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Assessment of the Knowledge and Practice of Doctors to Antibiotics Used in the Treatment of Diabetic Foot Ulcers at Alribat University Hospital, Khartoum 2019

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Abstract **Original Research Article**

Background: Generally, antibiotics misuse has serious effects on health. The main cause of bacterial resistance is the misuse of antibiotics. Also, the duration of antibiotic has a big role in treating the infection especially in diabetic foot infections. And this is the main problem for which this research is done for. ***Aim:*** In this study we tried to estimate the knowledge and practice of doctors in surgery unit to antibiotics in the treatment of diabetic foot ulcers and infections. ***Methodology:*** The study was a total coverage of Alribat university hospital at the surgery unit from the period 10th of June till 5th of August. A well-organized questionnaire was dispensed to the house officers, general practitioners, registrars and specialist. The results were analyzed using statistical package for social science. ***Results:*** We found that 76% of participants have a good knowledge score and 24% of them have a poor knowledge score. Also, 46% of doctors have poor practice while 54% of them have a good practice. Also, there is a significant and positive relation between the knowledge score and the position and age of participants. And regarding practice score there is a positive association between it and the gender, position and age group. Participants with good practice score have a higher knowledge score and vice versa. However, Specialists have the highest knowledge and practice score. Registrars' knowledge and practice score is higher than general practitioners and house officers. Participants who are 35 years old and more have the highest knowledge and practice score. And the ones ranged from 26-35 years old have higher knowledge and practice score than those who are 21-25 years old and participants whose have more than 10 years of experience have the highest mean knowledge and practice score, then those with 6 to 10 years, then those with 2 to 5 years of experience and those with less than 2 years have the lowest mean knowledge and practice score. ***Conclusion:*** There is a poor knowledge and practice scores among younger participants especially house officers and general practitioners.

Keywords: antibiotics misuse, bacterial resistance, surgery, diabetic foot ulcers and infections.

INTRODUCTION

Diabetes and the foot

According to the International Working Group on the Diabetic Foot (IWGDF) 'Diabetic foot problems are among the most serious and costly complications of diabetes. The rising prevalence of diabetes all over the world has brought with it an increase in the number of lower limb amputations performed as a result of the disease. Epidemiological reports indicate that over one million amputations are performed on people with diabetes each year. The majority of these amputations are preceded by ulcers. Only two-thirds of ulcers will eventually heal and the remainder may result in some form of amputation [1].

Despite being one of the most serious and costly complications of diabetes, diabetic foot complications can be prevented. By implementing a care strategy that combines prevention, the multidisciplinary treatment of foot ulcers, appropriate organization, close monitoring, and education of people with diabetes and healthcare professionals, it is possible to reduce amputation rates by up to 85%. [1]. In Sudan, Major lower extremity amputations continue at the rate

of 30–40% for inpatients in Khartoum's main teaching hospital [2].

Management of diabetic foot ulcers:

Management of contributing systemic factors, such as hypertension, hyperlipidemia, atherosclerotic heart disease, obesity, or renal insufficiency, is crucial [3]. Management of arterial insufficiency, treatment of infection with appropriate antibiotics, offloading the area of the ulcer, and wound care are also essential.

Antimicrobial therapy:

Infections in patients with diabetes are difficult to treat because these patients have impaired micro-vascular circulation, which limits the access of phagocytic cells to the infected area and results in a poor concentration of antibiotics in the infected tissues. For this reason, cellulitis is the most easily treatable and reversible form of foot infections in patients with diabetes. Deep-skin and soft-tissue infections are also usually curable, but they can be life threatening and result in substantial long-term morbidity [4].

If infection is suspected, the choice of antibiotics should be based on type/severity of the infection and the likelihood that resistant organisms are involved. Ideally, antibiotics should be chosen based on culture and sensitivity data, but these are not always available. Because data are limited, it is often difficult to compare treatment regimens for efficacy [4].

