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RESEARCH ARTICLE

CURRENT TRENDS OF DIABETIC FOOT SURGERY IN GENERAL HOSPITAL OF KSA: ARE WE DOING ENOUGH TO AVOID AMPUTATION?

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Abstract

In Saudi Arabia Diabetes Mellitus (DM) is one of the growing health problems. As the population increasing with changes in pattern of lifestyle, more people in the region exposed to diabetes and its complications. This study aimed to evaluate a pattern of diabetic foot presentation, investigations, treatment and complications in the respective population of Al Kharj Governorate and the cosmopolitan area, which was seeking medical attention from medium sized general hospital facilities. Out of 81 patients included in this study, 49% had amputation of the lower extremity at different levels because of such complications. Patient's characteristics and multiple parameters obtained for the data, both demographics and investigations, were analysed for statistical significance. This study highlighted necessity to develop specialised diabetic centres or units within hospitals in order to minimise morbidity and mortality from diabetic foot complications.

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Introduction:-

Currently diabetes mellitus (DM) is one of major problems not only in endocrinology, but also has a big socio-economic impact on modern society. The number of patients suffering from this condition and its complications in the world is doubling every 10-15 years (1, 2). Apart from development of retinopathy, nephropathy, and diabetic induced atherosclerotic changes in the arterial tree, critical ischemia with gangrenous changes of distal lower limb has occurred as a result of micro-angiopathy and neuropathy(3). Usually the attention of the surgeons first is attracted by fast development of necrotizing processes in distal foot associated with virulent infection, which leads to amputations and therefore high morbidity and mortality. Among some major reasons for the development of these complications are delayed detection of DM, the aggressiveness of the disease, lack of dynamic self-assessment, and poorly controlled hyperglycemia(1, 4, 5). Because of the critical ischemia leading to gangrene of the lower extremity, more than 200,000 high amputations performed annually in the world. According to the World Health Organization data, from 45% to 70% of non-traumatic amputations of the lower extremity are made for patients with Diabetes Mellitus (4-6). The aim of this study was to identify the current trends of investigation and treatment of the diabetic foot patients, presented with complications leading to surgical interventions such as amputations in particular. The reasons of the complications, which lead to amputations, were also investigated and attempt was made to highlight the ways to minimize the rate of amputations in diabetic patients.

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Material and methods:-

The design of this retrospective study was based on data obtained from the Department of Surgery at King Khaled Hospital (KKH), which is the teaching hospital for public admissions in Al Kharj Governorate of Saudi Arabia with population over 650,000 people. Medical records of 81 patients, admitted from 2010 to 2015 inclusive, with diabetic foot wounds, which received surgical treatment as emergency or elective cases were reviewed.

All patients were presented with various clinical features from infected ulcers to necrotizing wounds and gangrene at level of toes, mid foot and below knee. Criterion for inclusion in the study was any patient admitted with diabetic foot ulcer and ended up with debridement or amputation. The patients were divided in male and female groups. The factors like age, duration of current diabetic status, patients body mass index (BMI), level of patient education and awareness, diabetes control, co-morbidities associated with diabetes, were documented in database and analyzed.

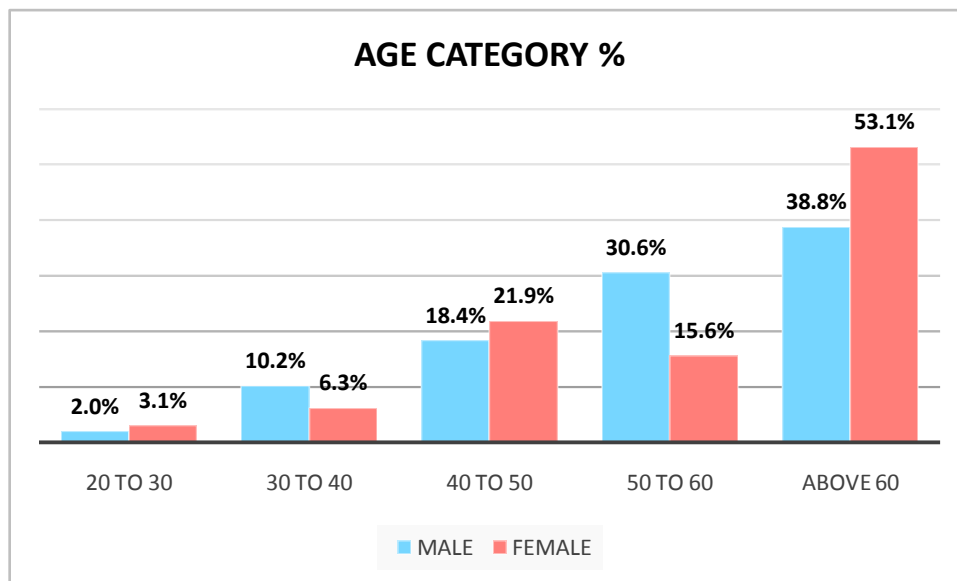
The surgical management of diabetic foot wounds included debridement or different level of amputation depending of the status of the wound. An objective investigation of the peripheral arterial blood supply was done by Doppler vascular study on 65 affected legs.

