



CODEN [USA]: IAJ PBB

ISSN: 2349-7750

## INDO AMERICAN JOURNAL OF PHARMACEUTICAL SCIENCES

<http://doi.org/10.5281/zenodo.3339381>

Available online at: <http://www.iajps.com>

*Research Article*

### INDICATIONS OF DIABETIC FOOT AMPUTATION IN AL MADINAH

Mohammed khalid zaki<sup>1</sup>, Abdullah Faisal Essa<sup>2</sup>, Abdullah Saeed omayr Alsaedi<sup>3</sup>, Osama  
Abdullah Omar Bashrahil<sup>4</sup>, Jebreel Mohammed Fallatah<sup>5</sup>, Faisal Abdullah AL-Johany<sup>6</sup>,  
Abdulaziz Yousef Aljazaeri<sup>7</sup>

<sup>1</sup>m\_kzaki@yahoo.com

<sup>2</sup>Afi.34@hotmail.com, +966554355993

<sup>3</sup>Abdullahsa2010@windowslive.com+966580414434

<sup>4</sup>Bashrahil-sr@hotmail.com, +966501821977

<sup>5</sup>Dr.gebo@windowslive.com, +966563553357

<sup>6</sup>alkalby.121@gmail.com, +966543074121

<sup>7</sup>azzo.azooz@hotmail.com,+966544108404

**Article Received:** May 2019

**Accepted:** June 2019

**Published:** July 2019

**Introduction** Diabetes mellitus is a chronic disease affects most of the body organs. Foot is common organ that affected by diabetes. It is estimated that there are about 200 million diabetics worldwide.

**Methods** This retrospective study involved 157 patients carried out in AL-Madinah leading centers; King Fahad hospital, and Miqat hospital. The information were extracted from patients' files regarding the presence of ischemia, bacterial infection, and neuropathy. We included the patients who met the criteria within the period between 2015 to 2018, who underwent amputation in ALMadinah.

**Results** We collected 157 patients underwent amputation due to diabetic foot from King Fahad Hospital (KFH) and Miqat hospital. 134 (85.4%) of them gathered from Miqat Hospital while 23 (14.6%) of them collected from KFH. In the indication of diabetic foot amputation, Ischemia (73.9%), bacterial infection (81.5%) are represented main indications as they signifies higher ratings. according to the culture and sensitivity, the most common organism in diabetic foot infection were as follows; streptococcus (84.63%), staph aureus (17.9%), E-coli (15.4%), Enterobacter (12.8%) and other type of organism (23.1%)

**Conclusion** Indication of diabetic foot amputation had been identified as; Ischemia, bacterial infection, neuropathy. The study showed the main identifier of ischemia were clinical judgment and investigations like ankle-brachial pressure index and transcutaneous oxygen measurements were not used for evaluation of ischemia and predict the viability of the tissues, Attempts at revascularization which could preserve limbs from amputation were also not done.

**Keywords** Diabetic foot, Amputation, Indication, Surveillance, Microorganisms, Infection.

#### Corresponding author:

Mohammed khalid zaki,  
[m\\_kzaki@yahoo.com](mailto:m_kzaki@yahoo.com)

QR code



Please cite this article in press Mohammed khalid zaki *et al.*, *Indications Of Diabetic Foot Amputation In Al Madinah.*, *Indo Am. J. P. Sci.*, 2019; 06[07].

## INTRODUCTION:

Diabetes mellitus is a chronic disease that affects most of the body organs. One of these organs is the foot; a case which is medically known as diabetic foot. It is estimated that there are about 200 million diabetics worldwide [1-6].

Diabetic foot results in amputation in a considerable number of cases. Over the past decade diabetic foot amputation ranged from 1.5 to 3.5 events per 1000 persons per year [7].

Diabetic foot complications contribute to both mortality and morbidity among the diabetic population leading to physical, physiological and financial burden for patients and government [6-8].

2.5% of patients suffering from diabetes will develop diabetic foot ulcer every year, and 15% will be affected during their live time [9-10].

