Detection of Pus Sample of Various Pyogenic Infections from Diabetic and Non Diabetic Patient and Compare their Socioeconomic Status in Bangladesh

Kaniz Fatema[a]*, Komol Mondol[b], Tanzina Akter[c], Suvomoy Datta[d]

[a,b,c,d]*Department of Microbiology, 9 HBR Tower, Primeasia University, Banani, Dhaka-1213*

[a]*Email: kaniz_0309@ yahoo.com*

Abstract

These studies were conducted for microbiological detection of pus sample from various pyogenic infections of diabetic and non-diabetic hospitalized (OPD patients) and compare their socio-economical condition of Bangladesh. 100 samples were collected of which 90% was positive isolates.

Among this all isolates *Streptococcus sp*35.55% rather than *E.coli* 28.88%.Diabetic patients (100%) were more vulnerable for pyogenic infection than non-diabetic patients (82.88%). The antimicrobial susceptibility testing showed that the isolates were highly sensitive to Cefuroxime, Cefixime, moderate sensitive to Ciprofloxacin, Azitromycin where as Cotrimoxazole, Ampicillin, Nalidixic Acid, Chloramphenical highly resistant to *Staphylococcus, Streptococcus* and *E.coli.*All ages of patients were admitted in OPD section in the hospital during the year 2014, Upazila Sirajdikhan, Munshigonj. For socio-economical analysis about the patients sign and symptoms of infection, duration of infection, pyogenic pathogen and bacteraemia were considered as key variables for analysis. On admission characteristics of cases and non-Fatal controls were comparable except for age. The study was showed that multi drug resistant is associated with diarrhea in Munshigonj, Bangladesh.

Keywords: Pus; pyogenic infection; diabetic and non-diabetic; socioeconomic status; OPD.

----
* Corresponding author.

1. Introduction

Infections of soft tissue are associated with production of pus and said pyogenic infection. Infection occurs when they evade the host defense, replicate a large numbers and attack the host tissues. The common pyogenic bacteria are: *Staphylococcus aureus, S.pyogenes, Streptococcus spp, Pseudomonas aeruginosa, Coliform bacilli*, and Anaerobic *organism: particularly Clostridium perfringens.* Infection characterized by non-diabetic and diabetic patient severe local inflammation, usually with pus formation, generally caused by one of the pyogenic bacteria [1]. Infective disease can manifest in many different ways. Three general patterns can be discerned: **Acute pyogenic infections,** generally rapid growing organisms, interaction with innate immune system and acute inflammation predominate, blood neutrophil count increases, where immune damage occurs it is often "post-infective" **Chronic (granulomatous),**Bacterial growth rate often moderate or slow organisms often survive and grow intracellular, immune damage occurs with infection, predominantly cell-mediated**,** bacterial growth rate often moderate or slow, Organisms often survive and grow intracellular--Immune damage occurs with infection – predominantly cell-mediated-Example: Tuberculosis caused by *Mycobacterium tuberculosis* (Mtb),Attack on the infected cells by cell-mediated immunity leads to granuloma formation, balance between bacterial growth and the immune response can lead to very long periods-between the time of infection and overt disease [2]. **Toxin-mediated disease,** pathology often distant from site of bacterial growth -protective immunity may be mediated by anti-toxin antibodies alone, disease may be fully reproduced by administering the toxin .

There is a general consensus among clinicians that diabetic patients are at risk of developing infection [3].This special vulnerability has been attributed to impair leukocyte function associated vascular diseases, poor glucose control and altered host response [4, 5].Once infection occurs, it is difficult to treat since the clinical course of the infection is more fulfillment and severe possess a greater threat to the glycemic status of the patient [6, 7].

With the advent of the new strategies in the prevention of these infections as with the introduction of new insulin preparation for good glycemic control, presumption in the altered patient behavior may reduce the incidence of infections or alter the type of infection [8, 9].The development of wounds is a serious complication for patient with diabetes. Numerous factors related to diabetes can impair wound healing, including, wound hypoxia infection, nutrition deficiencies, and the disease itself [10].

