

Life after Lower Extremity Amputation in Diabetics

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ABSTRACT

Lower limb amputees typically have reduced mobility which affects their ability to perform daily tasks and to successfully reintegrate into community life. A major goal of rehabilitation for amputees is to improve quality of life (QOL). This study therefore focussed on QOL and functional independence for persons with lower limb amputations secondary to diabetes.

Objective: *To determine the QOL and functional independence of lower limb diabetic amputees one to three years post amputation, using variables such as age, gender and amputation level.*

Method: *A total of 87 participants were selected from the 2006–2009 physiotherapy records at the St Ann's Bay Hospital. These participants completed the World Health Organization Quality of Life Scale (WHO QOL-BREF) and the Functional Independence Measure (FIM). Data were analysed using SPSS (version 12) and the mean values for QOL and functional independence were calculated. Relationships between the variables: age, gender and level of amputation with QOL and functional independence were analysed using descriptive and inferential statistical techniques.*

Results: *Among the 35 males and 52 females participating in the study, below knee amputees recorded higher scores for QOL ($p < 0.05$) and functional independence ($p < 0.0001$) compared to the above knee amputees. The result also showed that females had a significantly higher average score than males among the four domains for QOL. Similar results were obtained from the FIM where women again had significantly higher scores than males ($p < 0.0001$). The majority of females across the age groups reported average to high QOL ($p < 0.0001$) compared to the males. A positive correlation ($r = 0.5999$, $p < 0.0001$) was found between functional independence and quality of life of all participants.*

Conclusion: *The results showed that below knee amputees functioned better than those with above knee amputations and that females were more likely to cope and function with the disability than males.*

Keywords: Functional independence, lower limb diabetic amputees, quality of life

La vida Tras la Amputación de las Extremidades Inferiores por Diabetes

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RESUMEN

Los amputados de las extremidades inferiores enfrentan el cuadro típico de la reducción de su movilidad, lo cual afecta su capacidad para realizar las tareas cotidianas y reintegrarse con éxito a la vida de la comunidad. Uno de los objetivos principales de la rehabilitación de los amputados es mejorar la calidad de vida (CDV). En concordancia con ello, este estudio centra su atención en la CDV y la independencia funcional de personas con amputación de las extremidades inferiores a consecuencia de diabetes secundaria.

Objetivo: *Determinar la CDV y la independencia funcional de diabéticos amputados de las extremidades inferiores, de uno a tres años tras la amputación, a partir de variables tales como la edad, el género, y el nivel de amputación.*

Método: *Un total de 87 participantes fueron seleccionados de los archivos de fisioterapia de 2006–2009 en el Hospital Saint Ann Bay. Estos participantes completaron las evaluaciones de la Escala de Calidad de Vida de la Organización Mundial de la Salud (WHO QOL-BREF) y la Medida de Independencia Funcional (MIF). Se analizaron los datos usando SPSS (versión 12) y se calcularon los*

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valores promedios de la CDV y la independencia funcional. Las relaciones entre las variables – edad, género y nivel de amputación – con respecto a la CDV y la independencia funcional, fueron analizadas usando técnicas estadísticas descriptivas e inferenciales.

Resultados: Entre los 35 varones y 52 hembras que participaron en el estudio, los amputados por debajo de la rodilla registraron puntuaciones más altas para la CDV ($p < 0.05$) y la independencia funcional ($p < 0.0001$) en comparación con los amputados por arriba de la rodilla. El resultado también mostró una puntuación promedio significativamente más alta en las hembras que en los varones, en los cuatro dominios de la CDV. Se obtuvieron resultados similares del MIF, en los que de nuevo las mujeres tenían puntuaciones significativamente más altas que los varones ($p < 0.0001$). La mayoría de las hembras en todos los grupos etarios reportaron desde una CDV promedio a una CDV alta ($p < 0.0001$) en comparación con los varones. Se halló una correlación positiva ($r = 0.5999$, $p < 0.0001$) entre la independencia funcional y la calidad de vida de todos los participantes.

Conclusión: Los resultados mostraron que los amputados por debajo de las rodillas funcionaban mejor que aquéllos con amputaciones por encima de la rodilla, y que las mujeres presentaban una mayor probabilidad de lidiar y funcionar exitosamente con la discapacidad en comparación con los hombres.