The SPSS version 23 (Statistical Package for the Social Sciences) and Excel for Mac 2016 computer software programs were used to analyse data in this study. Mean and standard deviation were calculated and applied for comparison analysis from the data, and the T-test utilised to compare the means within groups, where $p < 0.05$ considered as statistically significant.

Results:-

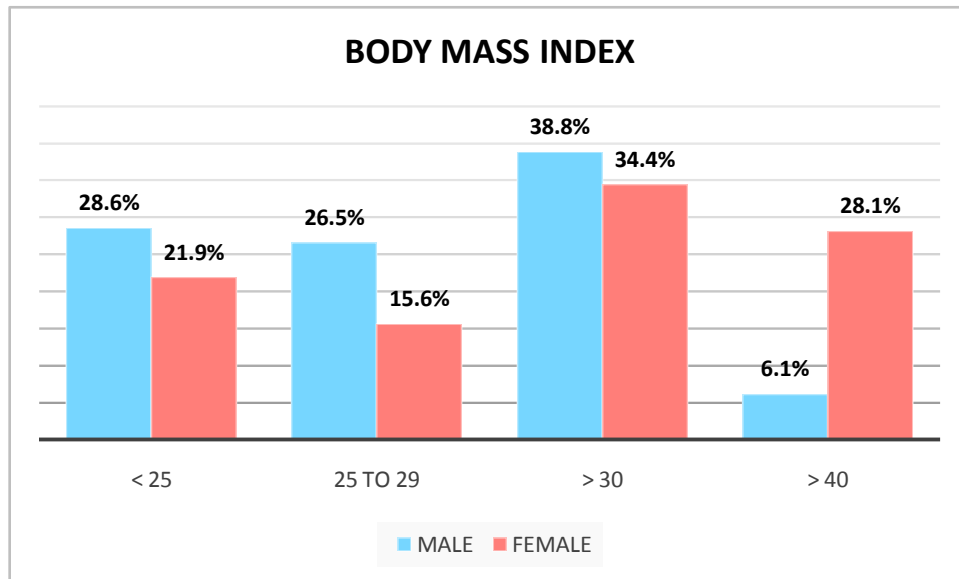
The data for 81 patients in total were analysed including 49 males and 32 females (60.5% and 39.5% respectively). The males mean age was 57.3 +/- 13.2, while for females mean age was 59.3 +/- 12.5. All patients were also discriminated by age groups as shown in Graph 1.

