Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2016; 4(1C):251-259 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2016.v04i01.046

Original Research Article

A study to determine the bacterial flora causing lower respiratory tract infection following tracheostomy and it's antibiotic sensitivity in hospitalized patient using broncho alveolar lavage in a tertiary care center

Dr Raghvendra Sing Gaur[1], Dr Swati Chandel[2]
[1]Assistant Professor Department of ENT CCM Medical College, Durg, CG, India
[2]Senior Resident Department of ENT CCM Medical College, Durg, CG, India

***Corresponding author**
Dr. Raghvendra Singh Gaur
Email: dr.raghu007@gmail.com

Abstract: The care of critically ill patients in the hospitals is a primary component of modern medicine. Nosocomial infection may develop during hospital stay .Upper air way protect the lower respiratory tract from invasion by pathologic bacteria, but after tracheostomy this protective mechanism has been bypassed. This study was conducted in tracheostomized patient 50 in number. Bronchoalveolar lavage was done on 3rd day of tracheostomy and lavage fluid was sent for the culture and sensitivity in sterile container. Total number of patient was 50 from age of 2yr to 72 yr with male 36 and female 14. 52% samples were positive and 48% were negative. Most common Organism isolated were Pseudomonas 42.30%, Klebsiella 19.23%, Streptococcus15.3%, Staphylococcus11.53%, Proteus11.53%. Sensitivity was as follows Pseudomonas –Ciprofloxacin 55%R28%S, Gaityfloxacin 45%S55%R, Gentamycin 36%64%R, Amikacin 19%S73R, Cefotaxim 18%S82%R, Ceftrixone+salbactam 55%S45%R, Pipearacillin+tazobactum 73%S27R. Klebsiella- Ciprofloxacine 100%R, Gaityfloxacin 100%R, Gentamycin 100%R, Amikacin100%R, Cefotaxim40%S60%R, Ceftriaxone+salbactam 60%S40%R, Piperacillin+tazobactum 60%S40%R. Streptococcus- Ciprofloxacin 25%S75R, Gaityfloxacin 75%25%R, Gentamycin100%R, Amikacin 100%R, Cefotaxim 100%R Ceftriaxon+salbatam 100%R, Piperacillin+tazobatum 50%S50%R, Staphylococcus- Ciprofloxacine 100%R, Gaityfloxacin 33%S66%R, Gentamycin 100%R, Amikacin 100%R, Cefotaxim 100%R, Ceftriaxone+salbactam 66%S33%R, Piperacillin+tazobactum 66%S33R. Proteus- Ciprofloxacine 100%R, Gaityfloxacin 50%S50%R, Gentamycin 100%S, Amikacin 100%R, Cefotaxim 100%R, Ceftriaxone+salbactam 50%S50%R, Piperacillin+tazobactum 100%S. After analyzing the results, source of infection is seems to exogenous as normal flora of oral cavity are Streptococcus, Neisseria, Anaerobe, Candida albicans.
Keywords: Nosocomial infection, tracheostomy, Antibiotics

INTRODUCTION

The care of critically ill patients in the hospitals is a primary component of modern medicine. Nosocomial infection in hospital is a common health problem throughout the world [1]. Patients with chronic diseases or accidents may have to be admitted for long periods of time; therefore, they are at greater risk for nosocomial infection. The infections may be severe even causing the fatalities [2, 3]. Nosocomial infections may also be resistant to antibiotics making treatment difficult [4].

Nosocomial infections are those which manifest in patients 48 hours after admission to hospital. These infections are directly related to diagnostic, interventional or therapeutic procedures a patient undergoes in hospital, and are also influenced by the bacteriological flora prevailing within a particular unit or hospital. Urinary tract infections are the most frequent nosocomial infection, accounting for more than 40 per cent of all nosocomial infections.

Hospital care increasingly use high technology medicine for patient care, haemodynamic monitoring, ventilator support, suction cleaning, haemodialysis, parenteral nutrition, and a large battery of powerful drugs, particularly antibiotics to counter infection [10, 11, 12]. It is indeed a paradox that the use of high-tech medicine has brought in its wake the dangerous and all too frequent complication of nosocomial infections [5].

