DETERMINANTS OF LOWER LIMB AMPUTATIONS IN DIABETICS IN SURGICAL DEPARTMENT OF MAYO HOSPITAL, LAHORE

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Abstract:

Diabetes is a major cause of lower limb amputations in Pakistan .In this research paper we held a cross sectional study to establish the major determinants of lower limb amputations in the diabetics admitted in surgical wards of MAYO Hospital. A sample of 60 patients (n=60) was taken by simple random technique following the inclusion criteria that the patient has diagnosed diabetes mellitus and has undergone non traumatic lower limb amputation. The determinants that we studied were neuropathy, vasculopathy, blood sugar levels, foot injury(GRADE OF foot injury), gangrene(wet or dry). The data was collected with the help of a pretested questionnaire. We found out a strong relationship between vasculopathy(93%) , neuropathy(75%), foot injury(75%), wet gangrene(78%), and poor glycemic control(high blood sugar level) (41%).

Conclusion: Vasculopathy, neuropathy ,foot injury ,wet gangrene, poor glycemic control are major determinants of lower limb amputations in diabetics

Keywords:*Diabetes. Lower limb amputation. Vasculapathy. Neuropathy. Foot injury. Poor glycemic control*

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INTRODUCTION:

WHO defines diabetes as a metabolic disorder of multiple etiology characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both [1].It can lead to multiple complications such as cardiovascular diseases, retinopathy, nephropathy, neuropathy, and diabetic foot [2]. Problems of the foot are the most frequent cause for hospitalization amongst patients who have diabetes and if left untreated, this can lead to lower limb amputation [2]. Globally, diabetes accounts for 85% of all amputations in the lower limb [3]. In 1991 American Diabetic Association conducted a study this prospective study showed that peripheral sensory neuropathy, PVD, foot ulcers (particularly if they appear on the same side as the eventual former amputation, and treatment with insulin are independent risk factors for LEA in patients with diabetes [4]. it is estimated that approximately 15% of the people with diabetes world-wide will at some stage develop diabetic foot ulceration. The prevalence of active foot ulceration varies from approximately 1% in certain European and North American studies to more than 11% in reports from some African countries[5]. . American diabetes association 's 7-year follow-up study held in 1995 gives strong evidence that poor glycemic control is an important predictor of amputation in patients with NIDDM in addition to clinically detectable peripheral arterial disease and peripheral neuropathy[6].In July 1999,according to American diabetes Association, certain foot deformities, reduced skin oxygenation and foot perfusion, poor vision, greater body mass, and both sensory and autonomic neuropathy independently influence foot ulcer risk, thereby providing support for a multifactorial etiology for diabetic foot ulceration[7].According to American Diabetes Association, the study held in 1998 showed that Presence of diabetic nephropathy further increases this risk [8]. The risk factors and incidence of lower limb amputation have been studied for the developed countries but not for developing countries like Pakistan [9], where it is estimated by 2030, Pakistan will rank as 4th in countries with highest prevalence of diabetes mellitus. [3] In Pakistan, 7.1 million people suffer from diabetes mellitus[3] and amongst people who have diabetes, amputations are reported to be 15 times more common than amongst other people.[2].A research carried out in civil hospital, Karachi showed that in cases of amputation, complications of diabetes was the indication of amputation in54.7% of subjects[10].

Our study aims at establishing the frequency and determinants for lower limb amputations in Mayo hospital, Lahore which is the oldest and largest hospital of Pakistan [11], hence giving an insight into the leading cause of lower limb amputation and its associated factors, in a third world country as Pakistan so as to provide knowledge and awareness, with future prospects of preventing lower limb amputation and salvaging the lower extremity in diabetics. This research will help us in establishing the relationship between LLA and its risk factors like the extent of diabetes control, its vascular and neurologic complications, and the socioeconomic status of the patients. With these statistics, we may be able to address the problem more effectively by alleviating the risk factors through modifications in health care facilities and lifestyle [12]

Hypothesis

Foot injury, ulcers, increased blood sugar level, non-compliance towards insulin and anti-diabetic drugs and neuropathy and vasculopathy increase the incidence of lower limb amputations in diabetics.

OPERATIONAL DEFINITION:

Determinants:

A factor/cause which decisively affects the nature or outcome of Lower limb amputation in diabetics.

Diabetic:

According to WHO recommendation, diabetes would be confirmed in patients having two random glucose measurements greater than 200 mg/dl and fasting blood glucose greater than 140 mg/dl

Lower limb amputation:

Surgical removal of part or whole of lower limb.

Neuropathy

Diabetic neuropathy is a descriptive term meaning a demonstrable disorder either clinically evident or sub clinically that occurs in setting of Diabetes mellitus, without other causes of peripheral neuropathy which will be measured by clinical symptoms such as burning pain and tingling, numbness itching and loss of sensation to pain

Foot Injury

Grade 0 pre or post ulcerative site that has healed
Grade 1 superficial wound through epidermis and dermis that did not penetrate tendon, capsule or bone.
Grade 2 Wound that penetrates into tendon or capsule.
Grade 3 Wound that penetrates into bone or joint.