Patients with mild infections can be treated in outpatient settings with oral antibiotics that cover skin flora including streptococci and Staphylococcus aureus. Agents such as cephalexin, dicloxacillin, amoxicillin-clavulanate, or clindamycin are effective choices. If methicillin-resistant S aureus (MRSA) infection is suspected, then clindamycin, trimethoprim-sulfamethoxazole, minocycline, or linezolid may be used. If gram-negative aerobes and/or anaerobes are suspected, dual drug treatment with trimethoprim-sulfamethoxazole plus amoxicillin-clavulanate or clindamycin plus a fluoroquinolone such as levofloxacin or moxifloxacin may be used. For moderate-to-severe infections, patients should be hospitalized for parenteral antibiotic therapy. Empiric choices should cover streptococci, MRSA, aerobic gram-negative bacilli, and anaerobes. MRSA is covered by vancomycin, linezolid, or daptomycin. Acceptable choices for gram-negative aerobic organisms and anaerobes include ampicillin-sulbactam, piperacillin-tazobactam, meropenem, or ertapenem. Alternatively, ceftriaxone, cefepime, levofloxacin, moxifloxacin, or aztreonam plus metronidazole would be sufficient to cover aerobic gram-negative and anaerobic organisms. Tigecycline has been studied, but published experience is limited [4].

Duration of therapy should be individualized. For those treated in outpatient settings with oral antibiotics, duration of treatment is usually 7-14 days. In those treated parenterally but without osteomyelitis, 2-4 weeks is sufficient. In patients with diabetic foot osteomyelitis, a 6-week course of antibiotics may be sufficient even in the absence of surgery, according to a randomized prospective study of 40 French patients. Current guidelines recommend at least 3 months or more of antibiotic therapy when diabetic foot osteomyelitis is not treated surgically or when residual dead bone remains after surgery. Duration of treatment may be shortened in those patients who undergo amputation as part of the treatment regimen. Consultation with an infectious diseases expert is recommended.

Adequate surgical debridement, in addition to antimicrobial therapy, is necessary to cure chronic osteomyelitis. Immobilization is important in acute or chronic osteomyelitis.

Dry gangrene is usually managed with expectant care, and gross infection is usually not present. Wet gangrene usually has an infectious component and requires surgical debridement and/or antimicrobial therapy to control the infection [5].

MATERIALS AND METHOD

Subjects and settings

This study design was descriptive, hospital based designed to estimate the knowledge and practice of doctors about the research problem by applying a good designed questionnaire to the surgery department.

This research was conducted in Alribat university hospital. Total coverage for the surgery department from the period 10th of June till 5th of Auguest. 71 doctor at the surgery department were given a questionnaire including general practitioners, house officers, registrars and specialists. Data analysis using statistical package for social science (SPSS) was done.

Data collection:

Data were collected using a well prepared questionnaire and well trained researchers. Participants were invited to complete the questionnaires by the researcher. Approval from university of medical sciences and technology was taken, also another approval from Alribat hospital was taken and oral permission from the targeted doctors was requested and obtained prior conducting the structured participant’s questionnaires.

Data variables:

Age, gender, years of experience and position of participants. Also knowledge and practice of participants.

Statistical analysis:

For analysis of data, Statistical Package for Social Sciences software, version 21.0 (IBM SPSSInc., Chicago, IL) and STATA 11 were used. Initially, all information gathered via questionnaire then coded into variables. Normality of data was tested using Kolmogorov-Smirnov test and Shapiro-Wilk test. Both descriptive and inferential statistics involving fisher's exact test, Pearson Correlation, Spearman rho correlation, Independent T-test, Mann-Whitney U-Test, One way ANOVA (Analysis of variances) and Kruskal-Wallis H-Test were used to present results. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Socio-demographic variables:-

The age of the participants was from the range of 21 years to 45 years old. 48% of them aged 21-25 years, 42% of them aged 26-35 years old and only 10% were more than 35 years old.

The years of experience ranged from 1-20 years. 42% of them have 2-5 years of experience,34% have less than 2 years, 14% have 6-10 and only 10%have more than 10 years of experience.

Regarding their gender, 63% were females and only 57% were males.

The total study was done in 71 participants. 69% of them were general practitioners and house officers. 24% were surgery registrars and 7% were surgery specialists.

