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"Evaluation and Management of Diabetic Foot According To Wagner's Classification"

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Abstarct: *Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease.[1] At present India topped the world with the highest number of people with diabetes mellitus.[1] Diabetes is a common disease affecting about 14.8% in rural and 19.7% in urban dwellers in India[1]. India has highest prevalence of diabetes in world and accounts for almost 1/6 of the diabetic patients[1]. Wagner's classification is the simplest, best known for evaluation and management of diabetic foot ulceration.[2]*

Background

1) *To Re evaluate role of Wagner's classification in the study and management of 100 diabetic foot in patients admitted in government general hospital guntur*
2) *To investigate the surgical strategy of diabetic foot and analyze the therapeutic efficacy.*
3) *To study and compare outcomes and also to identify measures to decrease the morbidity and mortality due to diabetic foot.*

Methods: *Diabetic foot patients secondary to type 2 DM and type 1 DM and admitted at government general hospital guntur between the period of May 2013 to April 2014.100 Cases was selected and followed for 6 months duration with random sample technique and Classification of diabetic foot according to Wagner's classification enables to institute proper treatment regimen and outcome retrospective study was done to see effectiveness of differential treatment based on Wagner's classification.*

Results

In The Study Of 100 Patients

1. *Highest percentages of cases (30%) were found in the age group of 51-60 yrs.*
2. *there were 76 males and 24 females.*
3. *60 patients were found to have peripheral neuropathy.*
4. *maximum no. of patients were presented with Grade II Wagner's lesion.*
5. *Conservative -15; Surgery -85;*

Conclusion: *Foot ulceration in diabetic patients is resource consuming, disabling morbidity, that often is the first step towards lower extremity amputation. Prevention is the best treatment Lesser grade lesion respond well to conservative treatment with antibiotics and debridement while those with higher lesion require some kind of amputation. Effective glycemic control and education are of key importance for decreasing diabetic foot disease.*

Keywords

1. *diabetic foot, Wagner's classification*
2. *ulcer, conservative treatment*
3. *gangrene, amputation*

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I. Introduction

GRADE Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease.[1] At present India topped the world with the highest number of people with diabetes mellitus.[1] Diabetes is a common disease affecting about 14.8% in rural and 19.7% in urban dwellers in India[1]. India has highest prevalence of diabetes in world and accounts for almost 1/6 of the diabetic patients[1]. Approximately 15% of patients with diabetics will have a life time risk of developing some foot complications during the course of illness from simple calluses to major abscesses and osteomyelitis. Several classifications exists for grading ulceration and their management, however Wagner's classification is the simplest, best known for evaluation and management of diabetic foot ulceration.[4]

1.1 Wagner's Classification As Adopted By Levin O Neals[3]
GRADE 0 - high risk foot with no ulceration (Skin intact).
GRADE 1 - Superficial ulcer.
GRADE 2 - Deep ulcer.
GRADE 3 - Osteomyelitis with ulceration 4 - Partial foot gangrene.
GRADE 5 - Extensive gangrene of entire foot.

1.2 Standard Treatment According To Wagner's Classification[5]
GRADE 0 - prevention
GRADE 1 - antibiotic, good glycemic control
GRADE 2 - surgical intervention
GRADE 3 - some sort of amputation
GRADE 4 - debridement and amputation
GRADE 5 - below knee amputation.