National Nosocomial Infections surveillance system (NNIS) of USA data suggests nosocomial pneumonia is the second most common nosocomial infection in hospital. Additionally pneumonia is associated with the greatest mortality among

nosocomial infections and with considerably increased costs of care. The widespread use of tracheal intubation and mechanical ventilation to support the critically ill has defined an expanding group of patients who are at particularly high risk for development of nosocomial pneumonia [6, 7, 8]. Despite advances in the diagnosis and treatment, our understanding of the nosocomial pneumonia remains subject to important limitations [13]

Despite availability of newer antimicrobials the treatment of nosocomial LRTI (Lower Respiratory Tract Infection) has proved to be difficult. The clinical presentation and organisms causing the nosocomial LRTI are different in different set ups [14]. Hence there is every need for early diagnosis and management of these patients to decrease morbidity and mortality [9].

The 3 studies in adult patients with tracheostomies showed that the microorganisms isolated from the lower airways differed from the bacteria carried in the oropharynx. Bartlett *et al.;* demonstrated in 16 patients that there was a poor correlation between oropharyngeal and tracheal cultures. Aerobic gram-negative bacilli (AGNB), mainly Pseudomonas and Serratia species, were the predominating potential pathogens. Niederman *et al.;*[14] examined 14 adult patients and found that the flora differed at the two sites and that Pseudomonas species persisted more often in the tracheal than in the oropharyngeal cultures.

Palmer *et al.;* confirmed in 7 patients that colonization differed between the oropharynx and trachea. Pseudomonas and Serratia species again emerged as the common potential pathogens.

In 14 endotracheally ventilated patients, Niederman *et al.;* [14] reported that Pseudomonas species were found more often in the tracheobronchial tree than in the oropharynx

AIMS AND OBJECTIVES

1. Incidence of Lower Respiratory Tract Infection (LRTI).
2. To determine predominance of flora causing LRTI.
3. To determine culture and sensitivity of microbiological flora
4. Determine relationship with nasopharyngeal carrier state.

MATERIALS AND METHODS

- **Source of Data-**

  This study was conducted in tertiary care hospital in Bhopal (MP) between June 2007 to October 2009 in tracheostomized patients 50 in number. Bronchoalveolar lavage was done on 3rd day of tracheostomy and lavage fluid was sent for the culture and sensitivity in sterile container.

- **Inclusion criteria -**

  All Tracheostomized patients- elective / emergency due to any cause.

- **Exclusion criteria**

  Patient already having an episode of LRTI.

  Patient who has had a stay in hospital for more than two days before tracheostomy.

OBSERVATIONS

Table-1:Distribution of age

SN	***Age***	**No**
1	1-10	7
2	11-20	3
3	21-30	8
4	31-40	7
5	41-50	7
6	51-60	12
7	>60	6

