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Physical Medicine

Diabetes Mellitus and Limb Loss: An Analysis from a Tertiary Care Center

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ABSTRACT

Objective: To compare the frequency and determinants of prosthesis fitting (artificial limbs) in diabetic and non-diabetic amputees at a tertiary care center.

Study Design: Cross Sectional Comparative Study

Place and Duration of Study: This study was conducted at Institute of Physical Medicine and Rehabilitation (IPM&R) at Dow University of Health Sciences, Karachi during Oct 2007- Sep 2010.

Materials and Methods: Data was collected from amputee records files seeking carefor prosthetic fitting. There were 1469 prosthesis fitted in both diabetic and non-diabetics patients. The data from both groups were compared for frequency of amputation in diabetic and non-diabetics. The data was entered and analysis was performed on SPSS windows version 16.

Results: The analysis of data was performed for patients who were provided prosthesis fitting at IPM&R. Diabetic males were 327(73.6 %) female were 117 (26.4 %).About a third of amputees had primary, secondary and tertiary health care services for control of diabetes. About 60 % of all diabetics were not able to seek medical care for control of diabetes. The use of primary, secondary and tertiary health care services to control diabetes were also recorded to correlate with health seeking facilities among diabetics.

Conclusion: The prosthesis fitting was given to one third of diabetic patients after lower limb amputation. The major determinants of diabetic amputees were old age, man un educated, low socioeconomic status. The facilities for primary, secondary and tertiary health care services to control diabetes are available only to one third of diabetic patients. Diabetic control, education of foot care and accessibility to diabetic and prosthesis centre can markedly improve functional integration of diabetic amputees in community.

Key Words: Amputees, Frequency, Determinants, prosthetic fitting, Diabetics, Non diabetics

INTRODUCTION

Globally lower limb Amputation (LLA) as a consequence of diabetes mellitus is becoming an increasingly serious public health problem. According to World Health Organization 10 percent of the world population is suffering from one or the other disability. This includes mental retardation followed by the physical disability.[1] Optimum goal for Prosthetic fitting affects people's ability to walk and participate in daily activities, body`s contour ,quality of life and social activities. Prosthesis provision leads to good quality of life after lower limb amputation due to improvedmobility.[2] Prosthesisare routinely prescribed with different components e.g. prosthetic foot, joints and socket, depending on the level of amputation and their causes.[3] Diabetes has been found to be one of the leading causes of amputation of the lower limbs throughout the world.[4] Among uncontrolled diabetics, one of the most potentially serious complications is neuropathy leading to amputation. Neuropathy leads to complications of the diabetic foot and hospitalization among uncontrolled diabetes. Diabetic amputations are reported to be 15 times more common than non-diabetics.[5] About half of all amputations occur in people who have uncontrolled diabetes. In the United States more than 185,000 new amputations are performed each year. The incidence rate was 46.2 per 100,000 for people with vascular disease, 5.86 per 100,000 for people with secondary trauma and 0.35 per 100,000 for people with bone or joint malignancy.

Several studies have shown that the lower limb amputation incidence rates vary. It ranges from 0.2 per 10,000 total populations for first major amputation in Japan, to 115.7 per 10,000 population aged over 90 years in Sweden. According to the last census the recognized disability population is 2.5 percent in Pakistan (UNICEF). Out of 3.6 million disabled people in the country, about 2 million are physically handicapped, these amputees can be useful citizens of the country if prosthesis (artificial limbs) industry in Pakistan is promoted as the economic impact of amputation is high in low socioeconomic class in our population

A model example can be taken from Germany where 90 percent high technology limbs were invented and mostly manufactured by amputees.[6] Several studies have shown that diabetic amputations caused by neuropathy and circulatory problems could be prevented by good diabetic control. The determinants of advancing age, male gender; poor glycemic control and smoking also increase risk of amputation. The classic traid of peripheral arterial disease, peripheral neuropathy, and infection is the hallmark of the

pathologic event of gangrene leading to amputation, however the causes of amputation were trauma and vascular insufficiency in most of the developed countries.[7]

Analysis of performas at the Institute of physical medicine and rehabilitation (IPM & R) has been performed to develop future strategies for lower limb amputees to achieve optimum mobility after prosthesis fitting. The aim of this study is to compare the frequency and determinants of prosthesis fitting (artificial limbs) in diabetic and non-diabetic amputees at a tertiary care center.

