The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 4, 2025

# EVALUATION OF DIABETIC FOOT COMPLICATIONS IN OPD PATIENTS AT DIFFERENT HOSPITALS OF DISTRICT NAUSHAHRO FEROZE

**Aijazan Parveen[*1], Tahira Jabeen[2], Jawaid Ahmed[3], Allah Bux Lakhiar[4]**

[*1,2,3]*Department of Zoology, University of Sindh Jamshoro, Sindh, Pakistan*
[4]*Senior Surgeon of Taluka Hospital Moro District Naushahro Feroze Sindh*

[*1]aijazanparveen26@gmail.com

**DOI:** https://doi.org/10.5281/zenodo.15254348

**Keywords**

**Article History**
Received on 12 March 2025
Accepted on 12 April 2025
Published on 21 April 2025


**Corresponding Author: * Aijazan Parveen[*1]**

## Abstract

*Diabetic foot is a global epidemic of 21th century and it is a major health problem. Foot complications in patients with Diabetes mellitus (DM) are a major health problem and account for 20% annual Diabetes related hospital admissions. This study was made in order to evaluate Diabetic foot complications in outdoor patients (OPD) at different hospitals from district Naushahro Feroze Sindh. This cross-sectional descriptive study was carried out from June to November 2021. It aims to find out the prevalence and causes of foot complications in type I and type II Diabetes mellitus patients and to find out the commonest complication in the area. The data was collected from the predesigned proforma and frequency, percentage, mean were analyzed and calculated statistically. During research period total 74 patients of type I and type II Diabetes mellitus patients were evaluated for Diabetic foot complications. Male to female ratio was 1.3:1. The ratio of type I and type II DM was 1:6.4. The commonest age group of patients was between 31- 45 years. 44 (59.4%) patients were educated (hardly five to seven or eight class). (40.54%) patients were uneducated. In our study most common foot complication was foot ulcer/ wound infection (33.7%). Second most common complication was diabetic foot gangrene (27.03%). Other foot complications were peripheral neuropathy (24.32%), foot abscess (10.81%) and cellulitus (4.05%). 35 patients (47.2%) cames with history of hereditary (genetics) and 39 (52.7%) patients had history of acquired disease. People educated/uneducated in District Naushahro feroze are unaware of DM and its complications Therefore public (patients) awareness about DM, foot complications and foot care is strongly needed in District Naushahro feroze Sindh.*

## INTRODUCTION

Diabetes mellitus is defined as a clinical condition that occurs either due to lack of insulin secretion or decreased sensitivity of the tissues to insulin. It is a disease in which carbohydrate, fat, and protein metabolism is impaired [1, 2]. The basic etiology of the disease is either genetic or environmental factors and the incidence is increased in Asia and Europe due to sedentary lifestyle, altered dietary habits, and aging population [3]. According to the latest edition of the Diabetes Atlas, an estimated 366 million people are affected throughout the world [4, 8]. There are about 60 million patients in Europe. Hyperglycemia kills more than 3.4 million patients annually. 80% of these deaths occur in underdeveloped countries. According to a WHO report, the number of deaths will double between 2005- 2030 [5]. International Diabetes

Federation reports that in 2015 about 415 million people were affected globally by the disease and this number may cross 640 million in 2040 [6]. More than 60% of the world's Diabetic population resides in Asian countries [7]. Diabetes mellitus is a global epidemic of the 21st century and it is a major health problem. The health record of the past three decades shows that Diabetes mellitus is increasing and probably it will continue to increase in the coming decades [9, 10, 15]. Diabetes mellitus may affect any system of the body causing various complications; some of the complications are life-threatening and adversely affect the quality of life (QoL) [11]. Foot complications in patients with Diabetes mellitus are a major public health problem and accounts for 20% of the annual Diabetes-related hospital admissions [12, 13]. Diabetes foot complications are the major cause of morbidity and mortality in patients with Diabetes mellitus [14]. The foot complications that can occur are foot ulcer, wound infection, abscess formation, infection of the foot's deeper tissues e.g., necrotizing fasciitis (deep wound infection), cellulitis, and wet or dry gangrene [11]. Diabetes foot ulcer (DFU) is the most common and most important complication of Diabetes mellitus and if left untreated it will lead to wound infection, gangrene, ultimately amputation of the affected part [15,16]. The main reason for foot ulceration is either neuropathy or peripheral arterial disease. Infection of foot ulcerations plays an aggressive role in causing superficial or deep wound infection, gangrene, or amputation [17]. A Diabetic patient has an up to 25% risk of developing a foot ulcer [18]. Diabetes mellitus is the mother of all diseases affecting different systems of the body e.g., cardio-vascular system, nervous system, skin, eyes, urogenital system, etc. The main culprit for its complications is hyperglycaemia, therefore control of hyperglycemia is essential to avoid complications of Diabetes mellitus [19, 20]. Early recognition of high foot risk and urgent treatment will save the patient from different types of lower limb amputations and disability [21].

