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Analysis of Wound Infections in Diabetic Patients in Abbottabad and Mansehra Districts Pakistan

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Abstract: Diabetes is the most widespread metabolic disorder in the world. Wound healing of Diabetes is one of the most common, disabling and costly complications of Diabetes. Diabetic patient have poor resistance to infection, poor circulation of nutrition so their wounds are highly susceptible to infection. Two hundred samples were collected from different wound samples of different Diabetes patients in Ayub Teaching Hospital, Abbottabad, Pakistan. The pus samples of diabetic patients were collected by sterilized swab sticks in Oncology, Medical OPDs and Wards. Cled and EMB media were used for urine culture of diabetic persons. Microorganisms were identified by using Gram staining under microscope and other biochemical tests were performed for identification of microorganisms. Of the 200 selected patients, 120 were male and 80 were female. Of the 120 male patients, majority were infected by *Staphylococcus* (62%), followed by *Streptococcus* (10%) and *E coli* (5%), while 22% males showed no bacterial growth. Among 80 female patients, 66% were infected by *Staphylococcus,* 12% by *Streptococcus,* 2% by *E coli*and 20% samples lacked any bacterial growth. Mostly diabetic wounds were caused by gram positive *Staphylococcus*. Diabetic patients between 41-50 years were exceedingly infected than other age groups. Wound infection in diabetic patient is a risk factor of ulcer so early diagnosis and antagonistic treatment should be used to reduce the ulcer and humanity in population.

Key words: Diabetes · Wound · *Staphylococcus* · *Streptococcus* · *Klebsiella* and *Escherichia coli*

INTRODUCTION

Diabetes is the most widespread metabolic disorder in the world [1]. Morbidity of Diabetes has increased dramatically over the past few years and afflicts about 100 million people worldwide. Wound healing of Diabetes is one of the most common, disabling and costly complications of it. Diabetic patient have poor resistance to infection, poor circulation of nutrition, so their wounds are highly susceptible to infection[2]. The diabetic wound is complex with contribution from infection, neuropathy and impaired vascular supply. There are many physiological defects in Diabetic wounds that include decrease growth factor production, epidermal barrier function, angiogenic response, macrophage function, collagen accumulation, quantity of granulation tissue, fibroblast migration, proliferation and bone healing. There is imbalance between the accumulation of extra cellular matrix components and their remodeling by matrix metallo-proteinases [3].

Diabetes lowers the efficiency of immune system against infection. High level of glucose limits the efficacy of immune system due to which individual become highly susceptible to infections and stops the healing process. Previous studies stated that particular enzymes and hormones produced in response to an elevated blood glucose levels suffocates the immune system in diabetes, which prolongs wound healing frequency. Few previous studies reported that *Staphylococcus aureus* is the main causative pathogen [4]. The intracellular bactericidal activity of leukocytes to both *Staphylococcus* and *Escherichia coli* (*E. coli*) was shown to have a direct relation to glucose control [5]. Diabetes mellitus is a risk factor for surgical site infection [6]. Wound infection of

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diabetic patients is at risk for developing a diabetic foot ulcer. In Diabetes, the body failed to effectively use sugar and 15% of the Diabetic wound population develops foot ulceration [7]. The molecular mechanisms leading to impaired wound healing in diabetes are not completely understood [8].

The spread of infection to soft tissue and bone is a major contributory factor for lower limb elimination, for this reason early diagnosis and appropriate treatment are essential. Optimal treatment often involves extensive surgical debridement and management of the wound base and effective antibiotic therapy [9]. Antimicrobial therapy was recommended for wounds when increased bacterial load has been identified [10]. There are multidisciplinary approaches prioritizing invasive infection drainage, necrosis debridement and the prompt start of empirical antibiotic therapy, followed by complete and appropriate vascular reconstruction. The negative pressure wound therapy is recommended for severe diabetic foot infection [11]. Vaccination elicits normal humoral responses in diabetic patients [12]. Current study was conducted to analyze the wound infections of Diabetic patients to know the wound causative agents.

MATERIAL AND METHODS

The samples were collected from different wounds of patients in Ayub Teaching Hospital Abbottabad, Pakistan. The pus samples of diabetic patients were collected in Oncology, Medical OPDs and Wards. The samples were collected by sterilized swab sticks. Cled and EMB media were used for culture due to best growth response of microorganisms on these media. The samples were inoculated in Cled and EMB media and incubated for 24 hours at 37°C. After 24 hours, microorganisms were identified by using Gram staining and other biochemical tests such as catalase, coagulase and oxidase were performed for identification of microorganisms. After microbial identification, sensitive media was used for antibiotics. Nutrient media was used for sub inoculation and different antibiotics were used and incubated for 24 hours at 37°C. After 24 hours the zone of inhibition was checked against different antibiotics.

