

How to Cite:

Samina, Rani, R., Neelam, Alam, M. A., Afzal, N., Qasim, Q. M., & Muhammad, L. (2023). Analysis of patient characteristics and clinical outcome in wound grades of diabetic foot ulcer in Peshawar Khyber Pakhtunkhwa. *International Journal of Health Sciences*, 7(S1), 1430–1437. <https://doi.org/10.53730/ijhs.v7nS1.14361>

Analysis of patient characteristics and clinical outcome in wound grades of diabetic foot ulcer in Peshawar Khyber Pakhtunkhwa

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Abstract---Introduction: Diabetic foot is utmost severe factor of diabetes which has negative consequences on the sufferance's life. Among diabetes serious and life threatening complications, diabetic foot ulcer (DFU) is very serious problem. Macro and micro vascular complications, time period of diabetes mellitus and bordering neuropathy govern the chance of foot ulcer. *Staphylococcus aureus* (a Bacterium) is the main cause of diabetic foot ulcer it has antibiotic

resistance genes which makes it resistant to antibiotics. Diabetic foot ulcer is spread by harmful and lytic way on the host cell. Objective: To analyze the patient characteristics and clinical outcome in wound grades of diabetic foot ulcer. Material and Method: First sample is collected from 150 patients suffering from DFU. Bacterial colonies were obtained from culture. Kirby Bauer disc diffusion method was used to check the antibiotic susceptibility. DNA was extracted and PCR was run to amplify Pantone Valentine Leukocidin gene using primers. Results were analyzed through SPSS version. Results: Total patients were 150. More than 50yrs was the mean age. 51.3% were female and on the other hand, 48.7% were male. Characteristics like age, education, Residence in percent (%) has been describes by tables. Discussion: It was found that patients who were suffering from diabetes mellitus had more chances of having DFU. Many factors including education, longer duration of diabetes mellitus, RBS, Urea, Creatinin, poor glucose control, smoking etc. 92% suffers have T2DM. 1.5(0.76) was Median (IQR) duration. 50% suffers had more than 5 years of diabetic mellitus. Conclusion: Lack of education, residence in rural areas, older age smoking urea RBS were main factors of DFU.

Keywords--patient characteristics, clinical outcome, wound grades, diabetic foot ulcer.

Introduction

Diabetic foot is utmost severe factor of diabetes which has negative consequences on the sufferance's life. It doesn't depend upon age and race races (Abdullah *et al.*, 2021) .35 million American had been affected by diabetes mellitus in 2000 (Dunla *et al.*, 2019). Among diabetes serious and life threatening complications, diabetic foot ulcer (DFU) is very serious problem. It is damage or injury extends below epidermis and dermis layer (Mariam *et al.*, 2017). In type 2 diabetes patients, DFU is considered very common (Zhang *et al.*, 2017). Macro and micro vascular complications, time period of diabetes mellitus and bordering neuropathy govern the chance of foot ulcer (Nongmaithem *et al.*, 2016). Foot ulcer which is caused by diabetes requires 15-20% computation (Mulder *et al.*, 1994).

When there is injury and less foot case, the supply of blood is reduced which leads to the loss of limb and infection (Xie *et al.*, 2021.). All 11.7 % of total population in Pakistan is suffering from type 2 diabetes mellitus, diabetic foot disease is elevated (Meo, Zia, Bukhari, & Arain, 2016). *Staphylococcus aureus* (a Bacterium) is the main cause of diabetic foot ulcer it has antibiotic resistance genes which makes it resistant to antibiotics. Diabetic foot ulcer is spread by harmful and lytic way on the host cell (Shettigar *et al.*, 2016). *Staphylococcus aureus* is a pandemic pathogen, It has the ability to propagate antibiotic resistance it weakens human inflammatory immune response as it has luk F-PV and luk S-PV genes which produce PVL (Livermore, Walsh, Toleman, & Woodford, 2011). PVL is a vital virulent factor that plays vital role in severe skin infections

this toxin damages host defense cell's membranes (Finck-Barbançon, Duportail, Meunier, & Colin, 1993; Fuchs, 2000).