Foot with complications in Diabetic patients is called a Diabetic foot [10, 22]. Diabetic foot complications can occur at any age but are more common in patients above 65 years old and it is a big economical threat [23]. The number of Diabetic foot patients is increasing globally which leads to an increased incidence of foot complications [24]. Therefore, foot disease is a common and most dangerous complication of type 1 and type 2 Diabetes mellitus [25, 26] and it is a major cause of morbidity and mortality in Diabetic patients [27, 32]. According to one estimation, one of every 30 patients with Diabetes Mellitus suffers from lower limb amputation [28]. Diabetic foot is also called Diabetic foot syndrome (DFS) and it is one of the most important complications of Diabetes mellitus [29, 33]. Diabetic foot complications are responsible for approximately 50% of all Diabetic related hospital admissions [30] and 15% of the 200million Diabetic patients throughout the world [31]. Diabetic foot complications no doubt are a challenge for the health care system and an economic burden for the patient and his family because complications follow longer duration and their treatment is expensive [34].

**PATIENTS AND METHOD:**

i.Study included 74 patients of type I and type II diabetic patients with diabetic foot complications.

ii.Cases were collected from different hospitals (non-teaching) of district Naushahro Feroze.

iii.Case study was done under the direct supervision / guidance of senior surgeon (masters in surgery) Taluka hospital Moro.

iv.All patients were registered after taking consent for study.

v.Fortnightly tour program was scheduled to visit different health facilities (hospitals) centers of the district.

vi.Concerned health facility doctor was requested to collect study cases on the scheduled date.

vii.In diabetic patients, foot problems other than diabetes mellitus e.g.: Traumatic foot injury, electric burn, surgical wound infections etc. were excluded from the study.

viii.Study depends mainly on patient history, clinical examination, necessary investigations like blood sugar, serum creatinine and in selected cases Doppler study for peripheral vascular flow / supply etc.

ix.A proforma was filled up for each patient.

**x.**Ordinary instruments like stethoscope, BP apparatus, thermometer, hammer, proforma etc. were needed.

**RESULTS:**

In my research project, there were 10 (13.3%) patients of type I DM and 64 (86.5%) patients of type II DM. Type I to type II DM ratio was 1:6.4 (Table: 1).

There were 42 (56.7%) male patients and 32 (43.3%) female patients. The male to female ratio was 1.3:1 (Table: 2).

The age distribution showed that 4 patients were between 15-30 years of age (3 male and 1 female), 34 patients were between 31-45 years of age (15 male and 12 female), 9 patients were between 61-75 years of age (3 male and 6 female patients) (Table: 3).

The mean age of male patients was 47.11 and female patients were 49.8 years (Table: 4].

Ten patients were thin build (6 male and 4 female patients), 54 patients were that of moderate build (32 male and 22 female patients), 10 patients were obese build (4 male and 6 female) [Table: 5).

30 (40.5%) patients were from urban population and 44 (59.5%) patients were from rural population (Table: 6).

44 (59.4%) were educated patients (34 "80.9%" male and 10 "31.25%" were female patients). 30 (40.54%) were uneducated patients (8 "19.04" male and 22 "68.75%" were female patients) (Table: 7).

18 (24.32%) patients presented with peripheral neuropathy, 25 (33.7%) patients presented with DFU/wound infection, 20 (27.03) patients presented with foot gangrene, 8 (10.81%) were cases of foot abscess, and 3 (4.05%) patients presented with cellulitis of foot and leg. (Table: 8).

35 (47.2%) patients came with family history of DM (hereditary) and 39 (52.7%) had acquired disease. (Table: 9).