MATERIALS AND METHODS

This was a descriptive analytic study and data was analyzed from lower limb amputees. Data was collected from amputee records files for those who came to Institute of Physical Medicine and Rehabilitation (IPM&R) at Dow University of Health Sciences for prosthetic fitting during Oct 2007- Sep 2010. There were 1469 amputees for prosthesis in both diabetic and non-diabetics. The data from both groups was compared for frequency of amputation in diabetic and non-diabetics. A structured Performa was used to collect data of prosthesis fitting from prosthesis & orthosis outpatients department.

All lower limb amputees reporting at IPM&R were enrolled in the study. The amputees came to institute for prosthesis fitting with major amputations. The amputees included both gender from rural and urban Sindh, Pakistan. Using the standard method of the Global Lower Extremity Amputation Study protocol,(GLEA Study) data was collected from structured Performa . Patient's age, level of amputation and causes of amputation were recorded in the structured Performa developed at IPM&R. A detailed History, general physical and local examination of stump were performed and recorded in structured Performa. Informed consent was taken from all patients pre and post prosthesis counselling sessions were conducted which included prosthesis provision, fitting, donning, doffing, cleaning & gait training.

Frequencies and percentages were computed for gender, age groups, Socio economic status (Middle and lower class), Diabetic and non-diabetic amputees. Mean ±SD were computed for age and monthly income. Chi-square test was used to compare the proportion of age groups, gender, and area of residence, social status and educational levels at 5% level of significance. Stratification was done with respect to gender, age, socio economic status, primary, secondary and tertiary care seeking facilities to see the effect of these on diabetic and non-diabetic amputees.

RESULTS

This study presents an accurate data on trends in prosthesis fitting for diabetes-related and non-Diabetic Lower Extremity Amputations inurban and rural Sindh. The data analyses of 1469 cases was performed on SPSS windows version 16 during period from Oct 2007 and Sep 2010. All patients seeking medical advice for prosthesis fitting were analyzed at IPM&R, Dow University of Health Sciences, Karachi, Pakistan.

Table No.1: Characteristics of prosthetic fitting in lower limb amputees at IPM&R, Karachi (n =1469)

Characteristics of Study population	**Number of Cases**	**%age**
Age *Mean* ±SD = 48.12 ±15.20 Years **Income** Mean(±SD) = 1.25 ± 1.5 US $ per day		
Gender		
Male	1046	71.2
Female	423	28.8
Residential Area		
Urban	661	60.6
Rural	430	39.4
Social Status		
Middle	716	48.7
Lower	753	51.3
Educational Level		
Nil	545	37.1
Primary	924	62.9
Health status Diabetics (Diabetes Mellitus)	444	30.2
Non Diabetics	1025	69.8

Table No.2: Determinants of prosthetic fitting in diabetics and non-diabetics amputees (n= 1469)

Characteristics of Study population	**Diabetics n = 444 No %**	**Non-Diabetics n = 1025 No %**	**P-Values**
Age (Years) 20-50 51-80	 44 (9.9) 400 (90.1)	 477 (46.5) 548 (53.5)	< 0.001
Gender			
Male	327 (73.6)	719(70.1)	0.097
Female	117 (26.4)	306 (29.9)	
Educational Level			
Nil	148 (33.3)	50 (5.8)	0.028
Primary	27 (11.6)	209 (24.4)	
Social Status			
Middle	308 (69.4)	408 (39.8)	< 0.0001
Lower	136 (30.6)	617(60.2)	
Primary care for diabetes control			
Yes	148(33.3)	439 (42.8)	< 0.0001
No	296 (66.7)	586(57.2)	
Secondary care for diabetes control			
Yes	148(33.3)	505(49.3)	< 0.0001
No	296(67.7)	520(50.7)	
Tertiary Care **for diabetes control**			
Yes	145 (32.7)	90 (8.8)	< 0.0001
No	299 (67.3)	935 (91.2)	

The characteristics of amputees have been shown in Table-I. Males were 1046 (71.2%) and females 423 (28.8%). The prosthesis given to diabetic amputees were 444(30.2%) and non-diabetic 1025(69.8%). About more than half of the patients 924(62.9%) had education for five years only. Most amputees were from lower socioeconomic status 753(51.3%) as shown in Table 1.

The prosthesis were mostly given to older age group 51-80 Years (P value=<0.0001) 90.1% with diabetics. Prosthesis fitting was not related to gender (P value=0.097).Diabetic patients from middle socioeconomic status had 308(69.4%) prosthesis after amputation (P value=<0.0001) and rest to low socioeconomic group. Only one third of diabetic amputees were able to seek medical in primary, secondary and tertiary care hospitals for control of their diabetes before amputation (P value=<0.0001) as shown in Table 2. The determinants of prosthetic fitting in diabetic and non-diabetic amputees have been outlined in Fig 1 with optimum success rate in the study population.

