to their limb loss.

CONCLUSION

Traumatic amputation is a devastating consequence of a natural disaster. In Haiti the functional adjustment and psychosocial adjustment of prostheses users present numerous challenges. Psychosocial adjustment is significantly more difficult than functional adjustment and will influence significantly the quality of life of individuals. The challenges faced by the population of individuals with amputation are many: environmental barriers, unemployment, access to prosthetic needs. In addition to independence in self-care activities, individuals must be able to navigate in their physical environment to improve the quality of their lives through work and social interaction. Further research is needed to investigate the needs of transtibial and transfemoral amputees in this challenging

environment in order to optimize their reintegration into their community through psychosocial and work retraining interventions.

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Table 1

Demographic information

Age	
mean (SD)	34.85 (11.97)
range	18 –64
Missing age data	4 (2.86%)
Gender, n (%)	
Male	68 (48.6%)
Female	72 (51.4%)

Table 2

Type of amputations

Types of amputation	N (%)
Transtibial	69 (49.3%)
Transfemoral	68 (48.6%)
Knee disarticulation	2 (1.4%)
Missing data	1 (0.7%)

Table 3

TAPES subdomain scores

Domain	Subdomain	Rating scale	Mean $\pm$ SD
Psychosocial	General Adjustment	1–5	3.65 $\pm$ 0.59
	Social Adjustment	1–5	2.58 $\pm$ 0.49
	Adjustment to Limitation	1–5	3.67 $\pm$ 0.86
Activity Restriction	Activity Restriction	0–2	0.99 $\pm$ 0.36
Satisfaction	Aesthetic Satisfaction	1–4	3.38 $\pm$ 0.88
	Functional Satisfaction	1–4	3.49 $\pm$ 0.53

Table 4

Comparison between transtibial and transfemoral prosthetics users

	Transtibial	Transfemoral	T Value	P Value
TAPES-General Adjustment	3.81 (.50)	3.50 (.64)	3.08	.01**
TAPES-Social Adjustment	2.61 (.44)	2.55 (.54)	.64	.52
TAPES-Adjustment to Limitation	3.88 (.74)	3.43 (.92)	3.12	.01**
TAPES-Activity Restriction	1.01 (.37)	0.94 (.34)	1.10	.27
TAPES-Functional Satisfaction	3.75 (.49)	3.53 (.63)	2.26	.03**
TAPES-Aesthetic Satisfaction	3.26 (.64)	3.07 (.85)	1.43	.16
LCI-Basic	19.06 (3.03)	19.19 (2.30)	0.27	0.79
LCI-Advanced	15.06 (5.01)	16.99 (3.59)	1.21	0.23