**Table 1: Showing distribution of patients according to type of Diabetes Mellitus (DM) (n=74)**

| TYPES | NO: OF PATIENTS | %AGE |
|---|---|---|
| **TYPE I** | 10 | 13.5 |
| **TYPE II** | 64 | 86.5 |
| TOTAL | 74 | 100 |

**TYPE I TO TYPE II RATIO = 1:6.4**



**Table 2: Distribution of patients according to sex /gender**
(N=74)

| SEX | NO: OF PATIENTS | %AGE |
|---|---|---|
| **MALE** | **42** | **56.7** |
| **FEMALE** | **32** | **43.3** |
| TOTAL | 74 | 100 |

MALE TO FEMALE RATIO 1.3:1

**Table 3: Age Distribution of male/female patients**
(N=74)

| AGE (YEARS) | MALE | FEMALE | TOTAL |
|---|---|---|---|
| 15-30 | 3 | 1 | 4 |
| 31-45 | 21 | 13 | 34 |
| 46-60 | 15 | 12 | 27 |
| 61-75 | 3 | 6 | 9 |
| TOTAL | 42 | 32 | 74 |

**Table 4: Mean age (years) of patients**
**(N=74)**

| SEX | MEAN AGE (YEARS) |
|---|---|
| MALE | 47.11 |
| FEMALE | 49.8 |

**Table 5: Distribution of patients according to build**
(n=74)

| BUILD | MALE | FEMALE |
|---|---|---|
| THIN | 6 | 4 |
| MODERATE | 32 | 22 |
| OBESE | 4 | 6 |
| TOTAL | 42 | 32 |

**Table 6: Distribution of patients according to urban/rural**
(n=74)

| URBAN/RURAL | No: OF PATIENTS | %AGE |
|---|---|---|
| URBAN | 30 | 40.5 |
| RURAL | 44 | 59.5 |
| TOTAL | 74 | 100 |

**Table 7: Distribution of patients according toEducated/uneducated**
**(N=74)**

| SEX | EDUCATED | UNEDUCATED | TOTAL |
|---|---|---|---|
| MALE | 34 (80.9%) | 8 (19.O4%) | 42 |
| FEMALE | 10 (31.25) | 22 (68.75) | 32 |

**Table 8: Distribution of patients according to Diabetic foot complications**
**(N=74)**

| COMPLICATIONS | NO: OF PATIENTS | %AGE |
|---|---|---|
| PERIPHERAL NEUROPATHY | 18 | 24.32 |
| DUF/WOUND INFECTION | 25 | 33.7 |
| GANGRENE | 20 | 27.7 |
| ABSCESS | 8 | 10.81 |
| CELLUTITIS | 3 | 4.05 |
| TOTAL | 74 | 100 |

**Table 9: Distribution of patients according to hereditary**

| HEREDITARY/ACQUIRED DISEASE | NO: OF PATIENTS | %AGE |
|---|---|---|
| HEREDITARY | 35 | 47.3 |
| ACQUIRED | 39 | 52.7 |
| TOTAL | 74 | 100 |

**DISCUSSION:**

Diabetic foot complications are the most common complications of DM, especially diabetic foot wound infection and gangrene are the deadliest complications leading to limb amputation and disability [35, 36,49]

The present study was carried out in district Naushahro Feroze (Sindh) to evaluate diabetic foot complications and their causes (etiology). 74 patients of DM I and DM II were collected from outpatient departments (OPD) of different hospitals (non-teaching) of district Naushahro Feroze. Our study was important due to the fact that such type of research work is still negligible in districts of interior Sindh. The total no: of patients DM I was 10 (13.5%) and DM II patients were 64 (86.5%). Our study agrees with the observations of Abdul Fatai B Olokoba et al and another study by Alistair D Mclnnes who claims that number of patients of DM II is more as compared to DM I and is increasing globally [37,38]. Sex distribution showed that the total no: of male patients was more (56.7%) as compared to female patients (43.3%) and the male to female ratio was 1.3:1. V Jyothylekshmy et al also have reported that Diabetic foot complications are more prevalent in male patients as compared to female patients [45]. In present study Diabetic foot complications are more common in 31-45 years age group and next common group is 46-60 years age. Mean age of male patients was 47.11 and that of female was 49.8 years. This contradicts study report of V Jyothylekshmy etal [45].

In our study Diabetic foot complications are more prevalent in rural population (59.5%) as compared to urban population (40.5%). In present study male patients were more educated (80.9%) as compared to female patients (31.25%). In our study the most common foot complication was DFU/wound infection (33.7%), the next common complication was diabetic foot gangrene (27.03%), the 3rd commonest foot complication was peripheral neuropathy (24.32%), abscess (10.81%) and cellulitis (4.05%) were least common complication.

