ORIGINAL ARTICLE

CULTURE AND SENSITIVITY PATTERN OF BURNS WOUND INFECTIONS IN PAEDIATRIC PATIENTS

Waheed Akhtar, Tariq Waheed, Mohammad Imran, Inayat Ur Rehman, Zia Ur Rehman

Department of Paediatric Surgery, Khyber Teaching Hospital, Peshawar - Pakistan

ABSTRACT

Objectives: To determine culture and sensitivity pattern of burns wound infections in paediatric patients.

Material and Methods: Cross Sectional Descriptive study conducted in Department of Paediatrics, Surgical Unit, Khyber Teaching Hospital, Peshawar, Pakistan from September 2014 to March 2015. A total of 241 patients are included in the study. Culture swabs were taken on first signs of infection and sent swab for culture and sensitivity.

Results: Total of two hundred and forty one patients were included in the study. Pseudomonas Aeruginosa was the most frequent isolate 30.3% , followed by Staphylococcus Aureus 24.5%, Enterobacter 22% , Escherichia Coli 12.86%, Proteus 6.2%, Klebsiella 2.9% and Acintobacter 1.2%. A variable antibiotic susceptibility pattern was observed among the cultured micro-organisms.

Conclusion: The most frequent isolates were Pseudomonas Aeruginosa, Staphylococcus Aureus and Enterobacter. Gram negative micro-organism are becoming more frequent. Both gram positive and gram negative microbes are becoming resistant.

This article may be cited as: Akhtar W, Waheed T, Imran M, Rehman UI , Rehman ZU. Culture and sensitivity pattern of burns wound infections in paediatric patients. J Med Sci 2017; 25: (1) (Supplement) 171-174.

INTRODUCTION

Burns are defined as coagulative destruction of tissue by thermal, chemical or electrical injury.[1] Burns in paediatrics patients are very distressing and it is the second most common cause of accidental death in children under 5 years of age.[2] It was estimated that global incidence of fire related injuries in 2004 was 1.1 per 100,000 population, with the highest rate 0.59 in South-East Asia and the lowest 0.17 per 100,000 in the America.[3] And estimated 265,000 deaths annually.[4] The mortality rates of burns with infections can be traced up to 50-60% in literature.[5]

The micro-organisms causing these infections are different in different hospitals and accordingly their antibiotic sensitivity varies. The emergence of resistant micro-organism is on the rise, more over gram negative infections rates have increased over the past years. The antibiotic sensitivity patterns are changing across the globe.[6] One of the challenges in burn units at the time of admission is the use of appropriate antibiotics. So it is necessity of the time that all burn units study their most prevalent micro-organisms and be able to start their patients on the most effective treatment at the earliest time.

Dr. Waheed Akhtar (Corresponding Author)
Trainee Registrar
Department of Paediatric Surgery, Khyber Teaching Hospital, Peshawar - Pakistan
Cell: +92-333-9388938
Email: drwaheedakhtar@yahoo.com
Date Received: November 8, 2016
Date Revised: December 27, 2016
Date Accepted: February 10, 2017

MATERIAL AND METHODS

This study was conducted in Department of Paediatrics Surgery Unit, Khyber Teaching Hospital, Peshawar, Pakistan from September 2014 to March 2015. Two hundred and forty one patients are included in the study. Culture swabs were taken on first signs of infection and sent swab for culture and sensitivity. All two hundred and forty one burn patients who were admitted in our unit, and meeting the inclusion criteria were included in the study. A detailed history was obtained and full examination performed to assess the degree and surface area of burn. Tissue culture swabs were taken on first signs of infection by taking 1x1cm2 area of tissue by excision under local anasthesia or during debridement under general anasthesia and sent swab for culture and sensitivity in saline solution.

All the data was entered and analysed in SPSS version 16.0. Mean±SD was calculated for numerical variables like age. Frequencies and percentages were calculated for categorical variables like Gender, common bacteria and their respective antibiotic sensitivity.

Common bacteria were stratified among the different antibiotics, age & gender to see effect modification. Consecutive non probability sampling was done.