Fluctuation blood sugar and hypoxia from poor circulation may impair the ability of white blood cells to destroy pathogenic bacteria and fungi, increasing infection risk [11]. Diabetic mellitus has become a global epidemic illness [12] and poses a treat for development of resistant bacterial infections. Diabetic patients are more prone of life threatening infections than non-diabetic patients [13] therefore; they have more exposure to antibiotics. Diabetic patients have greater problems with healing of infections because of reduced blood supply, which affects the body's ability to fight infection [14].When a diabetic patient contracts infections, the illness is often more frequent than in non-diabetic patients [15].

Foot ulcers are a significant complication of diabetes which is the most common cause of no traumatic lower extremity amputation in the industrialized world. The risk of the lower extremity amputation is 15 to 46 times higher in diabetics than in persons who do not have diabetes mellitus [16] Furthermore foot complications are

the most frequent reason for hospitalization in patients with diabetes.

Foot infections are the most common complications of diabetic foot and play a main role in the development of moist gangrene [17]. *Pseudomonas* spp., *Enterococcus* spp. &*Proteus* spp. carry a special role and are responsible for continuing and extensive tissue destruction with the poor blood circulation of the foot. A high frequency of anaerobic infection has also been reported [18].Patients with diabetes also can have a combined infection involving bone and soft tissue called fetid foot that extensive soft tissue and bone infection causes foul exudates, is chronic and usually requires extensive surgical debridement and / or amputation. In general, people with diabetes have infections that are more severe and take longer to cure than equivalent infections in other people. In terms of the infecting microorganisms that the likelihood of successful treatment with antimicrobial therapy. Adequate surgical debridement, in addition to antimicrobial therapy, is necessary to cure chronic osteomyelitis [19].To study the relative frequency of bacterial isolates cultured from diabetic foot infections and assess their in vitro susceptibility to commonly used antibacterial agents, a prospective microbiological study was carried out and results are presented here.

- To identify principle and method of isolation and identification of pyogenic bacteria from clinical specimens.
- To survey and Identify the microbial load of Total *Streptococcus* count, total *Staphylococcus* count, total *Pseudomonas* count, total *Klebsiella* count, total *Coliform* count ,total *Proteus* count.
- Investigate and compare microbiological assessment and socio- economical condition of infected patients from pus.
- To isolate and identify the causative agent of pus in those patient who had during treatment
- Determination of the drug resistance pattern of the isolate

2. Socioeconomic Study

There are different characteristics used as determinants to identify the pyogenic patients from infection Socio-economic studies are survey performed questionnaire. Survey was conducted in Sirajdikhan Upazila Health Complex, Munshigonj, Bangladesh

Variables:

1. Age, sex

2. Characteristics of infection

3. Place of defecation

4. Clinical assessment of infection

3. Methods and Materials

100 pus samples were collected from Upazila health complex, Sirajdikhan, Munshigonj, Bangladesh. Analysis was done of pus samples submitted for bacterial culture at Primeasia University Research Laboratory (Centre for excellence).The study population included infants, young children and adult. Pus samples were collected from the patients in sterile syringe and test tube. Information was obtained from each patient regarding age, sex, occupation, place where they live in. The bacterial count was performed by standard method. The microbiological condition safety and hygiene were assayed using the methods recommended by ICNSF. Gram staining, urease test, citrate utilization test, indole test, Kligler iron agar test, methyl red, vogesproskauer and motility test are done.

Antimicrobial susceptibility testing: In the study, antimicrobial susceptibility testing was done on Mueller-Hinton agar using disk diffusion technique. All isolates were tested for sensitivity to the following antibiotics: Ciprofloxacin (25 mcg), Nalidixic acid (30 mcg), Cotrimoxazole (25 mcg), Tetracycline (30mcg), Amoxicillin (10mcg), Erythromycin (10mcg), Azithromycin (10mcg), Neomycin (30mcg), Cefuroxime (30mcg), Cefixime (5mcg) and Cefotaxime (30mcg).