Graph.1



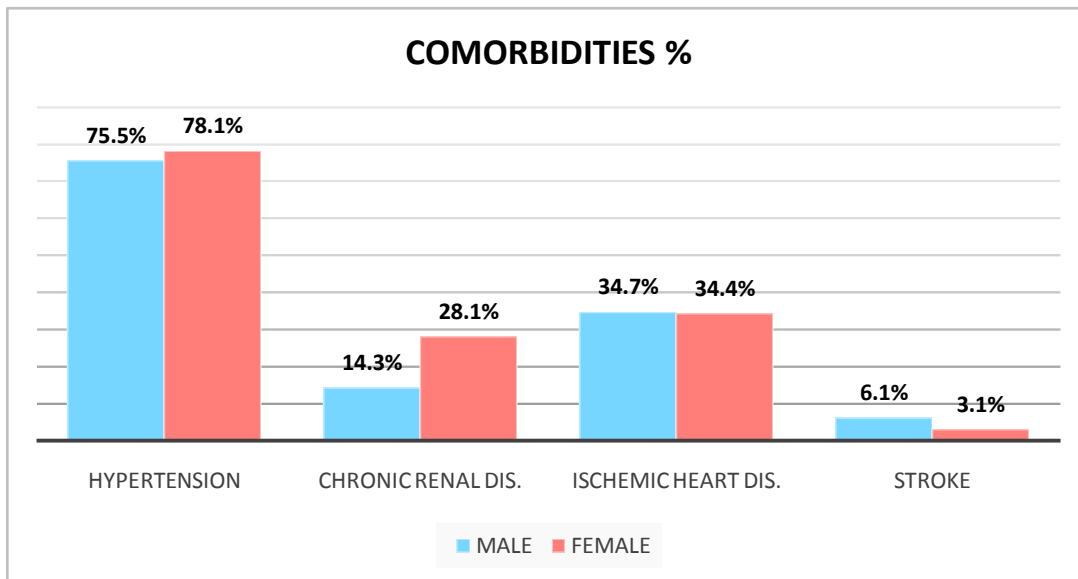
Among all the patients, Saudi were 64 of 81 (79 %), where males 35 (43.2%) and females 29 (35.8%) respectively and non-Saudi were 17 of 81 (21%) with males 14 and females 3 (17.2% and 3.7%) respectively. The mean duration of diabetes was 17 +/- 5.7 years. 25 out of 81 patients (30.9%) were insulin dependent, while the rest 69.1% were on hypoglycaemic agent's therapy. However, 68 (83.9%) patients had their diabetes not controlled, according to the random blood glucose level taken upon the patients' presentation to the hospital. Body mass index for all patients with gender and age discrimination was calculated as shown in Graph 2.

Graph 2



The analysis of the patients’ education has shown that no one had a higher education. However, 49 patients (60.4%) had low education and 32 (39.6%) had medium education respectively. All the patients had little knowledge or awareness of diabetes and its complications. Patient’s co-morbidities related to the diabetic complication shown in Graph 3. Complications like peripheral neuropathy and diabetic angiopathy were present in all patients included in the study.

Graph 3



From all 81 patients, social history of cigarette smoking was accounted in 51 (63%). However, we could not have identified from the medical records available the severity and duration of smoking characteristics, which may contribute to the development of diabetic foot with complications. 65 patients (80.2%) had a vascular Doppler study for investigation of peripheral arterial circulation when the clinical evaluation was inadequate. These studies demonstrated that peripheral arteries at different levels on the side of the affected leg were occluded in 35 (43.2%) patients. The breakdown of Doppler investigations presented in the Table1.

Table 1

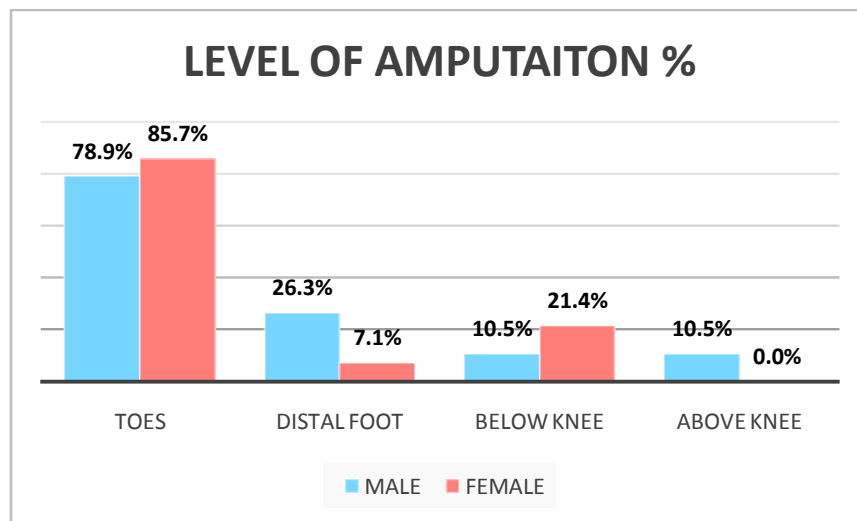
DOPPLER FINDINGS				
PERIPHERAL ARTERY	TRIPHASIC	BIPHASIC	MONOPHASIC	OCCLUDED
common femoral artery	81.5%	16.9%	0.0%	1.5%
superficial femoral artery	76.9%	20.0%	1.5%	1.5%
popliteal artery	58.5%	32.3%	4.6%	4.6%
anterior tibial artery	18.5%	50.8%	21.5%	9.2%
posterior tibial artery	16.9%	46.2%	27.7%	9.2%
dorsal pedal artery	0.0%	40.0%	32.3%	27.7%