All new patients, aged from 1 month to 14 years both genders, admitted to the unit within 24 hours of sustaining burns, having any degree of burns which show signs of infection during hospital stay were included. Where as re-admission, patients with established infection at the time of admission were excluded from the study.

RESULTS

Total of 241 patients were included in the study. Out of these, 54.8% were males while 45.2% were females. The age of the patients ranged from 1 month to 14 years (mean: 6.38 ± 4.08 years) whereas the total body surface area burned ranged from 20% to 90% (mean: 47.85 ±16.32%). Most of the patients were from Peshawar region 63.5%. The types of burn insults included scalds burns in 127 (52.7%) patients, flame burns in 87 (36.1%) patients and electrical burns in 27 (11.2%) patients.

Pseudomonas Aeruginosa was the most frequent isolate 30.3%, followed by Staphylococcus Aureus 24.5%, Enterobacter 22%, Escherichia Coli 12.86%, Proteus 6.2%, Klebsiella 2.9% and Acintobacter 1.2%. A variable antibiotic susceptibility pattern was observed among the cultured micro-organisms. More than half of the patients who sustained burn injury are male and most burns occurred at around 3 year's age. Pseudomonas Aeruginosa was the most frequent isolate, followed by Staphylococcus Aureus, Enterobacter, Proteus, Klebsiella Pneumoniae and Acinetobacter Baumannii.

Most of the micro-organism were sensitive to amikacin, Klebsiella Pneumoniae showed highest resistance amikacin. Most of the micro-organism were resistant to co-amoxiclave. However Staphylococcus Aureus was sensitive to co-amoxiclave in a large number of cases. Most of the micro-organisms in the study were resistant to ciprofloxacin. Pseudomonas Aeruginosa was the only micro-organism showing sensitivity in large number to ciprofloxacin. Cefoperazone+Sulbactum was effective against all, except Klebsiella Pneumoniae and Acinetobacter Baumannii. Meronem was effective against all micro-organisms included in the study.

Only Staphylococcus Aureus showed sensitivity to ceftriaxone. Even in Staphylococcus Aureus one third of them were resistant to ceftriaxone. Linezolid having no activity against Gram negative micro-organism was rarely checked against them. However against Staphylococcus Aureus (Gram positive), all the isolates were sensitive to Linezolid.

DISCUSSION

Burns are a major health problem all over the world. Wound infections are responsible for high mortality of burn patients. The risk of infection is directly proportional to the size and depth of the burn. Different types of micro-organisms colonize the burn wounds. These micro-organisms have different sensitivities to antibiotics and they affect the clinical course in different manners.

A ratio of male: female of 1: 0.82 was observed. In Turkey, in a study conducted by Aysun BO, male: female was 1:0.67, which was almost similar to observed in my study.[7] In striking contrast to our study, in some studies in Egypt and India girls were more affected.[8] Over all, most studies indicate male children were more affected than female.[9,10] The age of the patients ranged from 1 month to 14 years (mean: 6.38 ± 4.08 years). The most commonly occurring age was 3 years (mode=3). In Maiduguri, North East Nigeria age 3 years was the most affected.[11]

In contrast to our study, in Brazil, and India infants accounted for nearly half of the burnt children.[12] Most of the patients we received were having scald burns 52.70%, followed by flame burns 36.1%, and then electrical burns 11.2%. Scalds was the most common mode of injury observed in my study. This finding is in co-relation in with many studies[13,14].

In four countries it was found that 53% were scalds, 19% flame, 14% electrical and rest other mechanisms of injury.[12] In our study electrical burn was 11.2% which is similar to other studies worldwide. Electrical burns account for up to 10% of burns admissions worldwide.[15] Some of the variation in gender distribution, injury mechanism, TBSA burnt and other characteristics is likely to be related to differences in study designs, setting, study population and representativeness of individual studies. There are conflicting results from different burn centres regarding the most commonly isolated micro-organism.