Infection

Infection will be measured as presence of warmth, edema, and loss of function or pus discharge.

Increased Blood sugar level

A blood sugar level , that has been measured by a glucometer to be above than 140 mg/dl in fasting state and to be greater than 200mg/dl in random state

Vasculopathy

Diabetic vasculopathy is descriptive term meaning a demonstrable disorder either evident clinically or sub clinically that occurs in the setting of diabetes mellitus without other causes peripheral vasculopathy which will be measured by clinical symptoms such as loss of pulses (femoral ,posterior tibial,dorsalispedis) ,colour change, pallor,capillary refilling time

MATERIAL AND METHODS:

Study design:
 Prospective cross-sectional study.

Setting:
 Surgical department, Mayo Hospital, Lahore

Duration of study:
April 2015- June 2015

Sample size:
60

Sampling technique:
 Simple Random technique

Sample selection:

Inclusion Criteria: Patients who have been diagnosed with diabetes mellitus ,who may or may not have been taking medication and have undergone lower limb amputation

Exclusion Criteria: Patients undergoing traumatic LLA
Non co operative patients

Data collection tool:
Pretested questionnaire

DATA COLLECTION PROCEDURE:

All the consenting patients meeting the inclusion criteria will be approached by the research team members and a pre-tested questionnaire will be filled by the members via face-to-face method. The data collected through these questionnaires will be subjected to analysis by SPSS 2.0 and the major determinants will be tabulated.

DATA ANALYSIS
SPSS 2.0

PROPOSED SCHEDULE:

Phase	WORK	Duration
First	Synopsis approval	initial
Second	Data collection	One month
Third	Data entry in spss and analysis	One month
Fourth	Thesis writing and submission	One month

OUTCOME AND UTILIZATION
TO find out determinants of lower limb amputations in diabetics admitted   in the surgical department of Mayo Hospital Lahore

NAME		MARITAL STATUS	
AGE		RELIGION	
SEX		OCCUPATION	
OCCUPATION		CONTACT NO	
RESIDENCE		EDUCATION	
NUMBER OF AMPUTATION			
SITE OF AMPUTATION			
DATE OF AMPUTATION			
DURATION			
AVERAGE BLOOD SUGAR	FASTING		
	RANDOM		
	YES		NO

INSULIN USE	REGIMEN				
	COMPLIANCE	GOOD		POOR	
ANTI-DIABETIC DRUGS USE	YES			NO	
	COMPLIANCE	POOR		GOOD	

AMPUTATUION

DIABETES MELLITUS

YES		NO		SPECIFY	

CO-MORBIDITY

FOOT INJURY (IF YES)

GRADE	0	1	2	3
TYPE OF INJURY	ABRASION		LACERATION	INCISION
INFECTION	YES		NO	

SMOKING

YES	NO

VASCULOPATHY

LOSS OF PULSE	FEMORAL ARTERY		POSTERIOR TIBIAL ARTERY		DORSALIS PEDIS ARTERY	
	YES	NO	YES	NO	YES	NO
COLOR CHANGE	YES(SPECIFY)			NO		
PALLOR	YES			NO		
CAPILLARY REFILLING TIME	MORE THAN 2 SECONDS			LESS THAN 2 SECONDS		

NEUROPATHY

BURNING PAIN	YES	NO
TINGLING	YES	NO
ITCHING	YES	NO
NUMBNESS	YES	NO
LOSS OF RESPONSE TO PAINFUL STIMULUS	YES	NO

GANGRENE(IF PRESENT)

DRY		WET	

RESULT: AMONG diabetics who underwent lower limb amputation (n=60) majority of them were males and

the age group was between 50 to 60 years .AFTER describing the demographic characteristics using frequency tables, simple and multivariate regression logistic regression was applied

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age of subject	60	26	80	55.77	13.280
Duration since diabetes	60	1	25	8.30	6.035
Valid N (listwise)	60				

Frequency Table

Site of amputation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Toe/Toes	19	31.7	31.7	31.7
	Foot	8	13.3	13.3	45.0
	Below knee	27	45.0	45.0	90.0
	Above knee	6	10.0	10.0	100.0
	Total	60	100.0	100.0	

Number of amputations					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	51	85.0	85.0	85.0
	2	8	13.3	13.3	98.3
	3	1	1.7	1.7	100.0
	Total	60	100.0	100.0	

Average Blood Sugar Fasting					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 100	13	21.7	21.7	21.7
	100-150	33	55.0	55.0	76.7
	151-200	11	18.3	18.3	95.0
	201-250	2	3.3	3.3	98.3
	251-300	1	1.7	1.7	100.0
	Total	60	100.0	100.0	