20% to 50% of patients with diabetic foot ulcer will eventually undergo amputation. [11-13] Infected diabetic foot ulcers are responsible of 60% of non-traumatic lower limb amputation [14].

About half a million cases of diabetes-related amputation of lower limbs are likely to occur in the Middle East and North Africa over the coming decade [15].

In KSA, Riyadh city there are 90 diabetic amputations every month, performed only in one center (National Guard Hospital) [16].

Pathophysiology: ischemia due to atheroma, peripheral neuropathy and immunosuppression as a result of increased glucose levels in tissues make patients more prone to the infection. The combination of these three factors is related to the amputation in diabetic patient [17].

Several factors in the assessment of diabetic foot prior to proceeding to amputation are done to evaluate the need and extent of the amputation including vascular assessment (ankle-brachial pressure index, transcutaneous oxygen measurements, & Doppler ultrasound), as well as culture and sensitivity [18-21].

All previous points are alarming of the great danger of diabetic foot amputation and lack of local studies about it in KSA and AL-Madinah specially, increase the importance of searching about it.

## Methods:

The study is conducted through retrospective analysis carried out in AL-Madinah leading centers; King Fahad hospital and Miqat hospital; to cover the expected sample which is 153 patients at least, because the p value is 0.05 and the power of the study or the confidence level 0.80 and population size is 3970 case. This study was approved by Taibah university scientific research ethics committee and Institutional Review Board, General Directorate of Health Affairs. The information were extracted from patients' files regarding the presence of ischemia, bacterial infection, & neuropathy (information related to guidelines). We included the patients who met the criteria within the period between 2015 to 2018, who underwent amputation in ALMadinah. Lower extremity amputation is defined as resection of any segment of the lower extremity with removal of bone. Minor amputation was defined as any amputation that preserves the ankle joint with an intact healed wound. Major amputation was defined as any amputation that interferes with the ankle joint. In this study, we included all types of Lower extremity amputation (toe, metatarsal, below knee, above knee....), but we excluded the cases of reamputation, or amputations done for reasons other than diabetes. The expected outcome of the assessment is to find the indication of the amputation in our local community.

## Statistical Analysis Method

MS excel had been used for gathering of data and after necessary data cleaning and data recording, it was then exported to Statistical Packages for Social Sciences (SPSS) version 21 for further tabulation and subsequently for statistical data analyses. Descriptive statistics had been conducted for the frequency tabulation of all categorical variables and mean  $\pm$  standard deviation for all continuous variables. P-0.05 had been used to determine the level of significance for all statistical tests.

The assessment of indication of diabetic foot amputation which was comprised of 7 predictor variables such as; Ischemia, Neuropathy, bacterial infection, pus, pulse, Doppler ultrasound and culture and sensitivity. These variables which were composed of two categories as "yes" coded as 1 and "no" coded as 0.