Pseudomonas Aeruginosa was the most common micro-organism isolated in our patients. This is similar to many studies which have reported Pseudomonas Aeruginosa as the commonest micro-organism isolated from burn wounds.[16,17] In contrast to our study, some studies have reported Staphylococcus Aureus as their predominant micro-organism of bacterial burn wound infections.[18] In a study conducted by Yasmen et al in Turkey, their results showed Acinetobacter Baumanniito be most common.[19] In India, Klebsialla was found to be the most common isolate.[20]

Staphylococcus Aureus constituted the second most frequently isolated micro-organism in my study, conforming to published studies which have also reported it as the second commonest cultured micro-organism.[21] However other studies have reported Staphylococcus Aureusas the most common micro-organism.[18,22] In my study Methicillin-Resistant Staphylococcus Aureus (MRSA) was 15.25% (n=9) of total 59 Staphylococcus Aureusisolates. In contrast some published studies have a much higher incidence of MRSA. In Islamabad MRSA was 68.62%.[23] The MRSA isolates were generally multi drug resistant. But not resistant to Linezolid to which there was 100% sensitivity. So Linezolid can be used on empirical basis to treat infections caused by multi drug resistant strains of MRSA in our setup.

In our study Enterobacter came out to be the third most frequently identified organism. Until now Enterobacter was not very common but now many studies indicate that incidence of Enterobacter infection are on the rise in many burn units across the globe[24,25,26]. In my study Escherichia Coli, Proteus, Klebsiella Pneumoniae, Acinetobacter Baumannii were less common. But in contrast there are studies were these micro-organisms occur at much higher rates[27,28]. A variable antibiotic susceptibility pattern was observed among the culturedmicro-organisms. Our observation concurs to several published studies. These patterns change over a period of time. So regular periodic monitoring of the prevalence and antibiotic sensitivity of these challenging micro-organisms should be done. The study presented here should prompt more well designed local studies to confirm and improve upon our findings.

CONCLUSION

Children of less than 6 years age are affected more. Scalds is the most common mode of injury and boys are affected more than girls. The most frequent isolates were Pseudomonas. Aeruginosa, Staphylococcus Aureusand Enterbacter in burn wounds in our unit. Gram negative micro-organism are becoming more and more frequent. Both gram positive and gram negative micro-organisms are becoming resistant to routinely used drugs in our hospitals.

LIMITATIONS

Major limitation of my study was cross infections from patients received from other hospitals.

RECOMMENDATIONS

We should strictly adherence to infection control measures and properly use antibiotics to successfully control these infections. We need to revisit and revise our antibiotic policy according to sensitivity pattern of local microbial flora.

REFERENCES

1. Karpelowsky JS, Rode H. Burns. In: Puri P, Höllwarth M, editors. Paediatric Surgery: Diagnosis and Management. 1st ed.Verlag Berlin Heidelberg: Springer; 2009. 191-96.
2. Petersons A. Skin and soft tissue.In: Zachariou Z, editor. Paediatric Surgery Digest.1sted.Verlag Berlin Heidelberg:Springer; 2009.714-16.
3. WHO. Global Burden of Disease 2004 Summary Tables. Geneva, World Health Organization 2008. [Online], [Accessed on September 20, 2011].Available at who.int/healthinfo/global_burden_disease/estimates_regional/en/index.html
4. WHO. Burns Fact sheet N°365, [online], [Updated April 2014].Available at http://www.who.int/mediacentre/factsheets/fs365/en/
5. Rosanova TM, Stamboulian D, Lede R. Infections in burned children: epidemiological and risk factor analysis. Arch Argent Pediatr.2013; 111(4):303-08.
6. Azzopardi EA, Azzopardi SM, Boyce DE, Dickson WA. Emerging gram-negative infections in burn wounds. J Burn Care Res. 2011; 32(5):570-76.
7. Aysun BO, Ali RT, Alper K, Kaya Y. Burn injuries among children aged up to seven years. Turk J Ped. 2009; 51: 328-35.
8. Margie P, Kayode O, Joan O, Adnan AH, Christine B,Fazlur R et al. Burns. In; World Report on Child Injury Prevention. 2008.82-91.
9. Natterer J, deBuys RA, Reinberg O, Hohlfeld J. Targeting burn prevention in the paediatric population: a prospective study of children's burns in the Lausanne area. Swiss Med Wkly. 2009 19; 139(37-38): 535-39.
10. Van NA, Rode H, Laflamme L. Incidence and patterns of childhood burn injuries in the Western Cape, South Africa. Burns. 2004;30(4):341-47.
11. Gali BM, Maddziga AG, Naaya HU, Epidemiology of childhood burn in Maiduguri, North East Nigeria. Nig. J.Med. 2004;13;144-47.
12. Natterer J, deBuys RA, Reinberg O, Hohlfeld J. Targeting burn prevention in the paediatric population: a prospective study of children's burns in the Lausanne area. Swiss Med Wkly. 19 2009; 139(37-38): 535-39.
13. Rifat R .Childhood injuries seen at an Emergency Department, J Pak Med Assoc. Mar 2008; 58(3): 114-18.
14. Tomkins KL, Holland AJ. Electrical burn injuries in children. J Paediatr Child Health. 2008:50-55.
15. Noorbakhsh Sabet N, Japoni A, Mehrabani D, Japoni S. Multi-drug resistance bacteria in Qom hospitals, Central Iran. Iran Red Crescent Med J. 2010; 12: 501-03.