Knowledge of antibiotics in the treatment of Diabetic foot ulcers:

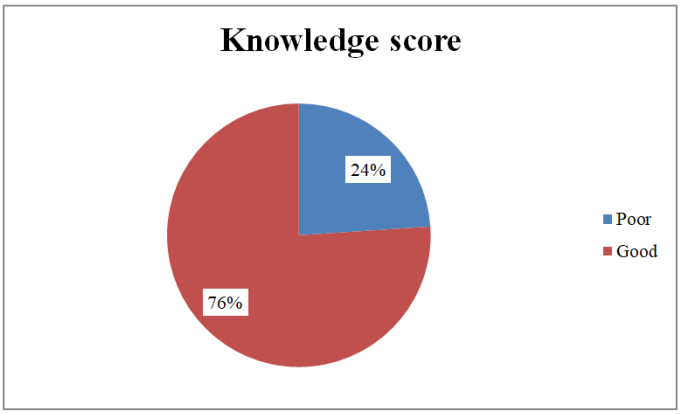

Figure 1: Percent of knowledge score

76% of participants have a good knowledge score and 24% of them have a poor knowledge score.

Practice of antibiotics in the treatment of Diabetic foot ulcers:-The first question regarding the practice of antibiotics was (What is your first action in diabetic foot ulcers?). 69% of participants said that they make culture then they start empiric antibiotics, while 30% said that they start antibiotics randomly.

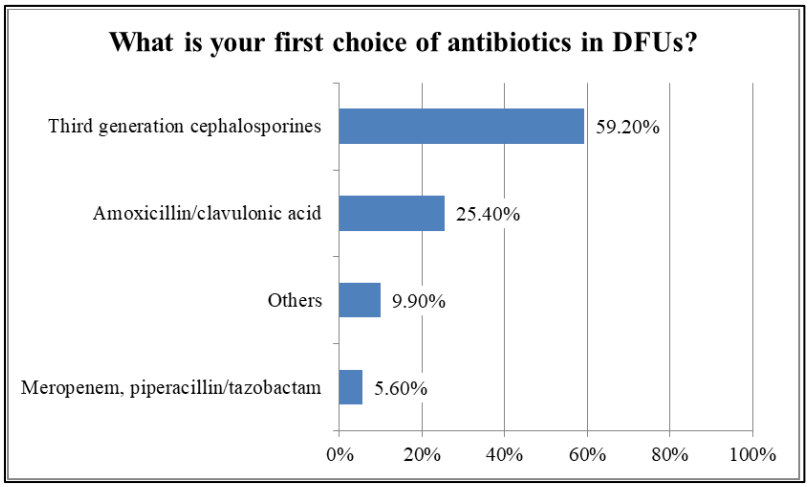

Figure 2: Distribution of the choice of antibiotics in DFUs

This question is neither done to estimate practice nor knowledge, but to know what do doctors mostly prescribe.59% of them said that they prescribe third generation cephalosporines, 25% of them choose

amoxicillin/clavulonic acid, 6% said meropenem, piperacillin/tazobactam and 10 %said others.

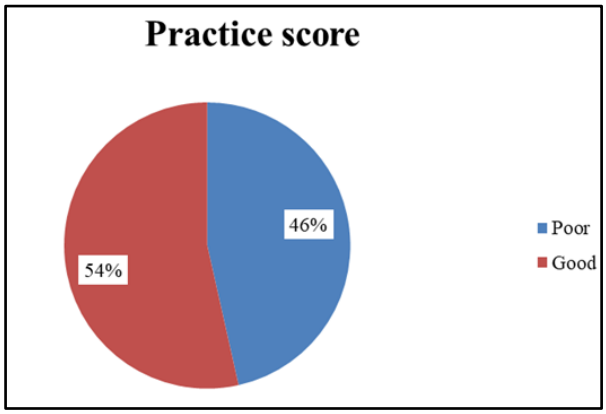

Figure 3: Percent distribution of practice score

Practice score was calculated and 46% of doctors have poor practice while 54% of them have a good practice.

Fisher exact test was done to estimate the relation between demographic data and knowledge score. There was insignificant relation between gender, position, age group and years of experience and the knowledge score according to the test, but further tests will be done to make sure.