Mean estimated total cost of management of diabetes in India was Rs 19914 per individual per annum. The estimated total mortality in diabetes was 1.09 lakhs and 2.2 million Disability adjusted life years (DALY) were lost due to the disease.[1] This places inordinate social and economic burden on the health care system and also the families of the patient. One of the most dreaded complications of diabetes is, foot ulcer and gangrene. Deaths due to foot gangrene are only second to cancer deaths. People with diabetes are at increased risk of complications from wound healing. A foot ulcer occurs in about 15% of all patients with diabetes and precedes 84% of all lower limb amputations. Relative Risk of leg amputation is 40 times higher among person with diabetes than with non-diabetic. Moreover up to 50% of diabetic amputees will undergo a second leg amputation within 5 years of initial amputation. The management of diabetic foot is focused primarily on avoiding amputationof lower extremities. Hence early recognition and proper therapy of diabetic foot lesion may save foot and leg.[4]

The amount of interest in the diabetic foot has increased tremendously over the past ten years. There continues to be great interest in the treatment and prevention of diabetes foot. 100 Diabetic foot patients admitted in our hospital between May 2013 to April 2014 will be classified according to Wagner's classification and will be managed according to the grade of the lesion. Wagner's classification helps in correlating appropriate treatment to proper grade of lesion with better outcome.[4] Lesser grade lesion responds well to conservative treatment with antibiotics and debridement while those with higher lesion require some kind of amputation.

II. Meterials And Methods

To Re evaluate role of Wagner's classification in the study and management of 100 diabetic foot in patients admitted in government general hospital guntur To investigate the surgical strategy of diabetic foot and analyze the therapeutic efficacy.To study and compare outcomes and also to identify measures to decrease the morbidity and mortality due to diabetic foot.
he patients were required to give written informed consents prior to their enrolment in the study and a clearance was taken as per the institute's ethical committee guidelines.

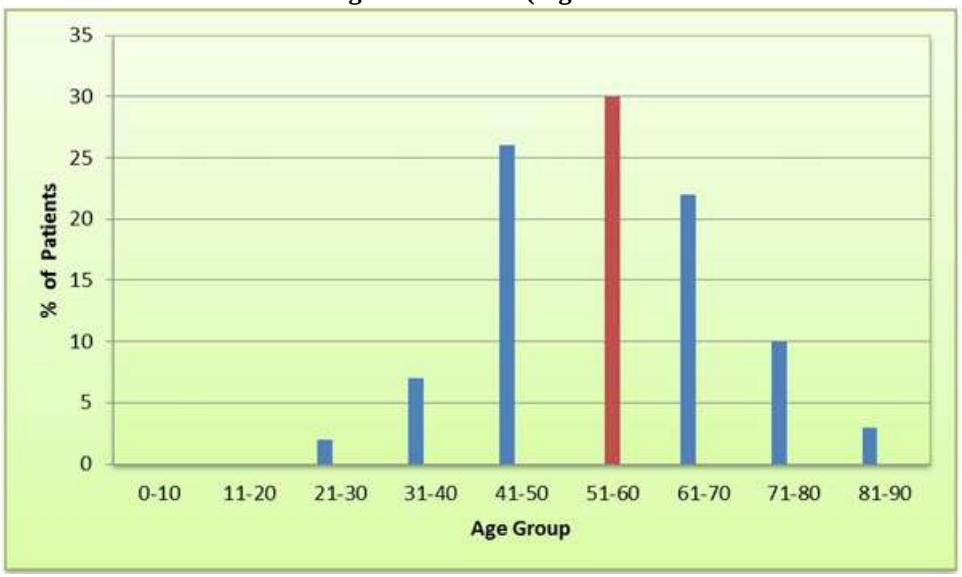
III. Observation And Results

The results of clinical study of 100 cases of diabetic foot studied at our hospital during the period of May 2013 to April 2014.**Age** distribution of 100 cases studied in our hospital. Youngest patient was 25 years old and older patient was 84 years old. Highest percentages of cases (30%) were found in the age group of 51-60 yrs.

