



## A STUDY ON ANALYSING PREDICTIVE FACTORS FOR MAJOR LOWER EXTREMITY AMPUTATION IN DIABETIC FOOT PATIENTS

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**ABSTRACT** Diabetic foot is defined by World Health Organisation as “The foot of a Diabetes mellitus patient that has the potential risk of pathologic consequences, including infection, ulceration, and/or destruction of deep tissues associated with neurologic abnormalities, various degrees of peripheral vascular diseases and/or metabolic complications of diabetes in lower limb”. The objective of our study is to analyse various clinical and pathological factors which contribute to major amputations of the lower extremities in diabetic foot patients and to determine the influence of each factor in the final therapeutic outcome. This study was conducted on 100 cases of diabetic foot ulcer patients admitted to Thanjavur Medical College Hospital during a period of 10 months from February 2018 to November 2018. The cases were all proven diabetics suffering from ulcers of the foot. Of the total 100 patients who were studied, 57% were managed conservatively. The overall amputation rate was 43% with 27 patients undergoing major amputations (22 below knee amputations and 5 above knee amputations) and 16 patients having to undergo minor amputations (13 digital ray-amputations and 3 tarsometatarsal amputations). This study has demonstrated that old age, male gender, the presence of gangrene, absence of pulsations of the affected limb, osteomyelitis, longer duration of diabetes, increased total leucocyte count (TLC), higher Wagner's grading of ulcer (grade 3 or more), low hemoglobin and soft tissue infection are adverse predictive factors for major lower extremity amputation in diabetic foot patients.

**KEYWORDS :** Gangrene, Wagner, Osteomyelitis

### INTRODUCTION AND AIM:

Diabetic foot encompasses a constellation of syndromes, in which the cumulative effects of neuropathy, ischaemia and infection lead to tissue breakdown. Global prevalence of diabetes in 2003 was estimated to be 194 million. By 2030, this figure is expected to rise to an astronomical 366 million due to longer life expectancy and changing dietary habits. India, with its oncoming diabetic epidemic and increasing geriatric population, has shown an upsurge in the incidence of peripheral vascular disease. Gangrene and ulcers preceding amputations are largely preventable through awareness generated by health education and organized foot care programmes.

Diabetes-related peripheral vascular disease and foot ulcers constitute a significant percentage of hospital admissions and this is of great socio-economic importance as majority of them are in the prime earning age group and are poor. The management of treating foot ulcers is rigorous and entails frequent consultations, expensive drugs, repeated investigations, dressings and procedures and this proves to be beyond the reach of most of the Indian population which struggles to have daily ends met. Various research papers published world over have demonstrated that the reaching out approach has dramatically reduced amputation rates and this is more impactful than tertiary care. Early detection and attention to warning signs can surely avert amputations and its attending repercussions, both socio-economic and personal. Lower limb ischaemia in diabetes due to macroangiopathy causes non-healing ulcers, infection, amputation and even mortality. Foot ulceration is absolutely preventable and by simple interventions one can reduce amputation rates in up to 80% of patients. Regular evaluation and early treatment are the most effective mechanisms to prevent the devastating diabetic foot complications.

This study was conducted to analyse the predictive factors (clinical and pathological) for major lower extremity amputation in diabetic foot patients.

### MATERIALS AND METHODS:-

Study was conducted on 100 cases of diabetic foot ulcer patients admitted to Thanjavur Medical College Hospital during a period of 10 months from February 2018 to November 2018. The cases were all proven diabetics suffering from lower limb ulcers secondary to Diabetes Mellitus and were evaluated for various clinical and pathological factors which were thought likely to favourably or

adversely influence the prognosis of diabetic foot ulcers. All values were analysed using percentages and tabulated for comparison.

### INCLUSION CRITERIA:

- All patients aged 12 years or more with diabetic foot ulcers.

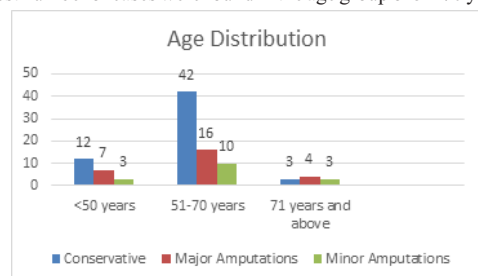
### EXCLUSION CRITERIA:

- Paediatric age group less than 12 years.
- Immunocompromised states like HIV, TB, and malignancy.
- Those who expired at the time of admission.

### RESULTS AND OBSERVATIONS

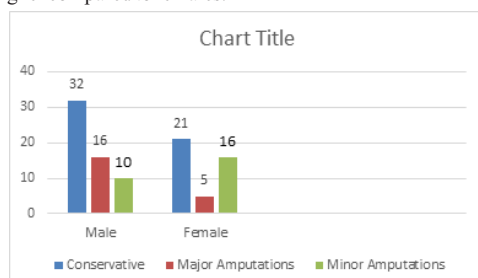
#### AGE DISTRIBUTION:

The youngest patient was 32 years old, and eldest was 80 years old. Highest number of cases were found in the age group of 51-70 years.



#### SEX DISTRIBUTION:

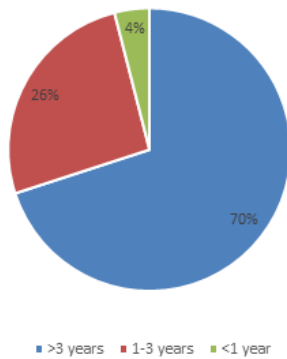
Out of 100 patients, 58 were male and 42 were females. Males are more commonly affected by diabetic foot disease and amputation rates are also higher compared to females.