Males have a higher knowledge score than females (males 76% good and females 75% good). House officers and general practitioners have the lowest knowledge score (69% good), then registrars (88% good) and then specialists with 100% good score.

Also, participants with the age group 21-25 years have the lowest knowledge score (64.7% good), then those with the age group 26-35 years (83.3%) and those who are more than 35 years old have 100% good score. However, participants with less than 2 years of experience have the lowest knowledge score (66.7% good), then those with 2-5 years (70% good) and those who have more than 6 years of experience have a 100% good score.

Table 1: Relation between demographic data and practice score using fisher test

Variables		Practice score		Fisher's Exact Test P value
		Poor	Good	
Gender	Male	8	18	0.038**
		30.80%	69.20%	
	Female	25	20	
		55.60%	44.40%	
Position	General practitioner or House officer	27	22	0.034**
		55.10%	44.90%	
	Registrar	6	11	
		35.30%	64.70%	
	Specialist	0	5	
		0.00%	100.00%	
Age groups	21-25 years	18	16	0.028**
		52.90%	47.10%	
	26-35 years	15	15	
		50.00%	50.00%	
	More than 35 years	0	7	
		0.00%	100.00%	
Years of experience	Less than 2 years	13	11	0.051*
		54.20%	45.80%	
	2-5 years	16	14	
		53.30%	46.70%	
	6-10 years	4	6	
		40.00%	60.00%	
	More than 10 years	0	7	
		0.00%	100.00%	
Knowledge score	Poor	11	6	0.101*
		64.70%	35.30%	
	Good	22	32	
		40.70%	59.30%	

- *.P value>0.05 that's considered as statistically insignificant.
- **.P value<0.05 that's considered as statistically significant.

This test is to estimate the relation between the demographic data and the practice score. The relation between practice score and gender was 0.038 which is significant relation. The relation between practice score and position was 0.034 which is also significant. The relation between practice score and age group was 0/028 and also considered a significant relation.

Males have a higher practice score than females (males 69% good and females 44% good). House officers and general practitioners have the lowest practice score (44% good), then registrars (64% good) and then specialists with 100% good score. Also, participants with the age group 21-25 years have the lowest practice score (47% good), then those with the age group 26-35 years (50%) and those who are more than 35 years old have 100% good score.

However, participants with less than 2 years of experience have the lowest practice score (45% good), then those with 2-5 years (46% good) , than those with 6-10 years (60% good) and those who have more than 10 years of experience have a 100% good score.

Table 2: Relation between the knowledge score and demographic data using one way Anova test

One Way ANOVA Test						
Variables		**Number**	**Knowledge score (%)**			**P value**
			Mean	**Std. Deviation**	**Std. Error**	
Position	General practitioner or House officer	49	49	23	3	0.036**
	Registrar	17	63	25	6	
	Specialist	5	70	21	9	
Age groups	21-25 years	34	46	21	4	0.006**
	26-35 years	30	58	24	4	
	More than 35 years	7	75	20	8	
Years of experience	Less than 2 years	24	50	23	5	0.058*
	2-5 years	30	50	24	4	
	6-10 years	10	65	21	7	
	More than 10 years	7	71	22	9	

- *.P value>0.05 that's considered as statistically insignificant.
- **.P value<0.05 that's considered as statistically significant.

There is a significant relation between the knowledge score and the position and age of participants.

Table 3: Correlation between practice and knowledge score with the age, years of experience and knowledge score

Correlations			
Variables		**Knowledge score (%)**	**Practice score (%)**
Age (Years)	Pearson Correlation	0.336**	0.535**
	Sig. (2-tailed)	0.004	0.000002
	Number	71	71
	Strength	Weak	Moderate
	Direction	Positive	Positive
Years of experience	Pearson Correlation	0.328**	0.500**
	Sig. (2-tailed)	0.005	0.00001
	Number	71	71
	Strength	Weak	Moderate
	Direction	Positive	Positive
Knowledge score (%)	Pearson Correlation		0.165
	Sig. (2-tailed)		0.168
	Number		71
	Strength		Weak
	Direction		Positive
** Correlation is significant at the 0.01 level (2-tailed).			