In our study majority of patients had acquired disease (52.7%) as compared to history of hereditary disease (47.2%). In this study after taking proper history and clinical examination of study cases our observation is that there is excessive use of potato, rice, sugar in the form of tea, soft drinks sweets etc. is common in rural and urban population. Such type of diet may promote hyperglycemia. Most of the patients belonging to higher economic groups e.g., landlords, merchants, shopkeepers and officers spend sedentary (physical inactivity) life. In our study DFU/ wound infection and foot gangrene are most prevalent foot complications in areas of district Naushahro feroze, which is matter of worry due to their grave consequences if left untreated. Diabetic foot infections (DFIs) can cause superficial or deep wound infections, gangrene, prolonged hospitalization and limb amputation [46, 48]. Our study agrees with the results of Pengzi Zhang Jin Lu et al study who reports DFU/wound infection prevalence is higher in male patients and in DM II patients [55]. David G. Armstrong et al claim that about one-third of half a billion people with DM globally develop DFU/wound infection during their lifetime and half of DFUs will develop foot infection and 17% of patients will need limb amputation due to DFU [44].

Our study agrees with the results of David G. Armstrong et al study reports that DFU/wound infection are a common and serious cause of morbidity and mortality in DM patients [40,41,42]. Ilkey Uckay et al study predicts as there is an increase in the incidence of DM and a longer lifespan of DM patients ultimately will lead to an increase in DFIs [47]. Our study agrees with the results of Pengzi Zhang Jin Lu et al study who reports DFU/wound infection prevalence is higher in male patients and in DM II patients [55]. Benjamin A. Lipsky et al reports that Diabetic foot infections (DFIs) commonly develop in neuropathic DFU [50]. Patients with DM are more prone to DFIs due to neuropathy, vascular insufficiency, and decrease neutrophil cells function [51]. A recent report estimated that the risk of hospitalization and lower extremity amputation is 155 times greater for patients with DFI [52]. DFIs if it causes osteomyelitis, it is also a serious complication [53]. Recently a prospective observational study reports that healing incidence in infected DFUs is 44.5% cases in one year [49]. Our study agrees with the results of Chanjuan Lu et al study who reports that early detection of diabetic foot complications and their predisposing factors is essential to avoid serious foot complications like DFIs and amputations [43]. Kristin S. Reid et al also suggest for early detection and prevention of foot complications [54]. In the present study, our observations are that the best treatment of DFIs is prevention, timely treatment (medical/surgical) of complications if it occurs. Prevention needs public/patient's awareness about DM and its complications, foot care, change in lifestyle especially of DM patients which consists,

avoiding food items that increase blood sugar level, routine exercise, etc. Prevention programs also include training of general practitioners (G.P) in DM and arrangement for concerned consultants (physicians and surgeons) and full facility arrangement of medical/ surgical treatment including medicine at nearby health facility and arrangement for public awareness at government level.

**CONCLUSION:**

Diabetes mellitus (DM) is a major public health problem globally. Its complications especially diabetic foot complications are more common in diabetic patients. In present study which was conducted from district Naushahro feroze, it is concluded that the type II diabetes mellitus is more common as compared to type I. The study depends on 74 cases. Male were more suffered from DM and foot complications than female (out of 74 patients, 44 patients were male and 32 female patients were infected).The commonest foot complications were DFU/wound infection and gangrene. The causes of these infections are: patients usually are very careless about their infections or disease, self-treatment by using different herbs and leaves of plants or trees, mostly patients use ill-fitting shoes or walking bare feet, patients are very careless about their hygienic condition, lack of knowledge about DM and its complications, lack of awareness, poverty and deliberate delay in referral by general practitioner (G.P), sedentary lifestyle of higher economic class, excessive use of potatoes, rice, sugar (common in Rural/urban population) are probably important causes of Hyperglycemia/DM and its complications especially foot complications. Public awareness is strongly recommended in district Naushahro Feroze.

**SUGGESTIONS & FUTURE DIRECTIONS:**

➢The golden rule prevention is better than cure is still true in the management of diabetic foot complications.

➢Prevention and treatment of diabetic foot must follow international standards.