Palabras claves: Independencia funcional, diabéticos amputados de las extremidades inferiores, calidad de vida

West Indian Med J 2011; 60 (5): 537

INTRODUCTION

The prevalence of diabetes worldwide continues to increase. It is estimated that by the year 2025, the number of diabetics will grow to about 300 million. Of this projected figure, the greatest increase will occur in the developing countries, with the developed countries seeing smaller increases (1). Within the English-speaking Caribbean, such an increase in prevalence has already become evident and is of public health concern. In Jamaica, more than 300 000 persons live with diabetes, of which approximately 50% are said to be unaware of their diabetic status (2). This situation places the undiagnosed diabetic in an unfortunate position as the pathophysiologic changes defining the disease will begin, unknown to them, thus pushing them closer to diabetic complications that could result in amputation. Anselm and Henry projected that about 15% of diabetics will have an amputation related to diabetic complications during their lifetime and will experience the resulting outcomes of permanent disability and a reduction in their quality of life [QOL] (3). These outcomes are particularly likely to occur in the Jamaican setting, with the limitations related to access to rehabilitative services and to appropriate prosthetic devices.

King *et al* in their 1998 diabetes prevalence report, noted that a gender bias towards diabetic females was found in developed countries and that a more equal gender distribution was to be found in the developing countries (1). Anselm and Henry in a later study, commented that such gender bias (in studies on diabetics) may have been influenced by the overall higher rates of female obesity (3) in the developed countries. This relationship between obesity and diabetes is well documented in the literature and could explain the gender distribution in Jamaica as a large number of Jamaican females are overweight/obese (4). However,

evidence was not found in the literature to support this gender bias among diabetic amputees.

Numerous studies (internationally) have been done exploring the factors associated (negatively or positively) with functional independence and quality of life of diabetic amputees. Gender, age, level of amputation and depression were the factors most studied. However, other factors such as the impact of obesity and presence of other co-morbidities have also been explored in the literature.

Age and the level of the amputation have been identified in the literature as the most significant predictors of functional outcome and subsequent functional independence (5–12). Higher level amputations were found to be more debilitating for the diabetic amputee compared to lower level amputations (13, 14). Younger amputees were found to achieve better functional outcomes and thus to report a better quality of life. Greive *et al* (7) found that amputees who were less than 65 years of age had a greater probability of achieving good autonomy in mobility than older amputees. They, however, were not clear if age itself was the important factor or that maybe increasing morbidity associated with advancing age could influence functional outcome and therefore quality of life.

Living with diabetes is very demanding both mentally and physically for the diabetic and their family members. Carrington *et al* found that, when compared to diabetics without amputations, diabetics with amputation made a significantly poorer psychosocial adjustment to their disability and demonstrated greater levels of depression (15, 16). The relationship between poorer quality of life and greater depression was also shown to be stronger in diabetics with poor glycaemic control than in those with better control. Depression will negatively impact on motivation, which is shown in the literature (17) to have a strong positive impact

on functional independence and QOL (7). This impact of depression is implied in the findings of a Jamaican survey which identified a lack of care, unawareness of the disease and neglect as reasons leading to the need for lower limb amputation (2). Statistics show that when compared with non-diabetics, diabetics are 10–24 times more likely to have lower limb amputations (18). Approximately 30% of diabetics with unilateral amputations can be expected to become bilateral amputees within two years, while roughly 50% of those with bilateral amputations can be expected to die within five years (5). In Jamaica, adult onset diabetes (Type 2) is listed as one of the five leading causes of death.

In summary, since almost all of the literature reviewed were of studies that were conducted overseas on populations that may have been dissimilar to that found in Jamaica, it seems prudent to explore the relationship of the factors most studied (age, level of amputation and gender) in a sample of the local population. As the goal of rehabilitation is to improve functional independence and by transference, quality of life, exploring these factors would be useful in structuring rehabilitative efforts to better meet the needs of this group of persons.

SUBJECTS AND METHODS

First, approval to conduct the study was granted by the University Hospital of the West Indies/The University of the West Indies/Faculty of Medical Sciences Ethics Committee and the St Ann's Bay Hospital. Participants were drawn from the surviving amputees, of both genders, who had received rehabilitation at the Physical Therapy Department of the hospital between 2006 and 2009. Selection was based on set inclusion and exclusion criteria. Participants had to have had lower limb amputations (transtibial or transfemoral) secondary to diabetes mellitus within the immediate one to three years prior to the study, and should be between the ages of 40–90 years. Those with symptoms of intermittent claudication, a history of epilepsy or other neurological disorder, or had their amputation secondary to trauma were excluded. Using a purposive sampling technique, a total of 87 participants were recruited. They signed an informed consent (after having read it), then they completed the World Health Organization Quality of Life Scale (WHO QOL-BREF) and the Functional Independence Measure (FIM). These instruments did not require any modification for cultural sensitivity in this study.