Random Blood Sugar level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100-150	9	15.0	15.0	15.0

		Frequency	Percent	Valid Percent	Cumulative Percent
	151-200	16	26.7	26.7	41.7
	201-250	25	41.7	41.7	83.3
	251-300	7	11.7	11.7	95.0
	300-350	2	3.3	3.3	98.3
	351-400	1	1.7	1.7	100.0
	Total	60	100.0	100.0	

Insulin use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	31	51.7	51.7	51.7
	Yes	29	48.3	48.3	100.0
	Total	60	100.0	100.0	

Compliance for insulin

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	12	20.0	40.0	40.0
	Good	18	30.0	60.0	100.0
	Total	30	50.0	100.0	
Missing	System	30	50.0		
Total		60	100.0		

Anti Diabetic Drugs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	16	26.7	26.7	26.7
	Yes	44	73.3	73.3	100.0
	Total	60	100.0	100.0	

Compliance for Anti Diabetics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Poor	34	56.7	75.6	75.6
	Good	11	18.3	24.4	100.0
	Total	45	75.0	100.0	
Missing	System	15	25.0		
Total		60	100.0		

Co-Morbidity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	37	61.7	61.7	61.7

	Yes	23	38.3	38.3	100.0
	Total	60	100.0	100.0	

Foot Injury

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	15	25.0	25.0	25.0
	yes	45	75.0	75.0	100.0
	Total	60	100.0	100.0	

Infection of foot

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	18	30.0	30.0	30.0
	Yes	42	70.0	70.0	100.0
	Total	60	100.0	100.0	

Smoking

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	31	51.7	51.7	51.7
	Yes	29	48.3	48.3	100.0
	Total	60	100.0	100.0	

Vasculopathy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	4	6.7	6.7	6.7
	Yes	56	93.3	93.3	100.0
	Total	60	100.0	100.0	

Neuropathy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	15	25.0	25.0	25.0
	Yes	45	75.0	75.0	100.0
	Total	60	100.0	100.0	

Gangrene in foot

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	13	21.7	21.7	21.7
	Yes	47	78.3	78.3	100.0
	Total	60	100.0	100.0	

Dry or wet gangrene					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Dry	16	26.7	34.0	34.0
	Wet	31	51.7	66.0	100.0
	Total	47	78.3	100.0	
Missing	System	13	21.7		
Total		60	100.0		

DISCUSSION:

Problems of foot are the most frequent cause of hospitalization among patients who have diabetes and leads to LLA.The determinants of LLA in diabetics are variable and vary with age and DURATION OF DIABETES.this study attempts to analyze the major determinants of limb amputations in diabetics.We studied 5 major factors which were associated with the risk of amputations in the previously published studies. Our study indicated that foot ulceration caused by the injury to foot and subsequent infections is connected to amputations in diabetics.Almost 75% of the patients had foot injury and 70% showed superimposed infection resulting in gangrene (wet gangrene) in 78% of the studied cases.This was supported by research conducted by J.M.boulton[5]and American Diabetic association [6] and diabetes.co.uk [9].All the aboved mentioned studies showed foot ulceration to be a major villain in lower limb amputations.

In our study Peripheral arterial disease resulting in vasculopathy was a major risk factor indicated by the presence of its signs in 93% of the given cases, as they cause poor perfusion of foot resulting in ischemic gangrene .This was supported by research conducted by American Diabetics Association [6] [7].

Peripheral sensory neuropathy is another risk factor for LLA recorded in 75% of the diabetics undergoing limb amputations which was supported by research of American Diabetics Association [6].Poor glycemic control is a common risk factor in LLA patients having diabetes as 55% of the patients had fasting BSL(Blood Sugar Level) in the range (100-150mg/dL) and 41.7% had random BSL in range of (202-250mg/dL) and 51.7% used no insulin to control BSL, all indicating poor glycemic control as the culprit which was supported by the studies of American Diabetese association[6][7].

However, other factors which we studied having predilection towards LLA such as smoking,co morbid conditions weren't suppored by other studies .Our study indicated that 48% were smokers and 51% were non smokers and 38% has associated comorbidity while 61% has no associated comorbidity.

ANOTHER determinant that we studied was glycemic control and whether the diabetics were taking insulin or antidiabetics ,moreover our study also indicates compliance of patients towards insulin and antidiabetics.41 % patients had poor glycemic control(random blood glucose levels 201-250mg /dl) 51% of the patients were taking insulin among which 20% had poor compliance while 48% were not taking insulin.

73% were taking antidiabetics among which 56 % have poor compliance while 26% were not taking antidiabetic.

CONCLUSION:

Lower limb amputation in diabetics is strongly associated with foot ulceration,vasculopathy by peripheral areterial diseases , peripheral sensory neuropathy, poor glycemic control.

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