➢Prevention includes following:

i. Public awareness on government level for diabetes and its complications especially foot complications which includes:
   a. Arrangement of seminars / training programs for local doctors and paramedic staff so that they know about DM and its complications and help in early diagnosis of foot complications and refer to consultant.
   b. Posting of specialists / consultants of different specialty e.g., general surgeon, orthopedic surgeon, physician specially trained in DM, podologist (foot specialist), physiotherapist etc.
   c. Provide full laboratory (lab) facility in governmental hospitals.
   d. Medicine required must be available.
   e. Arrangement of seminars for public awareness about DM.

ii. Patient should be trained in:
   a. Foot care (daily assessment of their feet).
   b. Improve personal hygiene.
   c. Control hyperglycemia.
   d. Must have sufficient knowledge about DM and its complications specially foot complications.
   e. Avoid ill-fitting shoes.
   f. Avoid walking bare feet.

**REFRENCES:**

[1]. Hall JE. Insulin, Glucagon and Diabetes mellitus.In Guyton and Hall Text Book of Medical Physiology. 13th edition, Vol: II, P-983-99.

[2]. Reec JB, Urry LA, Cain ML et al: Disease Diabetes mellitus: In Campbell Biology, 9th edition 2011, p-1029

[3]. Begum S, Zubair M, Alamri MM, Husain FM, Fatima F, Oves M, Ansari MA & Hassan I: Diabetic foot complication in Asia and European continents: Diabetic foot ulcer; 6 October 2020; pp 3-28.

[4]. CW Ma R & CN Chan J: Type 2 Diabetes in East Asians: Similarities and differences with population in Europe and the United States: Ann NY Acad Sci 2013 Apr:1281 (1): 64-91.

[5]. The challenge of Diabetes: The Data & statistics-WHO/Europe/Diabetes.

[6]. Papatheodorous K, Banach M, Bekiari E, Rizzo M & Edmonds M:Volume 2018.Complications of Diabetes 2017. (https://doi.org/10.1155/2018/3086167 )

[7]. RamChandran A & Chamukuttan S: Trends in prevalence of Diabetes in Asian Countries: World Journal of Diabetes: June 2012, 3(6): 110-117
[8]. Rhee EJ. Diabetes in Asians: Endocrinal Metab.2015 September: 30(3): 263-269.
[9]. Mendes JJ & Neves J. Diabetic foot infections: Current Diagnosis and Treatment: The Journal of Diabetic Foot Complications, 2012; vol 4, Issue 2, No. 1, pp 26-45.
[10]. Rossboth S, Lechleirtner M & Oberaigner W: Risk factors for diabetic foot complications in type 2 Diabetes – A systematic review; Endocrinology, Diabetes and metabolism vol: 4, 17 August 2020, pp 432-438.
[11]. Al Wahbi A: Autoamputation of Diabetic toe with dry gangrene: a myth or a fact? Syndr Obes, 2018; 11: 255-264.
[12]. Birke JA, Novick A, Hawkins ES & Patout Jr C: A Review of causes of Foot ulceration in patients with Diabetes mellitus. JPO, Journal of prosthetics and orthotics, vol:4 number:1, pp:13-22.
[13]. AL-Rubeaan K, AL-Derwish M, Ouizi S, Youssef AM, Subhan SN, Subhani SN, Ibrahim HM & Alamri BN: Diabetic foot complications and their risk factors from a large Retrospective cohort study: 6 May 2015.https://doi.org/10.1371/journal,pone.0124446.
[14]. TA low K, & Peh CGW: Magnetic resonance imaging of diabetic foot complications; Singapore Med J. 2015 Jan; 56(1): 23-34.
[15]. Pourkanzemi A, Ghanbari A, Khojamli M, Balo H, Hemmati H, Jafaryparvar Z & Motamed B: Diabetic foot care: knowledge and practice; BMC Endocrine Disorders: 20 March 2020, vol: 20, pp 102-109.
[16]. Fryberg RG, Armstrong DG, Giurini J, Edwards A, Kravette M, Kravitz S, Ross C, Stavosky J Stuck R & Vanore J: Diabetic foot disorders: a clinical practice guideline. American college of foot and ankle surgeons: The journal of foot and ankle surgery. 1 Jan 2000, 39(5 suppl): S1-60.
[17]. Besse J.-L, Leemrijse T & Deleu P.-A: Diabetic foot: The orthopedic surgery angle; orthopedics and traumatology: surgery & research; vol: 97, issue 3, May 2011, pp 314-329.
[18]. Stettler C, Christ E & Diem P: The Diabetic foot: The Never- Ending Challenge; Novelties in Diabetes. Endocr Dev.Basel, Karger 2016, vol: 31, pp 108- 134.
[19]. Adam M, Eddie Y.K. Ng, Tan JH, Heng ML, Tong J W.K Acharya UR: Computer aided diagnosis of diabetic foot using infrared thermography: A review; Computers in Biology and Medicine; vol 91, 1 December 2017, pp 326-336.
[20]. DeFronzo RA & Reasner C; The Diabetes Control and Complications Trial Study: Implications for the diabetic foot; The Journal of Foot and Ankle Surgery; 1 Nov 1994, 33(6): 551-556.
[21]. Sibbald G, Mayer D, Goodman L, Dch MB and Armstrong DG, Boeni T, Aiello EA & Kirsner RS: Diabetic foot ulcers: Part I. Pathophysiology and prevention. Journal of American Academy of Dermatology; vol: 70, issue 1, January 2014, pp 1.e1-1. e18.
[22]. Hadadi A, Ghiasi HO, Hajiabdolbaghi M, Zandekarimi M and Hamidian R. Diabetic Foot: Infections and Outcomes in Iranian Admitted Patients: Jundishapur J Microbial. 2014 July; 7(7): e 11680.
[23]. Allen L, Johnson T.M, Vaughan C and Mirk, A.K: Improving geriatric telehealth support for older, rural veterans at risk of diabetic foot complications: Journal of the American Geriatrics society; 69(suppl 1): S80, 2021.
[24]. Lipsky BA, Senneville E, Abbas ZG, Sanchez JA, Diggle M, Embil JM, Lavery LA, Malone M, Asten SA. V, Rovan U & Peters EJ. G: Guidelines on the diagnosis and treatment of foot infection in persons with diabetes (IWGDF 2019 update). International Working Group on the Diabetic Foot: 16 March 2020, pp (754-56).