Age Distribution **(Table 7)**

Age (years)	No. of patients	Percentage
0-10	-	-
11-20	-	-
21-30	2	2%
31-40	7	7%
41-50	26	26%
51-60	30	30%
61-70	22	22%
71-80	10	10%
81-90	3	3%
	100	100%

Age Distribution (Figure 3

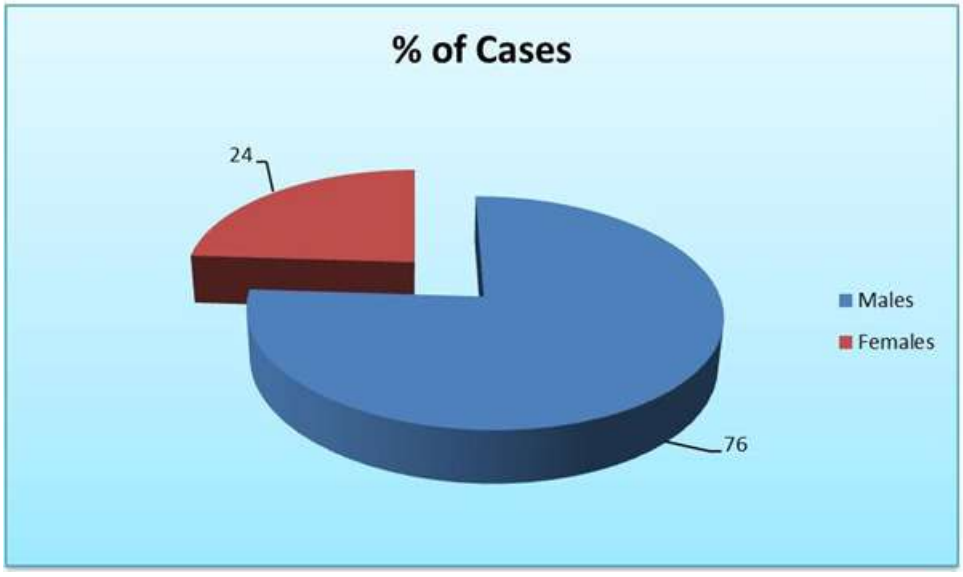


2. Sex- of the total 100 cases studied; there were 76 males and 24 females.

Sex Distribution **(Table 8)**

	No. of cases	**Percentage**
Males	76	76%
Females	24	24%

Sex Distribution **(Figure 4)**

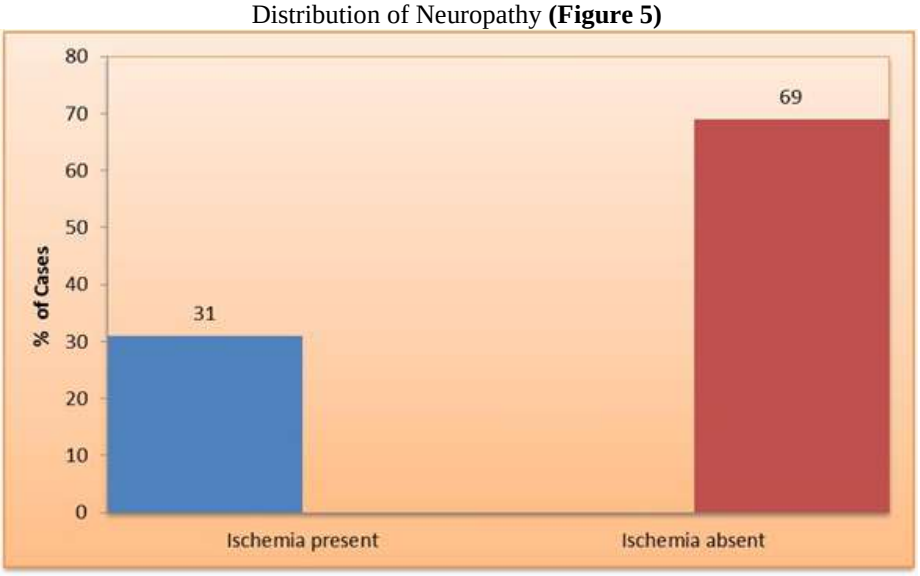


H/o Neuropathy – of the 100 cases studied 60 patients were found to have peripheral neuropathy.