All surgical interventions for patients care were divided in two categories: debridement of necrotic tissues or amputations at different levels. 41 (50.6%) of patients had ulcers and necrotic tissue debridement and 40 (49.4%) patients had amputations. Among them 16 patients had previous amputations of the contra-lateral side. The breakdown of surgical interventions presented in Table 2 and the level of amputations shown in Graph 4.

Table 2

Surgical Interventions				
	MALE	%	FEMALE	%
DEBRIDEMENT	30	61.2%	18	56.3%
AMPUTATION	19	38.8%	14	43.8%
TOTAL	49	100.0%	32	100.0%

Graph. 4



Our results demonstrated that patients with uncontrolled DM had a significantly higher number of amputations compared to patients who had their DM controlled ($p < 0.05$). However, there was no statistically significant difference seen when the BMI factor compared to the number of amputations ($p = 0.99$) in all groups.

The mean duration of the hospital stay was 21.44 +/- 17.7 days. The periods of hospital stay also subdivided due to the severity of presentation and necessity to manage co-morbidities as shown in the Table 3.

Table 3

HOSPITAL STAY				
Days	MALE	PERCENTAGE	FEMALE	PERCENTAGE
1- 5	26	53.1%	15	46.9%
6-10	10	20.4%	9	28.1%
11-20	10	20.4%	5	15.6%
21-30 <	3	6.1%	3	9.4%

Discussion:-

In the last decade, several studies of diabetic foot complications leading to limb amputation in DM patients have been reported. So called "diabetic foot" is the most common complication of uncontrolled DM due to diabetic angiopathy and neuropathy, which can be presented in forms of cellulitis, superficial and deep ulceration, development of partial tissue necrosis and gangrene.

Diabetic foot sepsis in DM patients is a common complication frequently presenting with gangrene, which require minor or major amputations at different levels and have high incidence (7). In this study, the mean age was 57.3 +/- 13.2 in males and 59 +/- 12.5 in females, which presents the younger age group compare to other western studies (1, 2). This can be explained by various factors including diet habits, the pattern of life style and lack of exercise, which varies from community to community and popularization by the media. Saudi Arabia accommodates more than 6 million expatriates, who represent about 40% of the Saudi population. This reflected in our study, which shown that, 43% of patients, included in this study, were Non-Saudi.

As a rule, diabetic complications of the foot leading to amputations at various levels related to multiple factors, such as, infection, neuropathy and peripheral vascular disease. 80.2% of patients included in this research had advanced peripheral arterial diseases playing a critical role in the course of diabetic foot complications and the fate of leg. Most amputations could be prevented by basic diabetic foot care and screening programs, which aim to identify diabetic foot complications at earlier stages of development. Many studies report about proactive population education and early identification of risk factors in diabetes affected patients, as well as appropriate foot care in order to prevent amputations and related disabilities (3-5). In addition, specialized investigations, including detailed vascular assessment are needed for assessment of the possibility of reconstructive vascular procedures.

Diabetic foot complications remain common reason for hospital admissions and have high impact on the cost of hospital care in Saudi Arabia (8). Apart from the large financial and economic burden on the Saudi Health system, lower limb amputations bring disability, suffering and earlier mortality in local communities. It has been highlighted previously that, one of the reasons for delayed presentation of the patients with a complicated diabetic foot is the fear of amputation. There are certain religious believes that any part of their body should not be lost despite of risk of death (9). Our study pointed out that, the lack of diabetic foot educational and screening programs in Al Kharj area are major contributing factors, leading to diabetic foot complication and amputation at relatively younger ages. Our finding also supported by the Oklahoma Indian Diabetes Study, where risk factors leading to amputation, such as: duration of diabetes, poorly controlled blood glucose level, the presence of hypertension, the long period of smoking, low education and prolong use of insulin, were found significant (10).