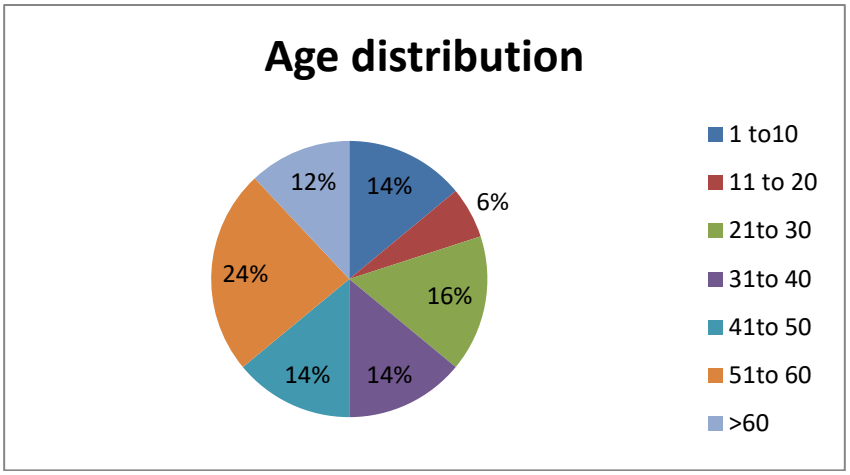

Fig-1: Distribution of age

Table No. 2: Sex ratio

SN	***MALE***	**FEMALE**
1	36 Patients	14 Patients

Total-50 cases

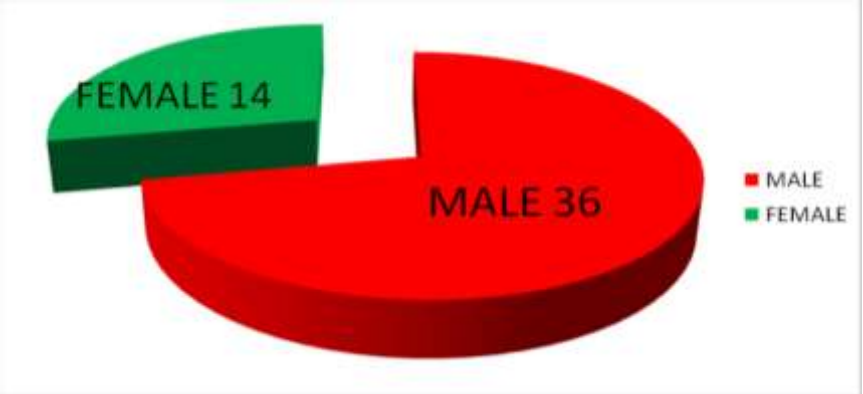

Fig-2: Distribution of sex

Table No. 3: Pathological Conditions Requiring Tracheostomy

SN	*DIAGNOSIS*	CASES
1	Ca larynx and Hypo pharynx	23
2	Clinical diphtheria	8
3	Polytrauma	6
4	Cut throat	5
5	Tetanus	4
6	B/L VC papillomatosis	1
7	GB Syndrome	1
8	Retropharyngeal schwannoma	1
9	Plasmacytoma	1

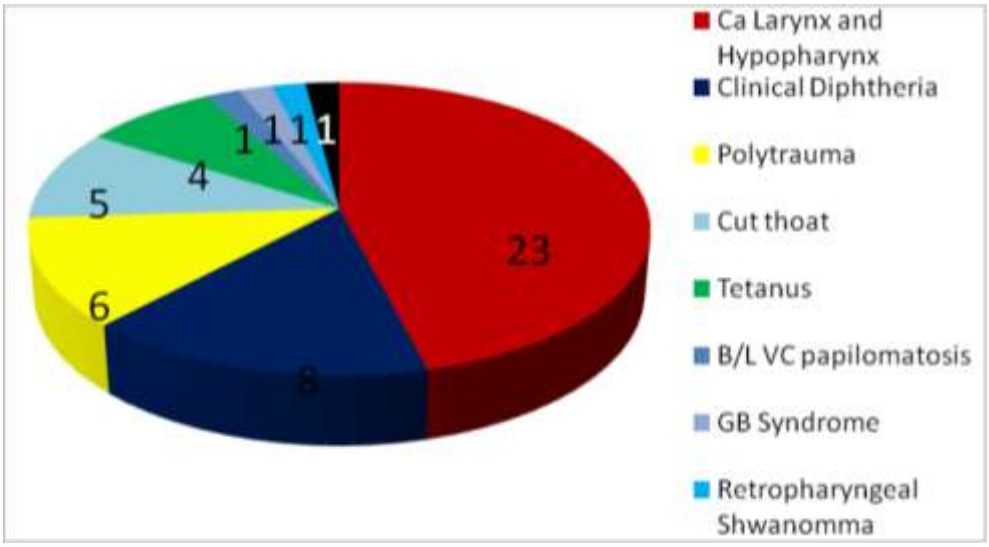

Fig-3: Pathological Conditions Requiring Tracheostomy

Table No. 4: Positive and Negative Sample Ratio

SN	Positive	**Negative**
1	52 %	48%

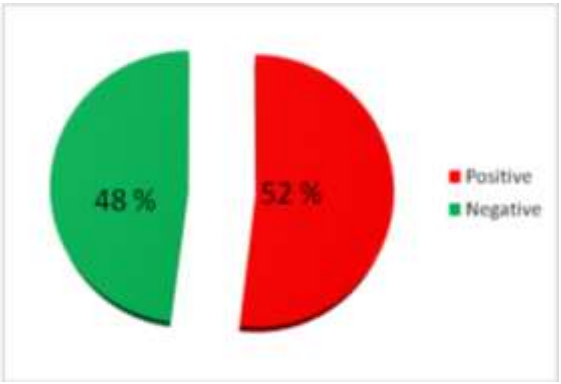

Fig-4:Sample ratio

Table No. 5: Organism Isolated

SN	**ORGANISM**	PERCENT
1	Pseudomonas	42.3%
2	Klebsiella Sps	19.23%
3	Streptococcus	15.3%
4	Staphylococcus	11.53%
5	Proteus	11.53%