The data were analysed using the Statistical Package for Social Sciences (SPSS) software, version (12). Descriptive statistics were calculated for demographic data (age, gender and level of amputation). Mean values for QOL and functional independence were calculated from the WHO QOL-BREF and FIM scores. Quality of life was divided into three categories (low, average and high). The relationships between functional independence, level of amputation and gender, QOL (continuous scale), level of amputation and functional independence were determined using *t*-test. The

relationship between age (categorical), gender and QOL was determined using Chi-Square. Alpha level of 0.05 was used to determine the statistical significance. The data were presented in narrative and graphic format.

RESULTS

The rate of return for the instruments was 100%. There were 87 participants, of which 35 were male and 52 female. Age ranged between 43–86 years with a mean of 62 years (± 9.939). Of the 87 participants, 64 had below knee amputation and 23, above knee amputation.

Among those with below knee amputation, 32 were male and 32 female, and among those with above knee amputation, 3 were male and 20 female (Table 1). Males with below knee amputation were in the older age groups (60–70 and 71–86 years) while the females were in the younger age groups (43–59 and 60–70 years). When the data for above knee amputation were examined, 50% of the female respondents were in the 43–59-year age group and the other 50% were in the 60–70-year age group. All males with above knee amputation were in the 60–70-year age group (Table 1).

Table 1: Level of amputation by age and gender

Age Group (years)	Level of Amputation			
	Below Knee (n = 64)		Above Knee (n = 23)	
	Male % (n = 32)	Female % (n = 32)	Male % (n = 3)	Female % (n = 20)
43–59	0 (0)	56 (18)	0 (0)	50 (10)
60–70	50 (16)	41 (13)	100 (3)	50 (10)
71–86	50 (16)	3 (1)	0 (0)	0 (0)

Relationship between QOL, Functional Independence and Level of Amputation

Below knee amputees recorded higher QOL scores compared to those with above knee amputation ($p < 0.05$). Functional independence measure scores were also higher for the below knee amputees ($p < 0.0001$) [Table 2].

Table 2: Mean (SD) QOL and functional independence scores by level of amputation

Variable	Level of amputation		
	Above Knee	Below Knee	<i>p</i> -Value
QOL Domains			
Physical Health	9.09 (2.091)	10.22 (1.085)	0.016
Physiological	8.47 (2.469)	9.65 (0.885)	0.028
Social Relationships	7.00 (3.029)	8.74 (1.287)	0.009
Environment	7.70 (3.337)	9.7 (1.717)	0.008
FIM			
(total score for all sub domains)	94.44 (16.625)	116.13 (7.412)	< 0.0001

Relationship between QOL, Functional Independence and Gender

Females were found to have significantly better QOL and FIM scores ($p < 0.0001$). Both males and females recorded the highest mean scores within the domain of physical health on the QOL outcome measure, 8.43 and 10.04 respectively, and the lowest mean scores within the social relationships domain, 5.09 for males and 9.06 for females (Table 3).

Table 3: Mean (SD) QOL and FIM scores by gender

	Gender		p-Value
	Male	Female	
QOL Domains			
Physical Health	8.43 (2.019)	10.04 (1.596)	< 0.0001
Physiological	7.00 (1.782)	9.98 (1.603)	< 0.0001
Social Relationships	5.09 (1.755)	9.06 (2.127)	< 0.0001
Environment	5.46 (2.593)	10.1 (1.741)	< 0.0001
FIM			
(total score for all sub domains)	86.14 (13.541)	109.62 (13.152)	< 0.0001

Relationship between QOL, Gender and Age

The majority of females in the 43–59-year and the 60–70-year age groups reported high to average QOL respectively ($p < 0.0001$), while the majority of males in the 60–70-year age group and all the males in the 71–86-year age group reported low quality of life. Only females were represented in the 43–59-year age group, of which the majority reported a high quality of life (Tables 4 and 5).

Table 4: Relationship between QOL and age groups of all females

QOL Categories	Age Group (Females)		
	43–59 % (n)	60–70 % (n)	71–86 % (n)
Low	0 (0)	8.7 (2)	100 (1)
Average	35.7 (10)	69.6 (16)	0 (0)
High	64.3 (18)	0 (0)	0 (0)

$p = < 0.0001$

Table 5: Relationship between QOL and age groups of all the males in the study

QOL Categories	Age Group (years)	
	60–70 % (n)	71–86 % (n)
Low	73.7 (14)	100 (16)
Average	10.5 (2)	0 (0)
High	15.8 (3)	0 (0)

$p = 0.086$

Correlation between QOL and Functional Independence Scores

A positive correlation was noted between QOL and functional independence ($r = 0.5999$, $p < 0.0001$).