Distribution of Neuropathy **(Table 9)**

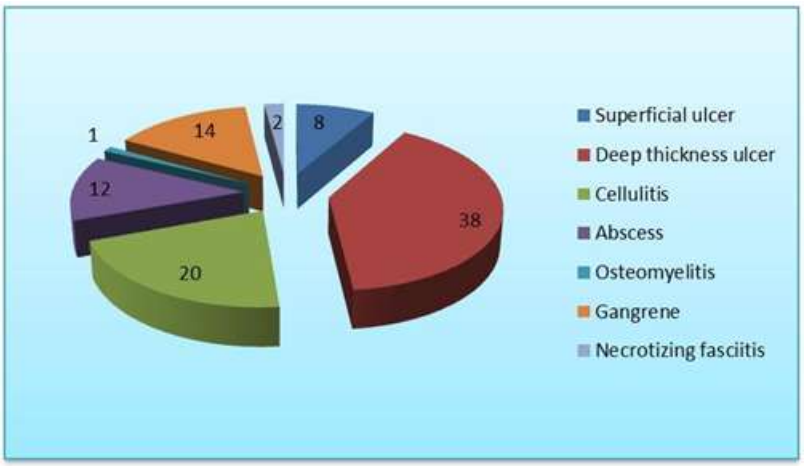
	Neuropathy present	Neuropathy absent	Total
Total no of cases	60	40	100
Percentages	60	40%	100%

Distribution of Neuropathy **(Figure 5)**



Nature of lesion-Distribution of lesion (Table 11)

Nature of lesion	No of lesion	Percentage
Superficial ulcer	8	8%
Deep thickness ulcer	38	38%
Cellulitis	20	20%
Abscess	12	12%
Osteomyelitis	1	1%
Gangrene	14	14%
Necrotizing fasciitis	2	2%
Lesions requiring amputation	5	5%
	100	100%



Distribution of lesion (Figure 7)

Distribution of lesion (Figure 7)

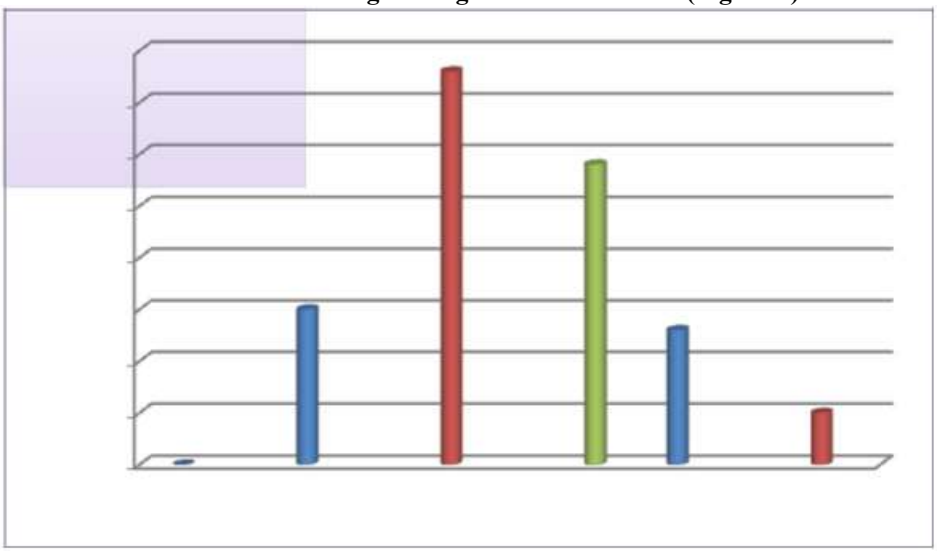
Presentation according to Wagner's classification - maximum no. of patients were presented with Grade II Wagner's lesion.