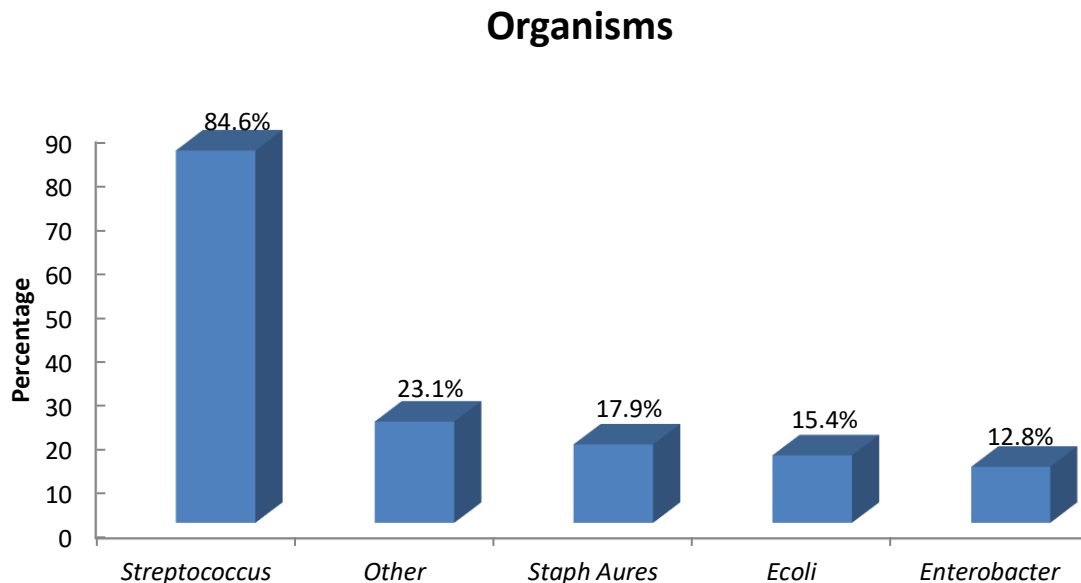
Relationship of level of compliance against its risk factors was conducted using chi-square test with p-values which signifies whether the relationship is statistically significant. Regression analysis was reported as well with odds ratio and confidence interval had also been described.

**RESULTS:**

Table 1: Description of socio demographic variables

Study Variables	N (%) (n=157)
Hospital site	
• King Fahad Hospital	23 (14.6%)
• Miqat Hospital	134 (85.4%)
	mean $\pm$ standard deviation
Systolic Blood Pressure (SBP)	140.4 $\pm$ 22.8
Diastolic Blood Pressure (DBP)	75.4 $\pm$ 12.5
Blood glucose value	251.7 $\pm$ 80.2
Name of organism for culture and sensitivity	
<i>Streptococcus</i>	33 (84.6%)
<i>Staph Aures</i>	07 (17.9%)
<i>Ecoli</i>	06 (15.4%)
<i>Enterobacter</i>	05 (12.8%)
Other	09 (23.1%)

Figure 1: Distribution of name of organism for culture and sensitivity



We collected 157 patients who underwent amputation because of diabetic foot from King Fahad Hospital (KFH) and Miqat hospital in Al Madinah, Saudi Arabia. Of the 157 patients, 134 (85.4%) of them gathered from Miqat Hospital while 23 (14.6%) of them collected from KFH. According to measurement of blood pressure, the mean value of SBP was 140.4 mmHg (SD 22.8) while the mean value of DBP was 75.4 mmHg (SD 12.5). Adherence to blood glucose shows mean value was 251.7 mg/dL (SD 80.2) and the transcutaneous oxygen measurements wasn't done to any patient in study sample. Based on the culture and sensitivity, the most common organism in diabetic foot infection were as follows; *streptococcus* on 33 (84.63%) patients, *staph aureus* on 07 (17.9%) patients, *Ecoli* on 06 (15.4%) patients, *Enterobacter* on 05 (12.8%) and other type of organism on 09 (23.1%) patients (Figure 1)

Table 2: Indication of diabetic foot amputation and its clinical risk factors <sup>(n=157)</sup>

Characteristics	Yes N (%)	No N (%)
Indication of diabetic foot amputation		
Ischemia	116 (73.9%)	41 (26.1%)
Bacterial Infection	128 (81.5%)	29 (18.5%)
Neuropathy	2 (1.3%)	155 (98.7%)
Evidence of bacterial infection		
Pus	128 (100%)	0
Wet gangrene	89 (69.5%)	39 (30.5%)
Culture and sensitivity	39 (30.5%)	118 (69.5%)
Evidence of ischemia		
Pulseless ( gangrene )	103 (88.8%)	13 (11.2%)
Doppler ultrasound	30 (25.9%)	86 (74.1%)
Ankle brachial pressure index	0	157 (100%)
Transcutaneous oxygen measurements	0	157 (100%)

Table 2 presented the indication of diabetic foot amputation and its evidence. Listed variables exemplified whether the patients is indicated for diabetic foot amputation. In the indication of diabetic foot amputation, Ischemia (73.9%), bacterial infection (81.5%) and represented main indications as they signifies higher ratings on yes group. For the evidence of bacterial infection, the pus was the main identifier for infection in all cases (100%), followed by presence of wet gangrene (69.5%) and culture and sensitivity (30.5%). Pulseless ( gangrene ) is the principal evidence of ischemia (88.8%), in addition to Doppler ultrasound (25.9%), while Ankle brachial pressure index (0) and transcutaneous oxygen measurements (0) were not used for evaluation of ischemia.