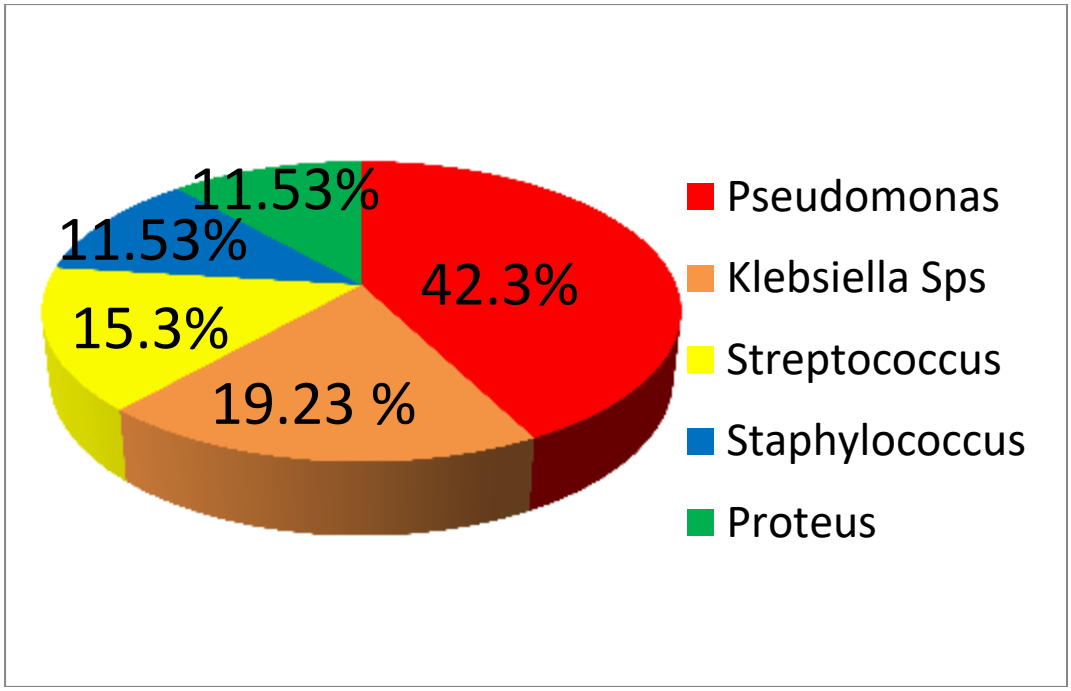

Fig-5: Organism isolated

Table No. 6: Pseudomonas Sps

SN	ANTIBIOTIC	SENSITIVE %	RESISTANT %	TEST NOT APPLIED %
1	Ciprofloxacin	55	28	17
2	Gatifloxacin	45	55	-
3	Gentamicin	36	64	-
4	Amikacin	19	73	4
5	Cefotaxime	18	82	-
6	Ceftriaxone sulbactam	55	45	
7	Pipearacillin+tazobactum	73	27	