Distribution according to Wagner's classification **(Table 12)**

Wagner's Grade	No. of patients	Percentage
Grade 0	-	-
Grade l	15	15%
Grade ll	38	38%
Grade lll	29	29%
Grade lV	13	13%
Grade V	5	5%

TOTAL	100	100%

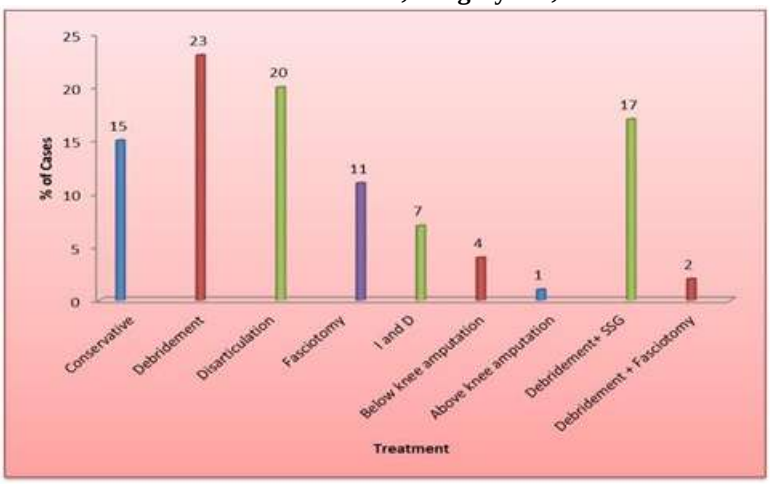
Distribution according to Wagner's classification (Figure 8)



Treatment modalities (Table 13)

	No. of cases	Percentages
Conservative	15	15%
Debridement	23	23%
Disarticulation	20	20%
Fasciotomy	11	11%
I and D	7	7%
Below Knee Amputation	4	4%
Above Knee Amputation	1	1%
Debridement + SSG	17	17%
Debridement + Fasciotomy	2	2%

Conservative -15; Surgery -85;



IV. Discussion

4.1 Age: Age distribution of 100 cases studied in our Hospital. Youngest patient was 25 yrs old and older patient was 84 yrs old. Highest number of cases were found in the age group of 51-60 yrs similar to that of study conducted "Waqar alam Jan[7]". As compared to study conducted by "Rooh-ul mukim" majority of our cases were in above 60years of age whereas in their study majority of cases were in 41-50 years of age group. As compared to study "Waqar alam jan, Habib ullah shah, Muhammad usman" the percentage of diabetic foot patients in the age group above 50 years are 79%. Most prevalence age group was 51-60 years comprising 46%.

(Table 14)

	<40 years	41-50years	51-60years	>60 years	Total
Present study	9%	26%	30%	35%	100%
Rooh- ul- Mukim,					
Mukhtar ahmed					
Samson Griffin	9%	47%	32%	12%	100%
Waqar alam jan,					
Habib ullah					
shah,					
Mohammad					
usman	1.02%	19.38%	45.91%	33.61%	100%
		50			

2.**Type of diabetic mellitus** - As compared to study conducted by "Rooh-ul-mukim" and "Waqar alam Jan" datas are almost comparable and diabetic foot complications is more commoner in type ll DM patient as compared to type l DM.

(Table 15)

	Type l DM	Type 2 DM	TOTAL
Present study	2	98	100
Rooh- ul-Mukim,			
Mukhtar ahmed,Samson	2	98	100
Griffin			
Waqar alam jan, Habib			
ullah shah, Mohammad	1.02%	98.98%	100%
usman			

3 sex - of the 100 cases studied 76 cases were males and 24 cases were females. Male to female ratio was 3.16. As compared to study by "Rooh-ul-mukim" and "Waqar alam Jan" there are more male patients and less female patients observed in our study. Higher incidence of diabetic foot in males may be due to the exposure to injuries during their work, which subsequently leads to injury mostly to the insensitive foot. As compared to study "Waqar alam jan, Habib ullah shah, Muhammad usman" there were 60% males and females were 40%

(Table 16)