### DISCUSSION:

The finding of this study shows, Ischemia, bacterial infection ,neuropathy and the combination of ischemia and bacterial infection were the predictors of diabetic foot amputation whereas risk factors of this disease revealed, hypertension, increased blood glucose.

In this study we found that the main indications for diabetic foot amputation in ALMadinah are combination of ischemia and bacterial infection followed by isolated bacterial infection, ischemia and to lesser extent neuropathy.

Among 157 patients in ALMadinah, diabetic foot amputation was indicated because of combination of bacterial infection and ischemia simultaneously in 89 patients ( 56.7%). While bacterial infection alone was indicated in 39 patients ( 24.8%). In addition, isolated

ischemia was the indication in 27 patients (17.2%), and lastly neuropathy indication in 2 patients (1.3%).

According to cross sectional study done in Malaysia, out of 218 patients underwent amputation, ischemia was not significant factor for amputation because 30 (13.8%) patients with gangrene underwent lower limb amputation compared to 188 (86.2%) patients without gangrene.[22] In contrast to this study result where gangrene affected significant number, 116 (73.9%) of patients in this study. Ankle-Brachial index and Doppler ultrasound were used for assessment of ischemia in all patients, which was more sensitive in ischemia compared to Doppler ultrasound which was used alone in 30 (25.9%) patients.

In study done in Saudi Arabia, Jeddah, out of 27 patients underwent lower extremity amputation the number of cases presented with foot infection was 18 (66.7%) and it was considered as major indication for amputation similarly to this study result (81.5%).[23] Similarity of population, socioeconomic status and ethnicity in both studies make the similarity of the result more reasonable.

A study done in Pakistan revealed that number of neuropathic feet under went amputation was 38 (35%) out of 110 patients which is clearly different from the result of this study which revealed 2 (1.3%) patients underwent lower extremity amputation because of neuropathic feet out of 157 patients.[24] Lack of neurological examination or documented neurological examination could be responsible for discrepancy in the result.

This study showed that the level of blood glucose was associated with increase the risk of lower extremity amputation with mean value reaching  $251.7 \pm 80.2$ . Study in Costa Rica mentioned that blood Glucose level (mean  $\pm$ SD)  $235.8 \pm 82.7$ (mg/dL) was elevated in amputees compared to  $177.3 \pm 79.4$ (mg/dL) in non-amputees.[25]

In this study we found that increased blood pressure is directly proportional with increased risk of amputation in diabetic foot. The mean value of systolic blood pressure was  $140.4 \pm 22.8$  and diastolic blood pressure was  $75.4 \pm 12.5$ . Compared to a study was done in India showed that from 50 patient with hypertension there are 31 patients (32.9%) of them had of amputation and the mean value of systolic blood pressure was  $134.4 \pm 23.9$  and diastolic blood pressure was  $80.9 \pm 12.2$ . [26]

In comparison with study done in Irbid, Jordan1, they found that the combination of bacterial infection and ischemia is present in 15 patients (57.7%) out of 26 patients underwent amputation. While bacterial infection alone was indicated in 5 patients (19.2%). Ischemia alone was indicated in 6 patients (23.1%). Both studies have similar results because we have almost the same retrospective study design. Results were almost the same because of both studies conducted in retrospective method, same geographic distribution.[27]