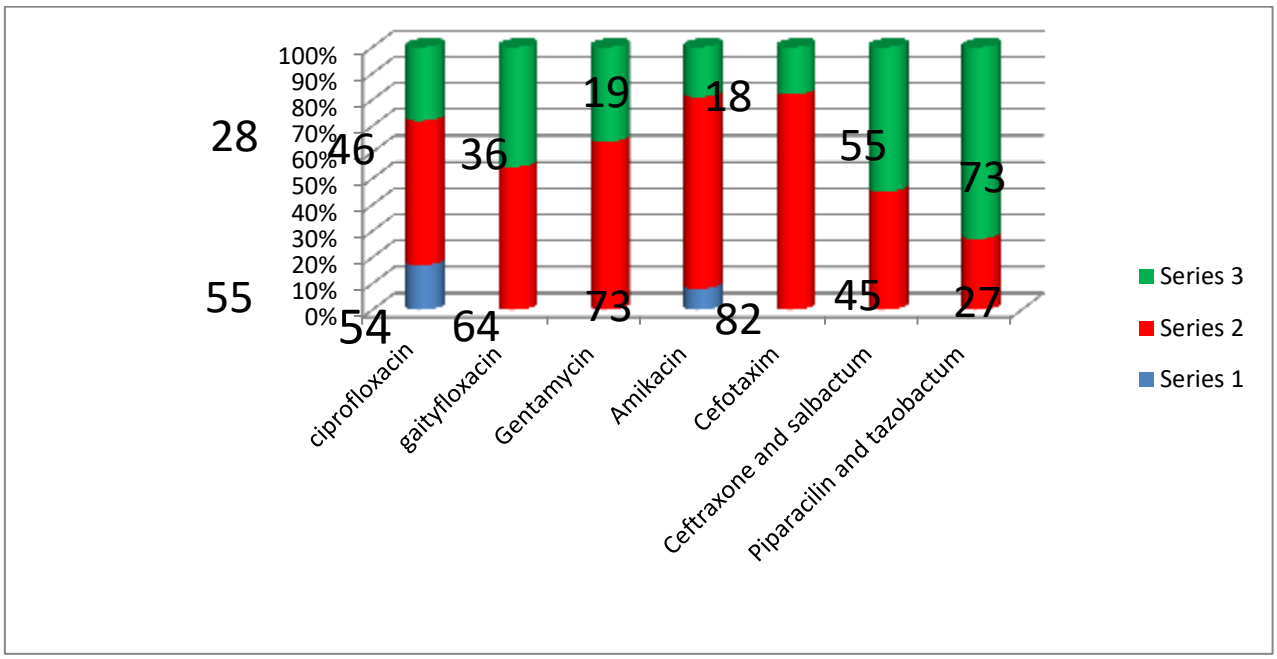

Fig-6: Pseudomonas Sps

Table No. 7: Klebsiella

SN	ANTIBIOTIC	SENSITIVE	RESISTANT	TEST NOT APPLIED
1	Ciprofloxacin	0	100	-
2	Gatifloxacin	0	100	-
3	Gentamicin	0	100	-
4	Amikacin	0	100	-
5	Cefotaxime	40	60	-
6	Ceftriaxone sulbactam	60	40	-
7	Pipearacillin+tazobactum	60	40	

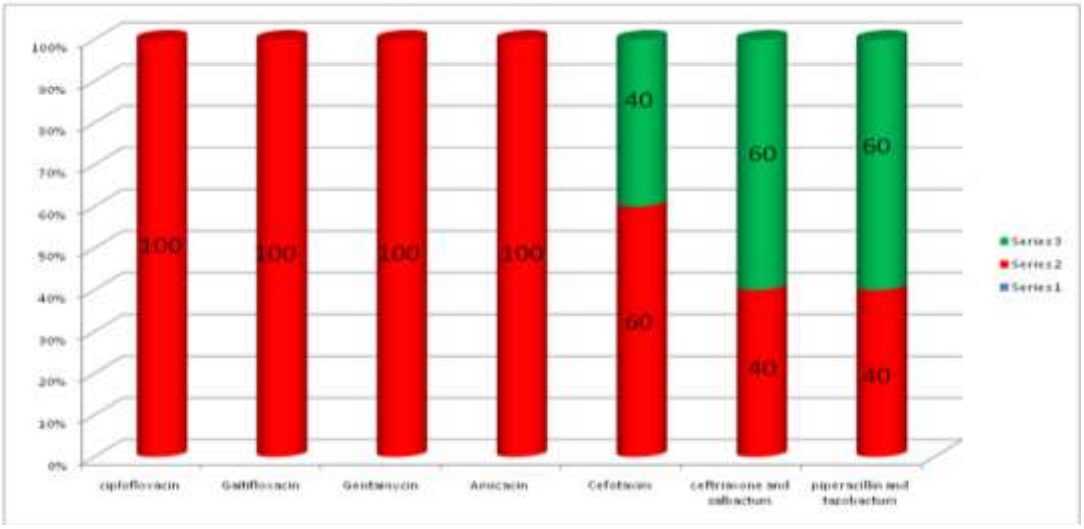

Fig-7:Klebsiella

Table No. 8: Streptococcus

SN	ANTIBIOTIC	SENSITIVE	RESISTANT	TEST NOT APPLIED
1	Ciprofloxacin	25	75	-
2	Gatifloxacin	75	25	-
3	Gentamicin	0	100	-
4	Amikacin	0	100	-
5	Cefotaxime	0	100	-
6	Ceftriaxone sulbactam	0	100	-
7	Piperacillin + Tazobactum	50	50	-