	Male	Female	Total
Present study	76%	24%	100%
Rooh- ul-Mukim,			
Mukhtar ahmed,	62%	38%	100%
Samson Griffin			
Waqar alam jan ,habib			
ullah shah,mohammad	60.2%	39.8%	100%
usman			

4Neuropathic lesion - diabetic peripheral neuropathy is the most important factor contributing the frequency and severity of the lesion.in the present study 60% of the patients were found to have peripheral neuropathy. These patients had h/o pain in the extremities, of burning and pricking in nature. Examination revealed reduced or absent cutaneous sensation and vibratory sensation. Kumar et al.[6] in 1994 reported high prevalence of peripheral neuropathy of (41.6%) in a population based study.

(Table 17)

	Peripheral neuropathy
Present study	60%
Kumar et al.	41.6%

5**Nature of the lesion** - of the 100 cases studied full thickness ulcer 38% was the most common presentation followed by cellulitis 20%, gangrene was seen in 14%, abscess in 12%, of the patients. Osteomyelitis present in 1% of the patients. Only 5% of the patients had lesion which requires some kind of amputation.

6Lesion according to Wagner's classification - Majority of the patients were in Grade ll lie 38% of the patients. No patients were observed in Grade 0 lesion. In Grade I 15%, Grade lll 29%, Grade lV 13% were observed. 5% of the patients were in Grade V who underwent major amputation. Studyconducted by "Rooh-ul-mukim" majority of the cases were in Grade ll and lll similar to present study where majority of the cases are in in Grade ll and Grade lll. As compared to study "Waqar alam jan, Habib ullah shah, Muhammad usman" No patients were observed due in Grade 0 lesion. In Grade I, 12% patients were presented. In Grade II, 17% patients were presented. In Grade III, 16% were presented. Most of the patients presented with Grade IV lesions which was different compared to our study and "Rooh-ul-Mukim" study the main reason for this is as the study was conducted in backward areas and in low literacy rate country. 18% patients were observed in Grade V.

(Table 18)

	Grade	Grade	Grade	Grade	Grade	Grade	Total
	0	I	II	III	IV	V	
Present study	0	15%	38%	29%	13%	5%	100%
Rooh- ul-	6%	14%	25%	30%	21%	4%	100%
Mukim,							
Mukhtar							
ahmed, Samson							
Griffin							
Waqar alam jan,							
Habib ullah							
shah,	0.	12.35%	17.26%	16.32%	35.71%	18.36%	100%
Mohammad							
usman							

7. Mode of treatment - only 15% of the individual improved with conservative management and majority patients 85% were subjected to surgical intervention. Of the surgical intervention, 38% of patients underwent debridement, 20% of patients underwent disarticulation for gangrene of toes. 2% of patients underwent SSG for covering the healing ulcer. 7% of patients were treated with I and D and 5% of patients underwent major amputation. Compared to "Rooh-ul-mukim" only 25% of our patient underwent disarticulation or amputation compared to 48% in their study. Only 15% of our patient improved with conservative management indicating that surgery is the main line of management in patient with diabetic foot. As compared to study "Waqar alam jan, habib ullah shah,Muhammad usman" majority of their cases 39% underwent amputations or disarticulations as most of them were presented in Grade IV Wagner's classification. Debridement was done in 29% of patients. Grafting done for chronic non healing ulcers in 2% of patients similar to our study.

