INTRODUCTION

Lower Extremity Amputation (LEA) is the complete or partial loss of any part of the lower extremities, for any reason. With the development of civilization and increase in burden of diabetes mellitus the incidence of LEA is increasing worldwide. Globally, diabetes accounts for 85% of all amputations in the lower limb, followed by trauma (10 – 74.2%) and tumor (3%). Currently, the estimated prevalence of diabetes mellitus in Pakistan has been 7.6%, therefore, by 20301,2 Pakistan will have the 4th largest diabetic population in the world.3 About 10 – 15% of diabetic patients develop foot ulcers at some stage in life.4 This has been responsible for nearly 50% of hospital admissions as the first step towards LEA.5 Non-traumatic LEA has been more common in developed world.6,7

The Diabetes Prevention Program in the United States, found that the incidence of diabetes was reduced by 58% in people who were following the diet and non-sedentary active lifestyle recommendations.8,9 Several studies have shown the gender, low educational levels (50%), poor socioeconomic class (high in 50%) have been the major significant predictors for LEAs both in diabetic related (DR) and non-diabetic (ND) amputees. In Pakistan, there has been a paucity of data regarding the incidence and determinants of LEA. Therefore, this study was conducted to assess the magnitude and common determinants of LEA for the purpose of development of reduction and/or primary prevention strategies at institutional levels with local resources.

The objectives of the study were to determine the most common and significant determinants of amputations among diabetic and non-diabetics.

METHODOLOGY

One thousand and ninety one patients were retrospectively studied with respect to demographic variables, co-morbidity, complications and outcomes in diabetic and non-diabetics. This retrospective data analysis was conducted at the Institute of Physical Medicine and Rehabilitation (IPM&R) at Dow University of Health Sciences, Karachi. All amputees reporting at IPM&R were enrolled from January 2007 to December 2010. The amputees came to our institute for prosthesis fitting with major amputations. The amputees included both the genders from all over Pakistan. Using the standard method of the Global Lower Extremity Amputation Study protocol, (GLEA Study) data was collected from charts. Patient's age, level of amputation,
stump complications and cause of amputation were recorded in the structured proforma. Prosthetic and orthotic assessment forms were developed at IPM&R. After a detailed history, general physical and local examination of stump was performed and recorded in the assessment forms. Informed consent were taken from all the patients and postprosthesis counselling sessions were conducted which included prosthesis provision, fitting, donning, doffing, cleaning and gait training. The frequency and determinants were recorded to compare diabetic and non-diabetic amputees. Data was analysed in SPSS windows version 16.

Frequencies and percentages were computed for gender, age group, socioeconomic status (i.e. upper, middle and lower class), amputees in DR and ND groups and levels of amputations. Mean ±SD was computed for age and monthly income. Chi-square test was applied 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 and socioeconomic status to see the effect of these on outcomes.

RESULTS

A total of 1091 subjects were assessed at IPM&R, Dow University of Health Sciences, Karachi. The characteristics amputees have been shown in Table I. Above knee amputation in diabetic amputees were 60 (25.8%) while below knee amputations in diabetic were 168 (72.1%). The complete distribution of level of amputees is presented in Table II.

The association between gender and diabetic status was significant (p = 0.021). Mean age of diabetic ampu-

Table I: Characteristics of total study population of amputees at IPM and R, Karachi (n = 1091).

<table>
<thead>
<tr>
<th>Characteristics of study population</th>
<th>Number of cases</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age: Mean (±SD) = 37.7 ± 16.4 years</td>
<td>847</td>
<td>77.6%</td>
</tr>
<tr>
<td>Income: Mean (±SD) = 1.25 ± 1.5 US$ per day</td>
<td>244</td>
<td>22.4%</td>
</tr>
</tbody>
</table>

| Gender | Male | 661 | 60.6% |
|        | Female | 430 | 39.4% |

| Social status | Upper | 628 | 57.6% |
|               | Middle | 263 | 24.1% |
|               | Lower | 200 | 18.3% |

| Educational level | Nil | 246 | 22.5% |
|                  | Primary | 236 | 21.6% |
|                  | Others | 609 | 55.8% |

| Diabetic status | Diabetics (diabetes mellitus) | 233 | 21.4% |
|                | Non-diabetics | 858 | 78.6% |

The association between age and diabetic status was significant (p = 0.001). Mean ±SD of diabetic and non-diabetic amputees were 49.6 ± 15.2 and 26.6 ± 17.9 years respectively. Area of residence (Karachi and outside Karachi) was not associated with diabetic status (p = 0.326) while socioeconomic status and educational levels were significantly associated with (p < 0.001) as shown in Table III.

DISCUSSION

The authors present data on trends in diabetes-related (DR) and non-diabetic LEA in an urban area of Karachi and rural Sindh during January 2007 and December 2010.