We compared the results of this study to the study which was done in Riyadh, it was found that the most common bacteria which cause bacterial infection in diabetic foot were: streptococcus 84.63%, staph aureus 17.9%, Ecoli 15.4%, Enterobacter 12.8%. Comparing to the results in Prince Sultan Military Medical City,

Riyadh which are: Staphylococcus aureus (35%), Pseudomonas aeruginosa (15.6%), Group B Streptococcus (8.9%), MRSA (7.5%).[28]

Also, we compared the results of this study to a study done in Rio de Janeiro in Brazil, it was found that the most common bacteria which cause bacterial infection in diabetic foot in this study were : (33) streptococcus 84.63% , (7) staph aureus 17.9%, (6) Ecoli 15.4%, (5) Enterobacter 12.8%. comparing to the results in Rio de Janeiro which were : (19) Acinetobacterspp.n 24.4% , (19) Morganellaspp.n 24.4% , (18) Proteusspp.n 23.1% , (15) Enterococusspp.n 19.2%. [29]

The assessment of diabetic foot ulcer wasn't according to Wagner wound classification system in Al-Madinah. In addition, the severity of foot ulcer, measured by the Wagner wound classification system, was positively associated with likelihood of Lower Extremity Amputation, adding further evidence for the use of multiple physical examination in Lower Extremity Amputation prediction. Study in Jeddah revealed that out of 27 patients underwent of Lower Extremity Amputation, patient with grade 1 didn't need to undergo amputation, while 7 (25.9%) patients with grade 2 underwent amputation, 13 (48.1%) patients with grade 3 underwent amputation and 7 (25.9) patients with grade 4 underwent amputation.[23]

Furthermore, for each unit increment in Wagner grade, there was a 65% increase in the risk of foot amputation in patients admitted with infectious complications in a lower limb.[30]

Several studies worldwide showed other methods of treatment instead of amputation such as revascularization can be used to save limbs. In this study showed that transcutaneous oxygen measurement was not used in Madinah hospitals (KFH, MEQ) as investigation for evaluation of diabetic foot. While in study was done in CHINA found that  $TcPo_2 \geq 40$  mmHg was associated with diabetic foot ulcer healing, but a  $TcPo_2 \leq 10$  mmHg was associated with failure of wound healing. That study found that a cut-point of 25 mmHg was most predictive of diabetic foot ulcer healing.[31] And due to lack of similar investigations the chances of revascularization were almost not considered which can preserve limbs of amputation as this study from Hanyang University Guri Hospital that performed for 263 patients , 54 patient underwent for revascularization surgery and 47 patient of them had successful revascularization which lead to improving blood flow.[32]

**CONCLUSION:**

Several factors have to be assessed carefully prior to any surgical amputation of diabetic foot. Indication of diabetic foot amputation had been identified in this study such as; Ischemia, bacterial infection, neuropathy and most cases were indicated because of combination of Ischemia and bacterial infection. This study also reported that the main identifier of ischemia was clinical judgment and investigation like Ankle brachial pressure index and transcutaneous oxygen measurements were not used for evaluation of ischemia and predict the viability of the tissues, Attempts at revascularization which could preserve limbs from amputation were also not done. Hence, further research and investigation in the subject are needed to validate these findings.

**Recommendation:**

We recommend that each patient with diabetic foot ulcer undergo full neurological assessment for lower extremity and according to Wagner wound classification system. Also, each diabetic foot ulcer should be sampled for culture and sensitivity. Investigation tools like Ankle brachial pressure index and transcutaneous oxygen measurements should be used for assessing ischemia more accurately and objectively. Different modalities of revascularization could be done prior the decision of amputation is made that may save significant number of limbs.

**ACKNOWLEDGMENTS:**

We acknowledge Dr. Mohammed Khaled Zaky for his efforts as a supervisor, and for supporting us during the project, and Taibah University, administration of King Fahad Hospital and administration Meqat hospital for provide us the resource of database. We also would to thank Dr. Ahmed Hamed for facilitating this project in King Fahad Hospital.