Amputations at different levels as the only option of treatment and general sepsis prevention occurred in 49% of patients. This study shown that, the rate of amputation was mostly correlated with duration of diabetes. There were no differences observed in relation between amputations and gender, age of patients or BMI factors. Prevention of amputations in diabetic patients seems to be logic approach in management. Excluding or minimising the known risk factors by tight control of blood sugar level can achieve this. However, importance to use insulin for better sugar control, when oral hypoglycaemic drugs fail, should be stressed out by general practice physicians in local communities, who perform regular check-up of diabetic patients. Early detection of vascular and neurological deficits at foot level, cessation of smoking, appropriate foot care under general or family physicians control can contribute to prevention of infection and ulceration (3).

The lack of standard protocols in management of diabetic foot leads to the discrepancy in the number of amputations among different practices and depends not only on the available facilities, but also on the appropriately trained specialist and multidisciplinary approach. This approach includes specialists from endocrine medicine, vascular surgery, infectious disease and diabetic educators, who must be involved in management of these patients from the time of admission. In most modern tertiary hospitals, where the vascular surgery unit included as part of surgical services, the diabetic foot patients managed directly by vascular surgeons, were full vascular work up starts with admission. The common understanding of surgical care in general country hospitals is that general surgeons should manage the patients with diabetic foot for debridement and wound care. In cases of absent palpable pulses, the vascular surgery team may not be available for proper patient's evaluation, and more likely, the amputation will be the choice of treatment by general surgeons. Presence of advanced peripheral vascular disease is a major predictor factor for the diabetic foot complication and was the cause of amputation in our patients. 80.2% of patients in this research had a vascular Doppler study for investigation of peripheral arterial deficiency. This is the first step

in identifying the patients with higher risk of amputation. Arguments towards the necessity of diabetic foot patients to be evaluated by the vascular surgery specialist dictated by the number of publication where percutaneous angioplasty can be used to prevent amputation or at least postponed it in order to reduce the level and therefore in the long run minimise disability. However, in some practices percutaneous angioplasty is not used for the reason of distal infra-popliteal disease. In these cases, revascularization with bypass has been utilised showing good limb salvage rate. Thus demonstrating that, presence of diabetic micro-angiopathy is not contraindication for revascularization (9).

The major issue for patients with complicated diabetic foot remains the long hospital stay. In most cases, when the amputations performed shortly after admission, the hospital stay was less than 10 days, which is comparable to most of the reports from small and large hospitals. However, patient's hospital stay for the much longer period were mostly related to initial refusal for amputation and attempts to fight progressive infection due to late presentation (6). The medium long hospital stay for patients in this study was 21.44 +/- 17.7 days. This is a common problem in the patients with diabetic foot complications due to difficulty to manage microbial infection compared to non-diabetic groups. Obviously, attempts for conservative treatment causing delays in surgical decision making towards amputation. In addition, the slow healing factors remain and in some cases, higher amputations needed to achieve good stump healing (8). Therefore, preventive measures like primarily good glycaemia control and appropriate foot care with the patients' education may dramatically reduce the incidence of amputations among Saudi patients with diabetic foot. Some western surgical centres have promoted development of teamwork in care of those patients. Our study advocating that, developing specialised diabetic centres or at least a specialised "diabetic foot clinic" in hospitals in different areas of Saudi Arabia can provide such care. Therefore, these steps can minimise the negative outcome of diabetic foot complications and significantly reduce morbidity and mortality in the diabetic population of Saudi Arabia.

Conclusion:-

The multidisciplinary approach in the management of diabetic foot, which includes detailed diagnosis of the patient's vascular status in order to improve peripheral blood supply can lead to large reduction of the amputees. Thus, preventive measures like primarily good glycaemia control and appropriate foot care together with the patients' education may dramatically reduce the incidence of amputations among Saudi diabetic patients.

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