There is a weak positive relation between knowledge score and age of participants, that means whenever the age increase the knowledge score is increased.

Also there is a moderate positive relation between practice score and the age and that means whenever the age increase, the practice score is increased.

From the other hand, there is a weak positive relation between knowledge score and years of experience of participants, that means whenever the years increases the knowledge score is increased weakly. Also there is a moderate positive relation between practice score and the years of experience and that means whenever the years increases, the practice score is increased.

There is also a weak positive relation between the knowledge and practice score. Whenever the knowledge score increases, the practice score is in increased too.

Table 5: Correlation between knowledge and practice scores with position and age groups

Spearman's rho Correlations			
Variables		**Knowledge score (%)**	**Practice score (%)**
Position	Correlation Coefficient	0.296*	0.394**
	Sig. (2-tailed)	0.012	0.001
	Number	71	71
	Strength	Weak	Weak
	Direction	Positive	Positive
Age groups	Correlation Coefficient	0.352**	0.331**
	Sig. (2-tailed)	0.003	0.005
	Number	71	71
	Strength	Weak	Weak
	Direction	Positive	Positive
Years of experience	Correlation Coefficient	0.266*	0.394**
	Sig. (2-tailed)	0.025	0.001
	Number	71	71
	Strength	Weak	Weak
	Direction	Positive	Positive
** Correlation is significant at the 0.01 level (2-tailed).			
* Correlation is significant at the 0.05 level (2-tailed).			

There is a weak positive relation between knowledge and practice scores and the position of participants, that means whenever the position increase the knowledge and practice scores are increased.

From the other hand, there is a weak positive relation between knowledge and practice scores and the age group, that means whenever the age group increases the knowledge and practice scores are increased.

DISCUSSION

Most of the researches which was done in diabetic foot ulcers concerned about the type of bacteria and the effectiveness of the antibiotics. This research was done to estimate the knowledge and practice of doctors in the treatment of diabetic foot ulcers. Also, for estimation of the indications to use antibiotics in DFUs. Other researches took different point of view. For example, the research which was done in KMC hospital, Manipal by SM Sekar et al, they concerned about the type of the bacteria in DFIs and found that most organisms in DFIs were Gram negative aerobes [6]. And another study in Guanzhou, China by Sun Yat-Sen , it concerned about the effectiveness and the choice of antibiotics and found that the most used antibiotics in diabetic foot infections was the third generation cephalosporines [7] as well as we found the same result in Alribat University hospital where the first choice of antibiotics was third generation cephalosporins by 60%.

There is a poor knowledge and practice score in some categories, which are:

1. General practitioners and house officers have 50% mean knowledge score and 38% mean practice score, while registrars have 65% mean knowledge score and 45% mean practice score.
2. Participants aged 21-25 years old have 50% mean knowledge score and 35% mean practice score, while those aged 26-35 years old have 60% mean knowledge score and 40% mean practice score.
3. Participants with less than 5 years of experience have 50% mean knowledge score and 40% mean practice score.

Regarding the indication to use the antibiotic, 69% of participants said that they prescribe antibiotics in uninfected wound as a prophylactic and according to guidelines that is totally wrong.

Limitations

The research was the first of its kind since there has been no previous studies conducted in Sudan on the knowledge and practice of doctors toward the antibiotic uses in diabetic foot ulcers and also the absence of recorded data base.

CONCLUSION

This research was done in 71 participants including house officers, general practitioners, registrars and specialist at Alribat university hospital in the surgery unit. The relation between knowledge and practice score with the age, position and years of experience was found to be directly proportional. The lowest knowledge and practice scores were in the general practitioners and house officers. That is due to their limited experience and knowledge. The knowledge and practice score of males was found to be higher than females, but that may be due to the large number of females (63%) to males (37%). When we put the light on a serious question like the third question in the practice of antibiotics which says: (Do you use antibiotics in uninfected wound as a prophylactic from infections?), we found that 69% of participants answered (yes) and only 31% of them answered (no). This is a serious problem, where using antibiotics when it's not indicated leads to some very big problems like antibiotic resistance. Also it may lead to complications like amputation. And all of that affect the quality of life and increase mortality.

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