**REFERENCES:**

- 1- Apelqvist J, Bakker K, van Houtum WH, Nabuurs-Franssen MH, Schaper NC. International consensus and practical guidelines on the management and the prevention of the diabetic foot. *Diabetes MetabRes Rev* 2000; 16(Suppl 1):S84-92.
- 2- Lantion-Ang LC. Epidemiology of diabetes mellitus in Western pacific region: focus on Philippines. *Diabetes Res ClinPract.* 2000;50Suppl 2:S29-S34. [PubMed].
- 3- Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care.* 2004;27:1047-1053. [PubMed].
- 4- Kumanyika S, Jeffery RW, Morabia A, Ritenbaugh C, Antipatis VJ, Public Health Approaches to the

- Prevention of Obesity (PHAPO) Working Group of the International Obesity Task Force (IOTF) Obesity prevention: the case for action. *Int J ObesRelatMetabDisord.* 2002;26:425-436. [PubMed]
- 5- Saxena M, Agrawal CG, Gautam S, Bid HK, Banerjee M. Overt diabetic complications in obese type 2 diabetes mellitus patients from North India. *Arch ApplSci Res.* 2009;1:57-66.
- 6- Sargen M, Hoffstad O, Margolis D. Geographic variation in Medicare spending and mortality for diabetic patients with foot ulcers and amputations. *Journal of Diabetes and its Complications.* 2013;27(2):128-133.
- 7- Moxey P, Gogalniceanu P, Hinchliffe R, Loftus I, Jones K, Thompson M et al. Lower extremity amputations - a review of global variability in incidence. *Diabetic Medicine.* 2011;28(10):1144-1153..
- 8- Gordois A, Scuffham P, Shearer A, Oglesby A, Tobian JA. The health care costs of diabetic peripheral neuropathy in the US. *Diabetes Care.* 2003;26: 1790-1795. [PubMed].
- 9- Shojaiefard A, Khorgami Z, Larijani B. Independent risk factors for amputation in diabetic foot. *International Journal of Diabetes in Developing Countries.* 2008;28(2):32.
- 10- Yesil S, Akinci B, Yener S, Bayraktar F, Karabay O, Havitcioglu H et al. Predictors of amputation in diabetics with foot ulcer: Single center experience in a large Turkish cohort. *HORMONES.* 2009;8(4):286-295.
- 11- Ashraf MN, Rehman K, Malik KI, Iqbal GS. Epidemiology and outcome in patients of diabetic foot. *J Ayub Med Coll Abbottabad.* 2011; 23(1):122-4.
- 12- Nontraumatic lower extremity amputations in diabetic and non-diabetic subjects in Madrid, Spain. - PubMed
- 13- Sämman A, Tajiyeva O, Müller N, Tschauner T, Hoyer H, Wolf G et al. Prevalence of the diabetic foot syndrome at the primary care level in Germany: a cross-sectional study. *Diabetic Medicine.* 2008;25(5):557-563.
- 14- Mottola C, Mendes J, Cristino J, Cavaco-Silva P, Tavares L, Oliveira M. Polymicrobial biofilms by diabetic foot clinical isolates. *Folia Microbiologica.* 2015;61(1):35-43.
- 15- Alzahrani, H. Diabetes-Related Lower Extremities Amputations in Saudi Arabia: The Magnitude of the Problem. *Ann Vasc Dis* 2012; 5:151-156
- 16- Aboalfotouh, M., Alfaihi, S., and Al-Gannas, A. "Risk Factors of Diabetic Foot in Central Saudi Arabia." *Saudi Medical Journal* 32 (7) 2011: 708-13.