**DURATION OF DIABETES MELLITUS:**

Over 70% of major amputations involved patients with longer duration of diabetes mellitus.

Amputation rates related to the duration of Diabetes



**PRESENCE OF GANGRENE:**

100% of patients with complete gangrene ended up in major or minor amputations with 58.33% patients needing major amputations.

Bacterial Culture	No of Patients	Major Amputations	Minor Amputations	Major Amputations%	Minor Amputations%	Conservative Management%
Positive	24	14	6	58.33%	25%	16.67%
Negative	76	13	10	17.10%	13.15%	69.75%

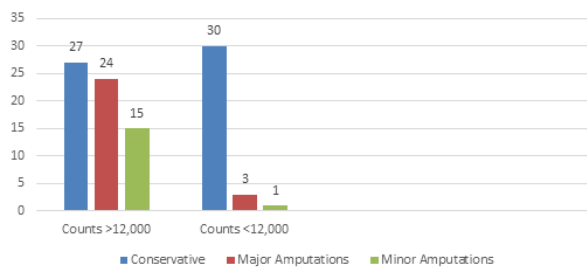
Common organisms were Staphylococcus aureus, Klebsiella, Pseudomonas, E. coli and Proteus.

**GRADING OF ULCER:**

Grade	Number of Patients	Major Amputations	Minor Amputations	Major Amputations%	Minor Amputations%	Conservative%
1	04	0	0	0%	0%	100%
2	53	0	0	0%	0%	100%
3	14	12	2	85.72%	14.28%	0%
4	24	10	14	41.67%	58.33%	0%
5	5	5	0	100%	0%	0%

**Total Leucocyte Count (TLC):**

Relationship between total WBC counts and amputation rates



**HAEMOGLOBIN:**

Hemoglobin gm%	Number of patients	Major Amputations	Minor Amputations	Major Amputations%	Minor Amputations%	Conservative Management%
<10gm %	36	16	9	44.45%	25%	30.55%
>10gm %	64	11	7	17.18%	10.93%	71.89%

An analysis of 100 cases of diabetic foot was done. These cases were treated in different surgical units in the department of general surgery, Thanjavur Medical College Hospital. Of the total 100 patients who were studied, 57 were managed conservatively with 27 patients undergoing major amputations (22 below knee amputations and 5 above knee amputations) and 16 patients having to undergo minor amputations (13 digital ray-amputations and 3 tarsometatarsal amputations).

**DISCUSSION:**

Of the total of 100 patients who were studied, 57 were managed

Gangrene	Number of patients	Major Amputations	Minor Amputations	Major amputation%	Minor amputation%	Conservative Management %
Present	26	15	11	57.69%	42.31%	0%
Absent	74	12	5	16.21%	6.75%	77.04%

**PULSE STATUS OF THE AFFECTED PART:**

100 % of patients with absent pulse went for major amputations.

Pulsations	Number of patients	Major Amputation	Minor Amputation	Major amputation%	Minor amputation%	Conservative Management %
Absent	22	22	0	100%	0%	0%
Present	78	5	16	6.40%	20.53%	73.07%

**Osteomyelitis:**

All 7 patients with osteomyelitis had to undergo amputation.

Osteomyelitis	Number of Patients	Major Amputation	Minor Amputation	Major Amputation%	Minor Amputation%	Conservative Management %
Present	7	3	4	42.85%	57.15%	0%

**INFECTIONS:**

Out of 27 amputations, 24 (89%) were infected with microorganisms.

Patients were arbitrarily divided into two groups according to Wagner's Grading system (low grade 0-2; High grade 3-5). Amputation rates were higher in Grade 3 and above.

conservatively with 27 patients undergoing major amputations (22 below knee amputations and 5 above knee amputations) and 16 patients having to undergo minor amputations (13 digital ray-amputations and 3 tarsometatarsal amputations). Most of the patients in this study presented when infection or gangrene had already set in. In this study, the major amputation rate in diabetic patients was as high as 27%. Male patients had a slightly higher rate of major amputations (16%) relative to female patients (5%). The major amputations were common in patients in their 5th-7th decades of age (16%). Positive bacterial cultures lead to significantly higher rates of major amputation with 58% of those showing organisms on culture needing major amputations. Presence of gangrene warranted major amputation in 58% patients and absence of peripheral pulses led to all patients having major amputations. Wagner's grading III- V was associated with higher rates of major amputations (86%, 42% and 100% for grades III, IV and V respectively). In this study, major amputation rates increased in patients having diabetes for more than 3 years (70%), possibly owing to worsening of arteriopathy. All seven patients with foot ulcers having osteomyelitis ended up having major (43%) or minor (57%) amputations. We have observed that higher levels of total leucocyte count (TLC) due to infection increases the rate of major amputation by eight times (24% in patients with TLC >12,000 against 3% in patients with TLC < 12,000). And amputation rate increases with fall in haemoglobin level with 45% of patients with Hb<10gm needing major amputations possibly attributed to diminished oxygen supply in an already ischemic limb.

**CONCLUSION:**

This study shows that old age, male gender, absence of pulsations, presence of infection, longer duration of disease, osteomyelitis, presence of gangrene, higher grade of Wagner's severity classification, leukocytosis, low hemoglobin were independent adverse predictors of major lower extremity amputation rates in diabetic foot patients. The care of the diabetic foot thus takes place at 3 levels; the patient must take routine measures to take care of his/her foot with early lesions getting quick attention from a podiatrist and advanced lesions requiring early specialised care.

**ACKNOWLEDGEMENTS: None****REFERENCES:**

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