Antibiotic resistance is becoming a crucial issue in India for DFU patients there is no specific research data has been accessible that affirms the existence of Multidrug resistant bacteria (MDR) and also its gene analysis. It is very important to understand the DFU microbial profile in order to save the unnecessary use of resources and avoid antimicrobial resistance (Akash *et al.*, 2020). Mostly DFU is not diagnosed due to ignorance of patients as patients are not able to notice ulcer because they do not feel any pain. It results in late diagnostic of DFU (Anumah *et al.*, 2017). Antimicrobial isolated in DFU and resist rates have not been reported in Khyber Pukhtonkhwa. Information about *Pseudomonas aeruginosa* and small sampling urea was only reported in Peshawar. (Ali, Ahmad, Rahat, & Ahmad, 2021).

Objective

To analyze the patient characteristics and clinical outcome in wound grades of diabetic foot ulcer.

Material and Methods

Patients suffering from diabetes mellitus type II having diabetic foot ulcer (DFU) were considered. First sample is collected from 150 patients suffering from DFU. Sample in cooled container were transported to microbiology laboratory with two hours. Inoculation of sample was done through streak plate method. The streak plate was incubated at 37°C for 24 hours. The isolated bacteria were cultured to obtain pure bacterial colonies. Antibiotic susceptibility was checked by Kirby Bauer Disc Diffusion Method. Inhibition zone was measured and then it was compared with CLST chart. Accuracy and reliability of antibiogram was checked through data positive controls.

From isolates of bacteria, DNA was extracted for genomic DNA conformation, 0.8% agarose gel was used. Then PCR was run. Gene Pantone Valentine Leukocidin was amplified by PCR using specific primers. Amplified product of 433 base pairs was obtained. The calculation of basis parameters and correlation coefficient was done. Results were reported as mean $\pm$ SD data was analyzed through statistical parameters using SPSS version and graphs were obtained accordingly.

Results

Patient's sociodemographic characteristics

	Population	Count	Table N %
Gender	Male	73	48.7%
	Female	77	51.3%

		Male		Female	
		Count	N %	Count	N %
Age n (%)	< 30	4	66.7%	2	33.3%
	31-50	7	38.9%	11	61.1%
	51-65	37	52.9%	33	47.1%
	66-80	17	37.8%	28	62.2%
	>81	8	72.7%	3	27.3%
Education level n (%)	None	12	31.6%	26	68.4%
	Primary	22	41.5%	31	58.5%
	Secondary	30	69.8%	13	30.2%
	Tertiary	9	56.3%	7	43.8%
Residence n (%)	Peshawar	13	43.3%	17	56.7%
	Charsada	10	52.6%	9	47.4%
	Nowshara	5	35.7%	9	64.3%
	Mardan	4	30.8%	9	69.2%
	Kohat	12	63.2%	7	36.8%
	Sawabi	10	52.6%	9	47.4%
	Banu	9	47.4%	10	52.6%
	Hangu	10	58.8%	7	41.2%
		Count	Table Total N %		
Residence	Rural	99	63.1%		
	Urban	51	32.5%		

Total patients were 150. More than 50yrs was the mean age. 51.3% were female and on the other hand, 48.7% were male. Characteristics like age, education, residence in percent (%) has been described by tables.

Clinico-Laboratory Findings

		Count	Table N %
Type of Diabetes Mellitus n (%)	Type 1 DM	6	4.0%
	Type 2 DM	139	92.7%
	Gestation DM	5	3.3%
History of Diabetes Mellitus n (%)	Yes (Previously diagnosed)	126	84.0%
	No(newly diagnosed)	24	16.0%
Duration of DM (Years) median (IQR)	1.5 (0.76)		
Duration of DM (Years) n (%)	<5	75	50.0%
	6 – 10	40	26.7%
	10-20	25	16.7%
	>21	10	6.7%
Type of Treatment n (%)	None	4	2.7%
	Diet	2	1.3%
	OHA	33	22.0%
	Insulin	62	41.3%
	Both diet and OHA	4	2.7%

	Both OHA and Insulin	45	30.0%
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Other Risk factors Include