[25]. Levy MJ & Valabhaji J: The Diabetic Foot. Surgery (Oxford) vol: 26, Issue 1, January 2008, pp (25- 28).
[26]. Pendsey SP: Understanding Diabetic foot: int journal diabetes Dev ctries- 2021 apr-jun; 30(2), pp 75-79.
[27]. Papanas N & Maltezos E; The Diabetic Foot: Established and Emerging Treatments: Int: J. of Clinical and Laboratory Medicine; vol: 62, 2007- pp 230-238.
[28]. Apelqvist J; Diagnostics and Treatment of the Diabetic Foot: Endocrine; 25 February 2012, vol: 41, pp (384-397).
[29]. Lobmann R, Schultz G & Lehnert H; Proteases and the Diabetic Foot Syndrome: Mechanisms and Therapeutic Implications: Diabetes Care 2005 Feb; 28(2), 461-471.
[30]. Ahmad J; The Diabetic foot: Diabetes Metab Syndr: Jan-Mar 2016:10(1): 48-60.
[31]. Paola D, Luca, Faglia & Ezio: Treatment of Diabetic Foot Ulcer: An Overview Strategies for Clinical Approach; Current Diabetes Review, vol: 2, Number: 4, 2006, pp 431-447(17).
[32]. Petrakis I, Kyriopoulos IJ, Ginis A and Athanasakis K: Losing of foot versus losing of dollar; a systematic review of cost studies in Diabetic foot complications; national library of medicine: 2017 Apr: 17(2): 165-180.
[33]. Papatheodorou K, Banach M, Bekiari E, Rizzo M & Edmonds M: Complications of Diabetes 2017; J Diabetes Res. 11 Mar 2018. Vol; 38, pp 12-17.
[34]. Giurini JM and Lyons TE: Diabetic foot complications: Diagnosis and management: Int J low Extreme wounds. 2005 September: 4(3):171-82.
[35]. Nather A, Cao S, Chen J L W & Low AY: Prevention of Diabetic foot complications; Singapore med J: 30 2018 Jun; 59(6):pp 291-294.
[36]. Huang YY, Lin CW, Yang HM, Hung SY & Chen I-W: Survival and associated risk factors in patients with Diabetes and amputation caused by infectious foot gangrene; Journal of Foot and Ankle Research; 04 Jan 2018; vol: 11, pp 21-22.
[37]. Olokoba AB, Obateru OA & Olokoba LB: Type 2 Diabetes mellitus: A Review of current trends: Oman Med j.2012 Jul; 27(4): 269-273.
[38]. Mclnnes AD: Diabetic foot disease in the United Kingdom: about time to put feet first; Journal of foot and ankle Research 11 oct 2012, vol: 5 article number: 26(2012).
[39]. Jain AKC: A new classification of diabetic foot complications: A simple and effective teaching tool; The Journal of Diabetes foot Complications, 2012; vol: 4, Issue 1, no.1, pp 1-5.
[40]. Armstrong DG & Lipsky BA: Diabetic foot infections: stepwise medical and surgical management; Int: Wound Journal (IWJ) 30 June 2004, vol: 1, pp 123-132.
[41]. Al-Shammaree SAW, Abu-Alkaseem BA & Salman IN: Procalcitonin levels and other biochemical parameters in patients with or without diabetic foot complications; J Res Med Sci.16 Aug 2017; 22: 95.
[42]. Lavoie HM, Ramsey A, Nguyen M & Singh S: Diabetic foot infections; In: stat pearls (Internet). Treasure Island (FL) Jan 2021, Jul 2021.
[43]. Liu C, Netten JJV, Baal JGV, Bus SA & Heijden FVD: Automatic detection of diabetic foot complications with infrared thermography by asymmetric analysis; J. OF biomedical Optics, 11 Feb 2015, 20(2), 026003.
[44]. Armstrong DG, Swerdlow MA, Conte MS, Pandula WV & Bus SA: Five-year mortality and direct cost of care for people with diabetic foot complications are comparable to cancer;Journal of Foot and Ankle Research; vol: 13 Article number: 16(2020) pp 203-208.