Pakistan, being a developing low resource country, has high incidence of amputation in diabetics and non-diabetics. The services offered at IPM&R included multidisciplinary approach with the strategies for prevention of progressive complications in LEA. This is particularly important in diabetes mellitus because of vascular, neurological and subsequent skin ulceration problems. Preparation for prosthesis, fitting and rehabilitation to become an active citizen is a time-consuming and expensive process which requires considerable expertise above standards in clinical care particularly in a developing country.
It has been observed that approximately 15% of all diabetics will develop foot ulcers during the course of disease. Ultimately 20 – 40% of patients with diabetic foot will require amputation. There is an increase in diabetes mellitus population which may need amputation of lower limbs in future because of suboptimal healthcare in Pakistan. The Mean ±SD age of diabetic amputees in this study was 49.6 ± 15.2 and 26.6 ± 1.79. Surahio showed that 75% patients are more than 60 years of age and 65% are men. The rise in male amputees in future will add to double burden for healthcare provision with permanent disabilities nationwide in future. The number increases as population age increases. Diabetics were 5 times more likely to have multiple operations and 46 times more likely a lower extremity amputation than non-diabetics. However, the frequency in this study showed 20 times more amputation in diabetics compared to non-diabetics. Diabetes-related lower extremity amputation rate was 80.1/10,000 and for non-diabetes-related 1.6/10,000. This study showed 20/10,000 amputations in diabetics. However, this could be due to lack of awareness of prosthetic services, delay in reaching diagnosis and achieving prosthetic services by an institution. The co-morbidities in diabetic amputees have higher prevalence of non-palpable pulses, nephropathy, neuropathy, and osteomyelitis as compared with non-diabetic amputees. This study has shown common co-morbidities as cardiac disease (29%), neuropathy (48.5%), osteomyelitis (54%) and skin problems (66%). A significant improvement has been observed in care for patients with diabetic foot disease as a result of better organized diabetes care in developed world. Therefore, this study suggests that an organized diabetic care services for prevention of diabetic foot is needed on priority basis. Diabetics tended to have more distal amputations but primary healing was lower than that of non-diabetics. Mostly, the medical management of patients with severe peripheral vascular disease has been sub-optimal and led to an amputation. This study also suggest that peripheral vascular signs assessment should be determined at an earlier stage during the care of diabetes mellitus to avoid amputations in diabetics. Studies have shown no differences between diabetics and non-diabetics concerning age, lower leg/thigh amputations, postoperative healing, rehabilitation using prosthesis or subsequent amputation of the second leg. However, this study has limitations for second amputation as IPM&R has been established 3 years ago and secondary amputations have not been reported till today. Shera et al., in a community based survey in 2010 reported that the prevalence of diabetes was 12.14% in males and 9.83% in females. Overall total glucose intolerance (diabetes and IGT) was present in 16.68% males and 19.37% females. Central obesity, hypertension and positive family history were strongly associated with diabetes. In this study, the lower limb amputees with diabetes were 233 (21.4%) compared to non-diabetics 858 (78.6%). Borssen study showed that there were 145 (80.1%) lower extremity amputations in the rural and urban areas among diabetics which is preventable. The risk of a person with diabetes undergoing LEA went from being 46 times that of a person without diabetes to 7.7. Therefore, this success story showed that reductions in frequency of amputees in diabetics need a holistic approach towards organized diabetes care. The major amputees belonged to non-diabetics 858 (78.6%) in which trauma (road traffic accidents and other injuries) were prevailing. These preventable risk factors require a holistic approach in future to reduce amputation and health economic burden on nation. Iranian National Trauma Project identified patients with lower extremity traumas undergoing amputation. They found occupational accidents (63.4%). The most common reasons for amputation were stabbings (37.8%) and crush injuries (31.7%) respectively. Primary care services for road traffic accidents, earthquake and flood affectees require an immediate assessment for risk of amputations in cases of multiple bone injuries in lower limbs. The preventable determinants for non-diabetics have been male gender, low social status and educational levels. In Cuba, a model of predicting short-term major lower-limb amputation (SMLA) was used to screen patients. Since Pakistan has been facing double burden of disease, therefore, in an urban population there have been a reduction in the rate of diabetic foot. The decline in diabetic LLA also reflects better care of the diabetic foot. This study has identified other predictors of amputations were type of lesion, (infections and ischaemia), initial diagnosis of phlebolymphopathies, acute arterial insufficiency, chronic arterial insufficiency. The International Diabetes Federation has also declared “Understand Diabetes” as theme for the years 2009 - 2013. There is a need for reduction in the risk factors by counselling, changing lifestyle, good glycemic control, following good foot care instructions along with routine checkup of pedal pulses and sensation by Semmes Weinstein Mono-filament for diabetics. These preventive strategies can be utilized for non-diabetics’ assessment for risk of amputations in multiple compound bone injuries at primary care levels after trauma. As the incidence of diabetes continues to raise, the burden of diabetic micro-vascular complications will increase in future, hence, there is need for an...
early detection of micro-vascular complications. The progression of complications in diabetics and non-diabetics including trauma, bone tumours and congenital abnormalities has been rising because of increased awareness in clinical and diagnostic abilities in the tertiary care institute and availability of trained healthcare professionals.22

These analytical chart analysis, despite having limitations for a developing country with limited data on health economics, a lack of continuous longitudinal data on LEAs, have identified frequency and associated risk factors of both diabetic and non-diabetic amputees.

CONCLUSION

This study has identified that most common and significant predictors were gender, low social status and educational levels. Other significant predictors of amputation identified were type of lesion, (infections and ischaemia), initial diagnosis acute/chronic arterial insufficiency and diabetic foot.

REFERENCES