RESULTS

Wound infection in diabetic patients was studied in Abbottabad and Mansehra Districts, Pakistan. A total of 200 patients were selected from medical OPDs and Wards, of which 120 were male and 80 were female. Of the 120 male patients, 62% were infected by *Staphylococcus,* 10% by *Streptococcus*, 5% by *E coli*, 1% were infected by *Klebsiella* and 22% showed no bacterial growth (Fig. 1). Of the 80 female patients, 66% were infected by *Staphylococcus,* 12% by *Streptococcus,* 2% by *E coli* (Fig. 1) and 20% samples lacked any bacterial growth. Diabetic patients (male and female) of age between 35-45 years were exceedingly infected than other age groups (Fig. 2a). The results revealed that most of the Diabetic wounds were caused by Gram positive *Staphylococcus* pathogens.

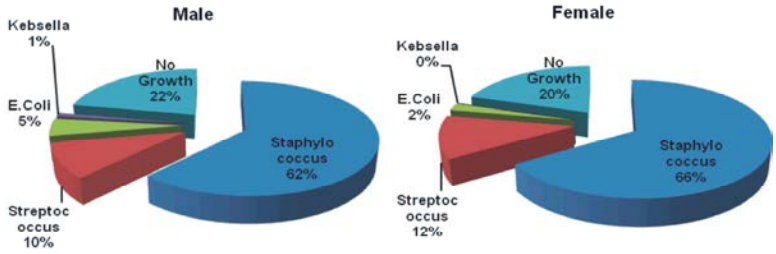

Fig. 1: The percentage of wound bacterial infection in male and female diabetic patients.

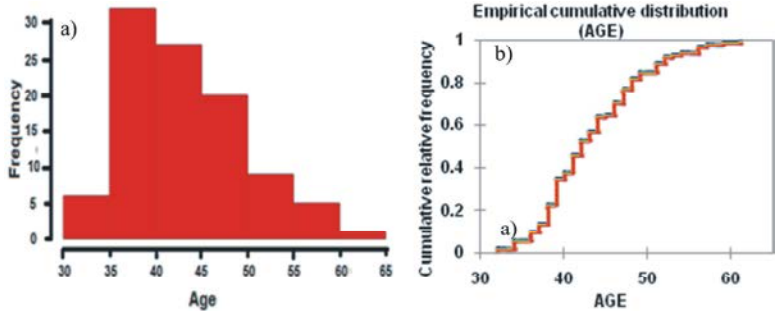

Fig. 2a,b: The percentage of diabetic wounds of patient's according to age group. The cumulative relative frequency with respect to age of the patients is given.

Cumulative relative frequency of different antibiotics was increased with respect to age of the patients (Fig. 2b).

DISCUSSION

Present study analyzed that mostly *Staphylococcus* pathogens caused wound infections in diabetic patients and in many sample contribute hyper inflammation. Previous study performed by Western blot, ELISA test and PCR demonstrated that in addition to inflammation, Toll like receptor 1, 2, 4 and 6 mRNA expression, MyD88 protein expression, tumor necrosis factor- alpha concentration, nuclear factor kappa B activation, inter-looking 1 beta and thiobarbituric acid reactive substances were significantly increased in diabetic wounds compared to nondiabetic wounds [13].

Several studies showed that blood glucose levels were increased in infected diabetic patients, so positive correlation existed between mean plasma glucose levels and the frequency of acute infection [14]. In present study, most patients were infected by *Staphylococcus*, followed by *Streptococcus* and *E. coli*, while only 1% was infected by *Klebsiella*. A previous study showed that 10.2% infections were caused by *S. aureus*, 7.1% by *Streptococcus pyogenes* and 15.3% by *Klebsiella pneumoniae*. This variation is due to the study at two different geographical regions with different bacteriological toxicity. Vancomycin was found to be most effective to Gram positive bacteria, whereas imipenem and amikacin were most effective against gram negative bacteria in the antibiotic test [15].

CONCLUSIONS

The present study revealed that mostly infections from wound samples of Diabetic patients are caused by Gram positive bacteria, while the wound samples from some patients showed no growth on culturing. The patients whose samples showed no growth should be advised for the repetition of clinical test in order to identify the microorganisms. Wound infection in diabetic patient is a risk factor of ulcer, so early diagnosis and antagonistic treatment should be used to reduce the ulcer and protect human health in population.

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