DISCUSSION

This study explored the effect of the level of amputation, age and gender on the functional independence and QOL of amputees at the St Ann’s Bay Hospital. Overall, there were more female participants than males, a distribution found to be consistent with the worldwide demographics for the prevalence of diabetes in developed countries (1). Females were found to be younger and equally likely to have above or below knee amputations while the males were older and more likely to have below knee amputations. While this study did not look at age of onset of diabetes or the presence of obesity, these factors have been mentioned in the literature as being associated with diabetic complications (3). Many Jamaican females are overweight compared to Jamaican males (19). This is more so with older females, due to factors such as child bearing and lifestyle changes such as becoming more sedentary and experiencing greater life stresses. One could therefore assume that overweight/obesity may play a big part in the early onset of diabetes in the females of this study. Considering that a large percentage of Jamaicans with diabetes are undiagnosed (2), the pathophysiology leading to complications could begin early, unknown to the individual, therefore complications leading to amputations would come at an earlier age.

The amputees with below knee amputations were found to demonstrate significantly higher levels of functional independence and QOL measures compared to those with above knee amputations. This finding is similar to those of other authors (13, 14). Lower level amputees were described in the literature as being less debilitated and more functional than those with higher level amputations. Debilitation relates to feebleness and is not just a factor of physical frailty but also includes the personal perceptions of ability or disability within the context of the physical environment. It is therefore expected that amputees with higher functional ability (the below knee amputees) would better perceive themselves as having a better quality of life, a positive association demonstrated in the moderate positive correlation between functional independence of the amputees and their perceived QOL. One can therefore assume that the below knee amputee, being able to better function in his/her environment, has a higher level of self-concept and a better self-image which translates into a better perception of QOL.

Females were found to have significantly better functional independence and QOL scores despite the fact that more of them had above knee amputation compared to the males. Maybe the fact that the women were generally younger than the males, allowed them to get better outcomes from rehabilitation, and hence achieve a better functional independence with the resultant better QOL. This positive

relationship between youth, amputation, better functional independence and QOL has also been documented in the literature (5–10). A closer look at the domains that produce the summative score for the QOL in this study, showed that females scored almost twice as much as the males in the domains of social relationships and (social) environment. The gender differences between the scores in the other two domains (physical health and physiological) were much smaller, thus demonstrating that the success of the females in this study may lie more in their ability to foster their social/family relationships and to be more comfortable in their (physical) environment. In many cases, women in Jamaica are closer to their children (due to female-headed households) than men and will therefore get better support from adult children. Also, women in Jamaica are generally more active in church and will get further support from the membership. They may also (due to their youth) have been gainfully employed which provided another sphere for social interaction. These social networks can give the women the external motivation to help them to become more functionally independent with a better QOL. Motivation, though not explored in this study, has been documented in the literature as having a strong impact on functional outcomes (7). Thus the person who is highly motivated will more likely demonstrate better levels of functional independence in spite of the physical/physiological difficulties they may face. In addition to being older, it is not surprising that a large percentage of the men in the study considered their QOL to be low. The negative physical and psychological changes in the body related to the ageing process, coupled with a possible diminished social network prior to and after the amputation could possibly explain the results for the males in the study when compared to their female counterparts.

Overall, this study has provided some valuable information about a group of Jamaican amputees. Though the results mirrored those of authors who studied larger populations outside of the Caribbean, it cannot be overlooked that the actual sample on which the data were collected was smaller than the calculated sample size. This carries implications for the power of the study. The results, therefore, should be interpreted and applied with caution.

CONCLUSION AND RECOMMENDATION

Female amputees had amputations at an earlier age than males and were found to better cope and function with lower limb amputations. Generally, below knee amputees were shown to achieved higher levels of functional independence and to demonstrate a better QOL through higher QOL scores. However, these findings are considered exploratory and a

more comprehensive study is recommended, using a larger sample of the population (of amputees). Such studies could explore the impact of obesity, age of onset (of diabetes) and depression, among other relevant factors, on functional independence and QOL in the Jamaican population. The findings could prove useful in structuring rehabilitative efforts to better meet the needs of this group of persons.

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