DISCUSSION

In this study 1469 prosthesis cases were analysed, the frequency and determinants of prosthesis in diabetic and non-diabetic amputees showed that only one third diabetic amputees were seeking prosthesis(artificial lower limb).Most of the studies in the developed world have shown that the lower limb amputation (LLA) were performed because of peripheral arterial disease due to diabetes.[8, 9,10]

The prevalence rate of prosthesis fitting was higher 19.4 per 1000 for people aged 65 years and older in United States, most studies have shown that the prosthesis given to lower limb amputees were older than 60 years with comorbidities. [11] In this study the age for all cases was Mean ±SD = 48.12 ±15.20 Years. Among diabetics most patients belong to the age group 50-80 years 400(90.1%) compared to non-diabetics 548 (53.5%). Although, gender based seeking behaviour was insignificant but diabetic male patients 327(73.6 %) seek for artificial limb compared to 719(71.1%) non diabetics. This also shows that after amputation only one third of diabetic patients have reported for prosthesis. The analysis for educational level showed that the most diabetic amputees belonged to group who received no education 148 (33.3%) compared to non diabetics 50(5.8%). Most of the finding regarding the characteristics of population have been consistent with the studies conducted both in developed and developing contries.[12, 13] the monthly income of the total population was mean (±SD) = 1.25 ± 1.5 US $ per day. However, diabetic amputees were 308(69.4%) from middle class and 136(30.6%) from lower class compared to non diabetic 408 (40 %)middle class and 617 (60 %) from lower class. [14,15]

Several studies have shown that the advanced age, associated diseases, and vascular complications were the risk factors of lower limb amputation for prosthesis fittings.[16] In this study the prosthesis were given mostly to old age group, males, un educated, middle class and no access toward primary, secondary and tertiary care for diabetes mellitus control[17]

Cavanagh and colleagues determined that foot deformities in diabetic patients with neuropathy accounted for increased plantar pressures causing ulceration leading to limb amputation.[18]. When Peripheral arterial disease (PAD) occurs in early uncontrolled diabetic patients it involves mostly the tibial and peroneal arteries,[19] this study also reported that foot ulceration which were not treated and controlled in time properly lead to gangrene and later amputation among diabetic amputees

The main criterion used to select an appropriate lower-limb prosthesis that corresponds to the patient abilities and needs have not been in practice. Therefore, lower-limb prostheses are usually prescribed based on empirical knowledge and current practice within the resources available in any center of rehabilitation in Pakistan.

Studies have shown that rehabilitation after amputation and functional outcome is dependent on age, duration and control of diabetes, compliance and training of the patients.[20] The success rate also depends on the compliance and acceptance by patients. Physical supports along with psychological counselling have been the factors for prognosis in future.[21]

An increasing age, comorbidities and low compliance were poor prognostic factors for post prosthesis functional level. It has also been shown that the level of amputation in diabetic patient is distal as compared to non-diabetic patients. The incidence of subsequent amputation either of the ipsilateral or contralateral limb rises to 50% or more at 5 years after first amputation in diabetics The prosthesis determinants in this study are dependent on old age, male, low social status, no education and lack of medical access for primary diabetes mellitus control and follow up. The optimum success rate for prosthesis fitting was 67 % in diabetes and 97 % in non-diabetics.

The preventive strategies and education have been the primary goals for most of the diabetes control program reducing the amputations caused by diabetes. Therefore, this study shows that only one third of the patients have access to primary, secondary and tertiary care for their diabetes mellitus. WHO has estimated that 13.9 million people in Pakistan will develop diabetes mellitus till 2030. Pakistan is sitting on a volcano of obesity and diabetes epidemics in future. Amputations can be prevented by optimum diabetes control. This study reflects that frequency and determinants of

amputation are mostly preventable and need action on priority basis.

CONCLUSION

The prosthesis fitting was given to one third of diabetic patients after lower limb amputation. The major determinants of diabetic amputees were old age, man un educated, low socioeconomic status. The facilities for primary, secondary and tertiary health care services to control diabetes are available only to one third of diabetic patients. Diabetic control, education of foot care and accessibility to diabetic and prosthesis centre can markedly improve functional integration of diabetic amputees in community.

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