[45]. Jyothylekshmy V, Menon AS & Abraham S: Epidemiology of diabetic foot complications in a podiatry clinic of a tertiary hospital in South India; Indian Journal of Health Science and Biomedical Research 2015, vol: 8, Issue 1: pp: 48-51.

[46]. Lavery LA, Ryan EC, Ahn J, Crisologo PA & oz OK: The Infected Diabetic Foot: Re-evaluating the infectious Diseases Society of America Diabetic Foot Infection Classification; Clinical Infectious Diseases, vol: 70, Issue 8, 15 Apr 2020, pp 1573-1579.

[47]. Uckay I, Sanchez JA, Lew D & Lipsky BA: Diabetic foot infections: What have we learned in the last 30 years? Int: J of Infectious Diseases; vol: 40, Nov 2015, pp 81-91.

[48]. Uysal S, Tasbakan MI, Cetinkalp S, Simsir IY & Ozturk AM: Risk factors for amputation in patients with diabetic foot infection: a prospective study; Int. Wound J. 2017 Dec: 14 (6): 1219-1224.

[49]. Hurlow JJ, Humphreys GJ, Bowling FL & McBain AJ: Diabetic foot infection: A critical complication: Int. Wound J. 2018 Oct 15(5): 814-821.

[50]. Lipsky BA, Berendt AR, Cornia PB, Pile JC & Peters E J.G: 2012 Infectious Diseases Society of America Clinical Practice Guideline for the Diagnosis and Treatment of Diabetic Foot Infections; Clinical Infectious Disease, vol: 54, Issue 12, 15 June 2012, pp 132-173.

[51]. Bader MS & John's St: Diabetic foot Infection; Am Fam Physician. 2008 July 1; 78 (1):71-79.

[52]. Richard J-L, Sotto A & Lavigne J-P: New insights in Diabetic foot infection; World Diabetes: 2011 Feb 15; 2(2): pp: 24-32.

[53]. Leone A, Vitiello C, Gulli C, Sikora AK, Macagnino S & Colosimo C; Bone and soft tissue infections in patients with diabetic foot: La radiologia medica vol: 125, pp 177- 187(2020).

[54]. Reid KS, Martin BD & Duerksen F: Diabetic foot complication in a Northern Canadian Aboriginal Community: Foot and Ankle Int: Dec 1, 2006: 27 (12): 1065-73.

[55]. Zhang P, Lu J, Jing Y, Tang S, Zhu D & Bi Y: Global epidemiology of diabetic foot ulceration: a systematic review and meta-analysis; Anna of Med: vol: 49, 2017-issue 2, pp 106-116