Frequency and Antimicrobial Susceptibility of Staphylococcus Aureus Isolated from Pus Samples of Paediatric Patients

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ABSTRACT

The formation of pus in infected wounds, ears and brain abscesses is a common problem for many patients which causes great distress in terms of discomfort, delayed healing and significantly increased healthcare cost. The aim of the study was to find out the frequency and antimicrobial susceptibility of Staphylococcus aureus isolated from pus samples. The study was conducted at the Microbiology Department of The Children’s Hospital and Institute of Child Health, Lahore during January 2009 to January 2010. A total number of 618 pus samples collected from infected wounds, ears and brain abscesses, were analyzed during the study period. Staphylococcus aureus was identified on the basis of colony morphology, Gram’s stain, catalase and DNase test. Out of 420 positive cultures 177 (42%) were Staphylococcus aureus which showed antimicrobial susceptibility to vancomycin (100%) followed by co-amoxiclav (84%), teicoplanin (82%), fusidic Acid (78.5%), cefotaxime (73%), amoxicillin (71%), erythromycin (67.7%), methicillin (66.7%), amikacin (65%), ampicillin (32%).

Key words: Staphylococcus aureus, Antimicrobial susceptibility, Pus samples

INTRODUCTION

Pus is a whitish yellow or yellow substance made primarily of dead white blood cells and dead bacteria; normally found in region of bacterial infections. It is produced during inflammatory pyogenic bacterial infections1. Accumulation of pus in an enclosed tissue space is known as abscess. A visible collection of pus within or breath the epidermis, on the other hand, is known as a collection of pustules or pimple2. Pus is produced from the dead and living cells which travel into the intercellular spaces around the affected cells3. Our skin normally protects from infections of pus producing bacteria. But sometimes these stubborn invaders penetrate the skin’s defenses. They can sneak in through a wound or come in the form of skin disease, such as cyst or acne4. There are different microbial species which are responsible for the pus formation in wounds, ear infections and brain abscess. These include different bacterial and fungal species. The most commonly found pus producing bacteria are Staphylococcus aureus5. Staphylococcus aureus is Gram positive cocci which is a facultative anaerobe. It is commonly present on skin flora and in nasal passage. It is one of the most common causes of nosocomial infections and can also cause post-operative infections5.

Methicillin Resistant Staphylococcus aureus (MRSA) are resistant to a large group of antibiotics which contain beta-lactam ring such as penicillin and standard penicillin-related antibiotics.6 Excessive use of penicillin antibiotics over the years has led to the development of resistant strains of bacteria that are no longer killed by penicillin type antibiotics. MRSA infections are difficult to treat in humans and these strains are often referred as super bugs’. Staphylococcal resistance to penicillin is mediated by penicillinase which cleaves the beta lactam ring rendering the antibiotic ineffective. Vancomycin and teicoplanin are glycopeptides antibiotics used to treat MRSA infections. The objective of the study was to find out the frequency and antimicrobial susceptibility of Staphylococcus aureus isolated from various pus samples.

METHODOLOGY

This cross sectional observational study was conducted in the Microbiology Department of The Children’s Hospital and Institute of Child Health Lahore, Pakistan, from January 2009 to January 2010. The pus swabs received during the study period were streaked on Blood and MacConkey agar plates and incubated at 37°C for overnight. Staphylococcus aureus were identified on the basis of colony morphology, Gram stain, Catalase and DNase test3.

The isolated Staphylococcus aureus species were processed for antimicrobial susceptibility testing to various antibiotics in vitro using the Kirby-Bauer disc diffusion method. A suspension of each bacterial strain was made according to the 0.5 McFarland turbidity standards and an even lawn of bacteria was made on Muller Hinton agar. The antibiotic discs of
amikacin (30µg), ampicillin (5µg), co-amoxiclav (20/10µg), cefotaxime (30µg), erythromycin (30µg), fusidic acid (5µg), teicoplanin (30µg), methicillin (30µg), vancomycin (30µg), and amoxicillin (30µg) were placed on the Mueller-Hinton agar plates and incubated at 37°C overnight. After overnight incubation the diameter of each zone of inhibition was measured in mm. The antimicrobial susceptibility testing results were noted according to the Clinical and Laboratory Standards Institute (CLSI) guidelines¹⁰.

RESULTS
A total number of 618 pus samples collected from infected wounds, infected ears and brain abscesses, were analyzed during the study period of thirteen months. Out of these, 420 (61%) were positive cultures while 261 (38%) samples were negative for bacterial growth. Different bacterial species were isolated from these 420 positive samples. The frequency of Gram positive bacteria among these positive samples was 213 (51%) while the frequency of Gram negative bacteria was 207 (49%). The most frequently isolated organism was Staphylococcus aureus 177 (42%), Pseudomonas species 61 (15%), Klebsiella species 58 (13%), E.coli 47 (11%), Streptococcus species 36 (9%). The rest of the bacteria were Proteus species 14 (3.3%), Acinetobacter species 8 (1.9%), Enterobacter species 14 (3.3%), Aeromonas species 2 (0.4%), Burkholderia species 2 (0.4%) and Ralstonia species 1 (0.2%).

Staphylococcus aureus (n=177) showed highest susceptibility to vancomycin (100.00%) followed by co-amoxiclav (84%), teicoplanin (82%), fusidic Acid (78.5%), cefotaxime (73%), amoxicillin (71%), erythromycin (67.7%), methicillin (66.7%), amikacin (65%) and ampicillin (32%). There were 33.3% MRSA strains.

![Fig 1: Frequency of different organism among positive cultures](image1)

![Fig 2: Frequency of Gram positive and Gram negative bacteria among positive samples](image2)
Pus can be formed in wounds, ears and brain abscesses by the action of organisms described in this study. Although pus formation cannot be completely eliminated, a reduction in its infection rate to a minimum level could have significant benefits, by reducing wastage of health care resources and by controlled and accurate use of antibiotics. A continued monitoring of susceptibility pattern needs to be carried out in individual settings to detect the true burden of antibiotic resistance in organisms and to prevent their further emergence by controlled and judicious use of antibiotics. In the present study vancomycin and teicoplanin remained effective antibiotics for the treatment of MRSA.

REFERENCES


Table 1: Antimicrobial susceptibility of Staphylococcus aureus (n=177)