4. Results

A total of 100 patients were studied whereas 90 patients were positive of this, 42 males and 48 females with different age. The highest number of pathogen is *Streptococcus sp, E.coli* and lowest amount is *Klebsilla, Proteus.*

Table 1: The frequency distribution of bacterial isolates from pyogenic infected patients according to diabetic and non-diabetic patients (**N=Number of respondents=90**)

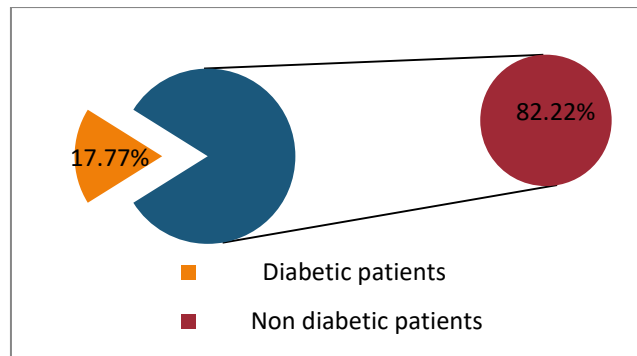| Total patients (N=100)	Infected organism (%)
Positive number of patients (N=90)	
Streptococcus pyogenes	35.55
E.coli	28.88
Staphylococcus aureus	13.33
Pseudomonas aeruginosa	11.11
Klebsiellasp	6.66

Figure 1: Comparative analysis of diabetic & non diabetic patients for pyogenic infection
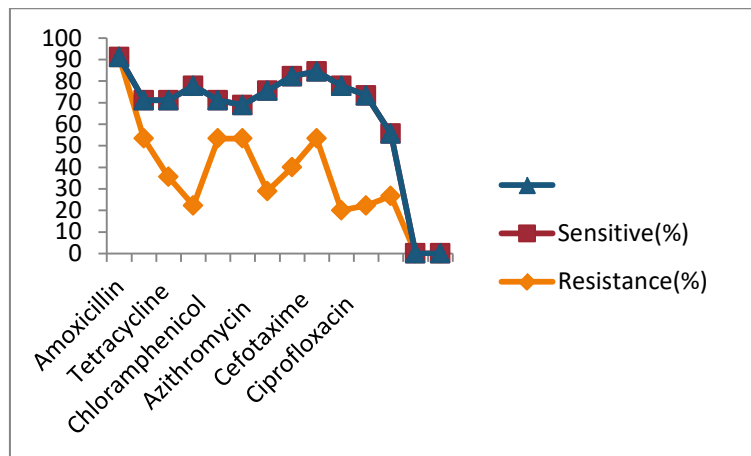

Figure 2: Antibiotic sensitivity pattern of pyogenic infection

Table 2: Socio-demographic distribution of diabetic and non-diabetic patients who treated with pyogenicinfections at SirajdikhanUpazila Health Complex, Munshigonj, Bangladesh. The mean age of the individual was 27.2 ± (SD=16.4)

Variable	Frequency	%
Socio-economic condition		
Rich	14	15.55
Middle class	26	28.88
Poor	50	55.55
Age Distribution		
<10	18	10.9

11-20	07	5.4
21-30	09	4.2
31-40	26	15.7
41-50	45	27.1
51-60	45	27.1
>60	45	27.1
Sex distribution		
Male	42	46.66
Female	48	53.33

Table 3: Clinical Features of Patients who had pyogenic infection for non-diabetic and diabetic patients in Upzilla Health Complex, 2014 and association with complication

Diabetic patient	Non-diabetic patient
1.Foot infection (Most common)	1.Secondary infection after surgery /RTA
2. Infected sebaceous cyst	2.Carbuncle
3. Cellulites	3.Abscess
4. Palonycia	4.Boil

5. Discussion

Of 100 samples were analyzed in this study, which showed 45 (90%) were positive for pyogenic infection. Among the culture screened causative agents- Streptococcus pyogenes was found to be the most prevalent (35.55%), followed by E.coli (28.88%), Staphylococcus aureus(20%), Pseudomonas sp (11.11%), Klebsiellasp (6.66%) and Proteussp (4.44%).Diabetic patients (100%) were more vulnerable for pyogenic infection than non-diabetic patients (82.88%). Socioeconomically condition of the infected patients were Rich (15.55%), Middle class (28.88%), and poor (55.55%)Most of the Streptococcus sp, Staphylococcus sp, E. coli, & Pseudomonas sp were found to be resistant against Amoxicillin, Cotrimoxazole, Nadixic acid, Erythromycin and Cefotaxime.