16. Muhammad NS, Naheed A, Iftikhar HK, Arif BM, Faisal W. Bacterial profile of burn wound infections in burn patients. Ann. Pak. Inst. Med. Sci. 2012; 8(1): 54-57.

17. DiMuzio EE, Healy DP, Durkee, Paula BS, Neely AN,Kagan RJ. Trends in bacterial wound isolates and antimicrobial susceptibility. Paediatric burn hospital. J Burn Care Res. 2014;35(5):19-26.

18. Bayram Y, Parlak M, Aypak C, Bayram I. Three year review of bacteriological profile and antibiogram of burn wound isolates in Van, Turkey. Int J Med Sci. 2013;10(1):19-23.

19. Srinivasan S, Vartak AM, Patil A, and Saldanha J. Bacteriology of the burn wound at the Bai Jerbai Wadia Hospital for children, Mumbai, India. Indian J Plast Surg. 2009;42(2):213-18.

20. Muhammad NS, Naheed A, Iftikhar HK, Arif BM, Faisal W. Bacterial profile of burn wound infections in burn patients. Ann. Pak. Inst. Med. Sci. 201 2; 8(1): 54-57.

21. Mohammedaman M, Alemseged A, Tsegaye S. Antimicrobial susceptibility pattern of bacterial isolates from wound infection and their sensitivity to alternative topical agents at Jimma University Specialized Hospital, South-West Ethiopia. Ann Clin Microbiol Antimicrob. 2014; 13-14.

22. Muhammad S, Shehzad A, Muhammad SZ. Burn Wound infections and antibiotic susceptibility patterns at Pakistan Institute of Medical Sciences, Islamabad, Pakistan. World J Plast Surg. 2015; 4(1): 9-15.

23. Kumar A, Kashyap B, Mishra S, et al. Bacteriological analysis and antibacterial resistance pattern in burn sepsis: An observation at a tertiary care hospital in east Delhi. Inf Diseases Clin Pract. 2011;19:406-12.

24. Shi MM, Zhao DM, Wang Q, et al. Analysis of drug resistance and risk factors of Enterobacteriaceae in burn units. Zhonghua Shao Shang Za Zhi. 2010;26:199-201.

25. Leseva M, Arguirova M. Nashev D, Zamfirova E, Hadzhyiski O. Nosocomial infections in burn patients: etiology, antimicrobial resistance, means to control. Ann Burns Fire Disasters. 2013 31; 26(1): 5-11.

26. Leila A, Abbas M, Amirmorteza EN, Babak A, Abdolaziz RL Nosocomial infections in burned patients in Motahari Hospital, Tehran, Iran. Derm. Res. Pract. 2011.61-67.

27. Srinivasan S, Vartak A, Patil A, Saldanha J. Bacteriology of the burn wound at the Bai Jerbai Wadia Hospital for children, Mumbai, India-A 13-year study. Part I-Bacteriological profile. Indian J Plast Surg. 2009; 42(2):213-18.

CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE NIL

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Akhtar W: Main idea & concept.
Waheed T: Data collection.
Imran M: Bibliography.
Rehman IU: Critical review & final approval.
Rehman ZU: Follow-up.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.