(Table 19)

		Rooh- ul-Mukim,	**Waqar alam**
	Present study	**Mukhtar ahmed, Samson**	**jan, Habib**
			ullah shah,
		Griffin	**Mohammad**
			usman

Conservative	15%	17%	8.16%
Debridement	38%	28%	28.54%
SSG	2%	2%	2.04%
Amputation +			
	25%	48%	38.77%
disarticulation			
I and D	7%	5%	22.44%
Fasciotomy	13%	-	-
Total	100%	100%	100%

Diabetic patients have always suffered from complications affecting the lower limbs. Foot infection and the subsequent amputation of a lower extremity are most common cause of hospitalization among diabetic patients.It is more common in males between 40 -60 years of age. The hallmark of diabetic foot problem in our populations is gross infection and major contributing factors for late presentation include bare foot walking with abnormal gait, trust in faith healers and undetected diabetesIll fitting foot wear leading to foot deformity and improper toe nail cutting increases the risk while use of chappals with a single throng between hallux and second toe results in pressure ulcer.Wagner's classification score may be different for a surgeon as compared to physician, because they came with advanced disease to a surgeon and for this reason patient with grade 0,1 are lesser and those with grade 2,3,4 and 5 are more in our study.Peripheral neuropathy and infection are common risk factors in our studyThe standard treatment for diabetic foot according to Wagner's classification is prevention for grade – 0. Antibiotics and good glycemic control for grade – 1.Grade – 2 needs hospital admission as they need surgical intervention along with antibiotics and glycemic control.Grade – 3 requires some sort of amputation. Grade – 4 needs wide debridement and amputation. Grade – 5 the preferred treatment is below knee amputation.Well established widely used Wagner's wound classification system provide description of ulcers to varying degree and is easy to use among health care providers and can provide a guide to planning treatment strategies.Nelzen O et-al prospective cohort study shown that diabetic patients with foot ulcers have a lower survival rate when compared with non diabetic patients with foot ulcers.Pecoraro R et-al[8] study has been demonstrated that skin oxygenation plays an important role not only in predicting the healing of diabetic foot ulcers but also in the development of lesion.Landau Z et-al study shows that topical hyper baric oxygen and low energy laser therapy was found effective in chronic diabetic ulcer.Reiber and Mayfield studies shown that infection and peripheral vascular disease are associated with increased risk of amputation.In a retrospective study, Luciano sciontic and colleagues reported on a year population bases study on lower limb amputation in both people with and without diabetes showed that nearly a 30 fold increased risk of amputation in diabetes patients.There were mortalities in our study, all had grade 5 Wagner's diabetic foot disease of these

one was due to septicemia and another due to chronic renal failure with diabetic ketoacidosis.Our study concluded that prevention strategy including patient education in foot care, prophylactic skin and nail care reduces the risk for foot ulcers and lower extremity amputations. Prescription of foot wear accommodating deformity and decreasing pressure and shear forces applied to skin overlying bony prominence, keep individuals ambulatory and to protect from ulcer formation.

VII. Conclusion

1. Foot ulceration in diabetic patients is resource consuming, disabling morbidity, that often is the first step towards lower extremity amputation. Prevention is the best treatment.
2. Wagner's classification helps in correlating appropriate treatment to proper grade of lesion with better outcome. Lesser grade lesion respond well to conservative treatment with antibiotics and debridement while those with higher lesion require some kind of amputation.
3. Effective glycemic control and education are of key importance for decreasing diabetic foot disease.
4. With early presentation and hospital admission, aggressive medical and surgical treatment according to the grade of the disease can improve outcome and reduce the morbidity and mortality due to diabetes.

V. Dicussion

Diabetic patients have always suffered from complication affecting the lower limbs. Foot infection and subsequent amputation of lower extremities are the most common cause of hospitalization among diabetic foot patients.Preventing strategy including patient's education in foot care, prophylactic skin and nail care, and footwear reduces the risk of foot ulceration and lower limb amputation by 25%. Prescription footwear accommodating deformity and decreasing pressure and shear force applied to skin overlying the bone prominence, keep individuals ambulatory and protect them from ulcer formation.A nurse provided foot specific diabetic screening and education combined with protective foot wear, is a cost and resource effective method of decreasing rate of diabetic foot ulcers, and the risk of eventual lower extremity amputation.Grading diabetic foot lesion according to the Wagner's classification helps in correlating appropriate treatment to proper grade of lesion with better outcome.

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