6. Conclusion

Our result suggests that, Ciprofloxacin, Cefuroxime, Cefixime were found to be the most appropriate drug to treat the pyogenic infection that to address this issue, antibiotic therapy should take into consideration and should avoid incomplete use, in appropriate use and unnecessary use of antibiotics. It is important to take medication only when prescribed by a health professional. In addition, the incidences of pyogenic infection were observed due to poor personal hygiene.

References

[1] Infection of the diabetic foot.–International dictionary [Online].Available:http://www.mondofacto.com.

[2] Infection of the diabetic diabeticfoot.Availableathttp://www.Braces&supports.com./

[3] McMahon M.M and Bistrian, B.R. (1995).Host defenses and susceptibility to infection in a patient with diabetes mellitus. Infect. Dis. Clin. North Am. 9: 1-721(4):246.251

[4] Bhatia, J.Y. Pandey, K. Rodrigues, C., Meetha, A., JOSHI, V. R. (2003). Postoperative wound infection in patients undergoing coronary artery bypass graft surgery: A postoperative study with evaluation of risk factors. Ind. J. Med. Microbial. 21(4):246.251

[5] Louie, A., Balch, A. L. and smith, R. B. (1993).Gram-negative bacteria surveillance in diabetic patients. Infect. Med., 10 (2): 33-45

[6] Beckert, S. et al., (2006). A new wound-based severity score for diabetic foot ulcer: Prospective analysis of 1000 patients diabetes care, 29 (5): 988-992.

[7] Eaglstein, W. H. (1997) chronic wounds. Surgical C1N Am.77 (3): 689-700.

[8] Piaggesi, A., et al., (2007). An off the shelf instant contact casting device for the management of diabetic foot ulcer. Diabetic care, 30 (3): 586-590.

[9] Armstrong, D. G., Lavery, L. A. And Harkless, L. B. (1998), Validation of a diabetic wound classification system, Diabetes care, 21(5): 855-859.

[10] Lavery, L. A. et al., (2007), preventing diabetic foot ulcer recurrence in high-risk patients. Diabetes care, 30: 14-20.

[11] Devraj S, goyal R, Jialal I. London: Touch Briefings; 2008, Inflammation, oxidative stress and metabolic syndrome of endocrinology; PP. 32-7.

[12] Muller LM, Gorter KJ, Hak E, Goudzwaard WL, Schellevis FG, Hoepelman Al, et al. Increased risk of common infections in patient with type 1 and type 2 diabetes mellitus. Clin Infect Dis. 2005; 41:281-8.

[13] Marble A, white HJ, Fernald AT, The nature of the lowered resistance to infection in diabetes mellitus. J Clin Invest.1938; 17:423-30.

[14] Marble A, white HJ, Fernald AT, The nature of the lowered resistance to infection in diabetes mellitus. J Clin Invest.1938; 17:423-30.

[15] ZubairM,Abida M, Jamal A. Clinical bacteriology and risk factors for the diabetic foot infection with multidrug resistance microorganisms in North India. Biol Med. 2010; 2:22-34.

[16] Luo G, Spell berg B, Gebremariam T, Boris M, Lee H, Fu Y, et al. Diabetic murine models for Acinetobacter baumannil infection. J Antimicrobial Chemotherapy. 2012, 67: 1439-45.

[17] Sarkar PK, Ballantyne S. Management of leg ulcers. Postgard Med J 2000; 76:674-82.