- 17- Williams N, O'Connell P, McCaskie A. Bailey & Love's short practice of surgery. London, CRC press. 2015.
- 18- Sacks D, Haskal Z. Peripheral Arterial Disease Practice Guidelines and Sausage. *Journal of Vascular and Interventional Radiology*. 2006;17(9):1379-1381..
- 19- Bargellini I, Piaggese A, Cicorelli A, Rizzo L, Cervelli R, Iacopi E et al. Predictive value of angiographic scores for the integrated management of the ischemic diabetic foot. *Journal of Vascular Surgery*. 2013;57(5):1204-1212.
- 20- Pinzur M, Gottschalk F, Guedes de S. Pinto M, Smith D. Controversies in Lower-Extremity Amputation. *The Journal of Bone and Joint Surgery-American Volume*. 2007;89(5):1117-1127..
- 21- Sumpio B, Lee T, Blume P. Vascular evaluation and arterial reconstruction of the diabetic foot. *Clinics in Podiatric Medicine and Surgery*. 2003;20(4):689-708.
- 22- Yusof NM, Rahman JA, Zulkifly AH, Che-Ahmad A, Khalid KA, Sulong AF. Vijayasingham 3. Predictors of major lower limb amputation among type II diabetic patients admitted for diabetic foot problems. *Singapore Med J* 2015;56:626–31.
- 23- Wang, D., Jamjoom, R., Alzahrani, A., Hu, F. and Alzahrani, H. (2015). Prevalence and Correlates of Lower-Extremity Amputation in Patients With Diabetic Foot Ulcer in Jeddah, Saudi Arabia. *The International Journal of Lower Extremity Wounds*, 15(1), pp.26-33.
- 24- SALEEM, S., HAYAT, N., AHMED, I., AHMED, T. and REHAN, A. (2017). Risk factors associated with poor outcome in diabetic foot ulcer patients. *TURKISH JOURNAL OF MEDICAL SCIENCES*, 47, pp.826-831.
- 25- Laclé, A. and Valero-Juan, L. (2012). Diabetes-related lower-extremity amputation incidence and risk factors: a prospective seven-year study in Costa Rica. *Revista Panamericana de Salud Pública*, 32(3), pp.192-198.
- 26- Pemayun, T., Naibaho, R., Novitasari, D., Amin, N. and Minuljo, T. (2015). Risk factors for lower extremity amputation in patients with diabetic foot ulcers: a hospital-based case-control study. *Diabetic Foot & Ankle*, 6(1), p.29629.
- 27- Shatnawi, N., Al-Zoubi, N., Hawamdeh, H., Khader, Y., Gharaibeh, K. and Heis, H. (2018). Predictors of major lower limb amputation in type 2 diabetic patients referred for hospital care with diabetic foot syndrome. *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*, Volume 11, pp.313-319.
- 28- Al Ayed, M., Ababneh, M., Alwin Robert, A., Alzaid, A., Ahmed, R., Salman, A., Musallam, M. and Al Dawish, M. (2018). Common Pathogens and Antibiotic Sensitivity Profiles of Infected Diabetic Foot Ulcers in Saudi Arabia. *The International Journal of Lower Extremity Wounds*, 17(3), pp.161-168.
- 29- CARDOSO, N., CISNEIROS, L., MACHADO, C., CENEDEZI, J., PROCÓPIO, R. and NAVARRO, T. (2017). Bacterial genus is a risk factor for major amputation in patients with diabetic foot. *Revista do Colégio Brasileiro de Cirurgiões*, 44(2), pp.147-153.
- 30- Verrone Quilici, M., Del Fiol, F., Franzin Vieira, A. and Toledo, M. (2016). Risk Factors for Foot Amputation in Patients Hospitalized for Diabetic Foot Infection. *Journal of Diabetes Research*, 2016, pp.1-8.
- 31- Yang, C., Weng, H., Chen, L., Yang, H., Luo, G., Mai, L., Jin, G. and Yan, L. (2013). Transcutaneous Oxygen Pressure Measurement in Diabetic Foot Ulcers. *Journal of Wound, Ostomy and Continence Nursing*, 40(6), pp.585-589.
- 32- Chang, J., Heo, W., Choi, M. and Lee, J. (2018). The appropriate management algorithm for diabetic foot. *Medicine*, 97(27), p.e11454.