Risk factors		Male		Female		P Value
		Count	Table N %	Count	Table N %	0.000028
Smoking	Yes	23	15.3%	4	0.1372.7%	
	NO	50	33.3%	73	48.7%	
No of Comorbidities	None	9	6.0%	15	10.0%	0.137
	1	31	20.7%	29	19.3%	
	2	13	8.7%	19	12.7%	
	3	10	6.7%	12	8.0%	
	4	8	5.3%	2	1.3%	
	5	2	1.3%	0	0.0%	

Laboratory parameters

	Male				Female				P value
	Count	Mean	Standard Deviation	Median	Count	Mean	Standard Deviation	Median	
RBS mg/dl	73	186.16	9.44	189.00	77	185.70	8.69	185.00	0.00135
HbA1c%	73	9.28	0.81	9.30	77	9.34	0.78	9.40	0.062
Creatinin mg/dl	73	1.52	0.52	1.10	77	1.45	0.47	1.10	0.34
Urea mg/dl	73	39	11	40	77	37	12	34	0.00031

		RIGHT		LEFT		SUBTOTAL n (%)		Statistics
		Count	Column Total N %	Count	Column Total N %	Count	Column Total N %	
Anatomic Sites of Foot ulcer	Forefoot	7	9.2%	11	15.1%	18	12.1%	X2= 42.3 DF= 147 P value= 0.0399
	Midfoot	13	17.1%	10	13.7%	23	15.4%	
	Hindfoot	10	13.2%	13	17.8%	23	15.4%	
Type of ulcer	Ischemic	27	34.2%	23	31.5%	50	32.9%	X2= 52.3 ZZ DF=146 P value= 0.767
	Neuropaty	31	39.5%	30	41.1%	61	40.3%	
	Neuro- Ischemic	19	19.7%	20	16.4%	39	26.2%	

Wagner stage	0	2	2.6%	2	2.7%	4	2.7%	X ² = 45.1 DF=147 P.value=0.925
	1	29	38.2%	22	30.1%	51	34.2%	
	2	26	34.2%	30	41.1%	56	37.6%	
	3	13	17.1%	11	15.1%	24	16.1%	
	4	2	2.6%	4	5.5%	6	4.0%	
	5	4	5.3%	4	5.5%	9	5.4%	

Statistical analysis of clinical outcome with smoking, residence and Gender

		Clinical outcome						P Value
		Complete healing	Ongoing healing	Non-healing	Minor surgery	Major surgery	Expired	
		Count N %	Count N %	Count N %	Count N %	Count N %	Count N %	
Gender	Male	15 38.5%	14 60.9%	7 50.0%	3 30.0%	1 33.3%	3 37.5%	0.701
	Female	24 61.5%	9 39.1%	7 50.0%	7 70.0%	2 66.7%	5 62.5%	
Residence	Rural	25 64.1%	16 69.6%	9 64.3%	8 80.0%	3 100.0%	5 62.5%	0.533
	Urban	14 35.9%	7 30.4%	5 35.7%	2 20.0%	0 0.0%	3 37.5%	
Smoking	Yes	4 10.3%	6 26.1%	2 14.3%	2 20.0%	0 0.0%	2 25.0%	0.048
	No	35 89.7%	17 73.9%	12 85.7%	8 80.0%	3 100.0%	6 75.0%	

Discussion

It was found that patients who were suffering from diabetes mellitus had more chances of having DFU (Chalya *et al.*, 2011). Present study showed that many factors are responsible for the cause of DFU. One of the factors is lack of education on come of foot. 69% female had less education on the other hand male had been more educated in secondary education. In Tanzania and Sudan lack of education is a major factor which leads to DFU (Shigidi & Abdelgafar, 2013). The recent study showed that 92% sufferers have T2DM. 1.5(0.76) was Median (IQR) duration. 50% sufferers had more than 5 years of diabetic mellitus (Nyamu *et al.*, 2003). Longer duration of DM was also a factor causing DFU (Awadalla *et al.*, 2017). Other factors include RBS, urea, creatinine, poor glucose control. (Chiwanga & Njelekela, 2015). Previous study was done by Nyamu and colleague in which they declared smoking which is a greater factor of DFU (Nyamu *et al.*, 2003). Smoking and alcohol habit were higher in DFU the previous study has shown it in Tanzania (Chalya *et al.*, 2011).

Conclusion

Lack of education, residence in rural areas, older age smoking urea RBS were main factors of DFU.

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