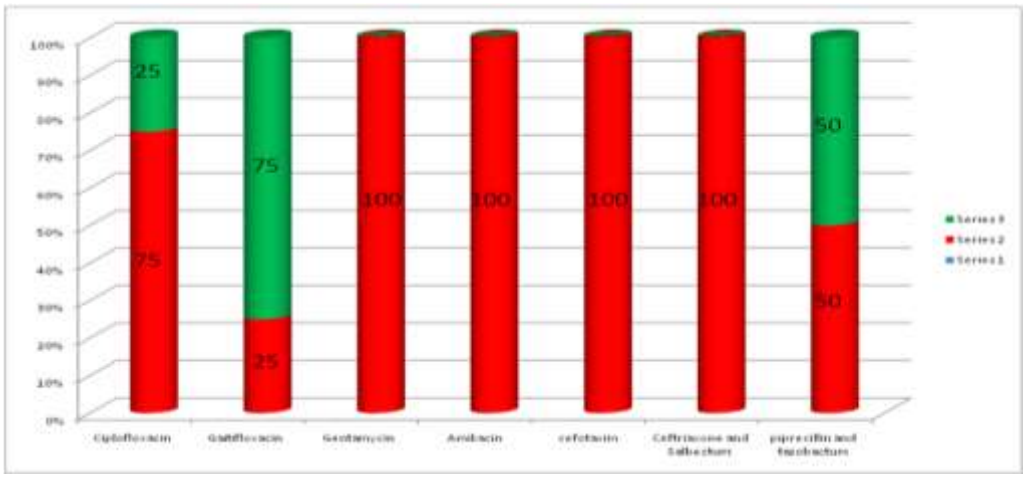

Fig-8: Streptococcus

Table No. 9: Staphylococcus

SN	ANTIBIOTIC	SENSITIVE	RESISTANT	TEST NOT APPLIED
1	Ciprofloxacin	0	100	-
2	Gatifloxacin	33	66	-
3	Gentamicin	0	100	-
4	Amikacin	0	100	-
5	Cefotaxime	0	100	-
6	Ceftriaxone sulbactam	66	33	-
7	Pipearacillin+tazobactum	66	33	-

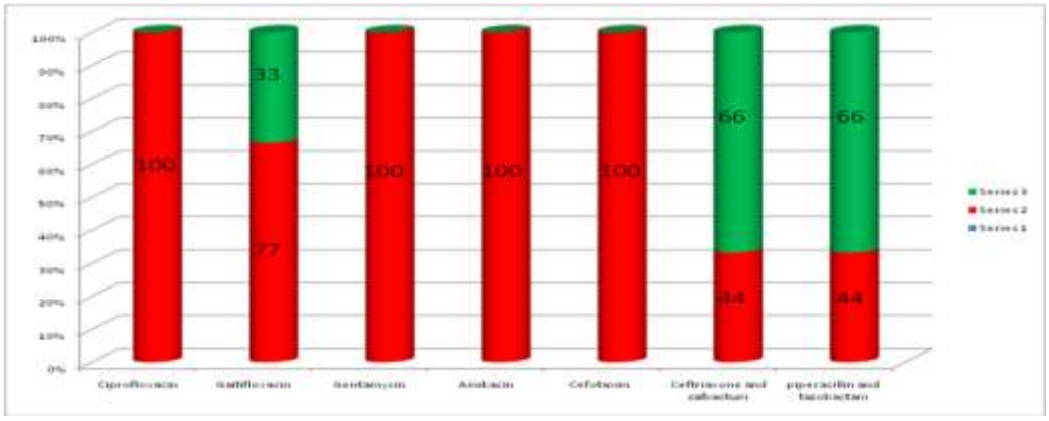

Fig-9: Staphylococcus

Table No. 10: Proteus

SN	ANTIBIOTIC	SENSITIVE	RESISTANT	TEST NOT APPLIED
1	Ciprofloxacin	0	100	-
2	Gatifloxacin	50	50	-
3	Gentamicin	100	0	-
4	Amikacin	0	100	-
5	Cefotaxime	0	100	-
6	Ceftriaxone sulbactam	50	-	50
7	Pipearacillin+tazobactum	100	0	-

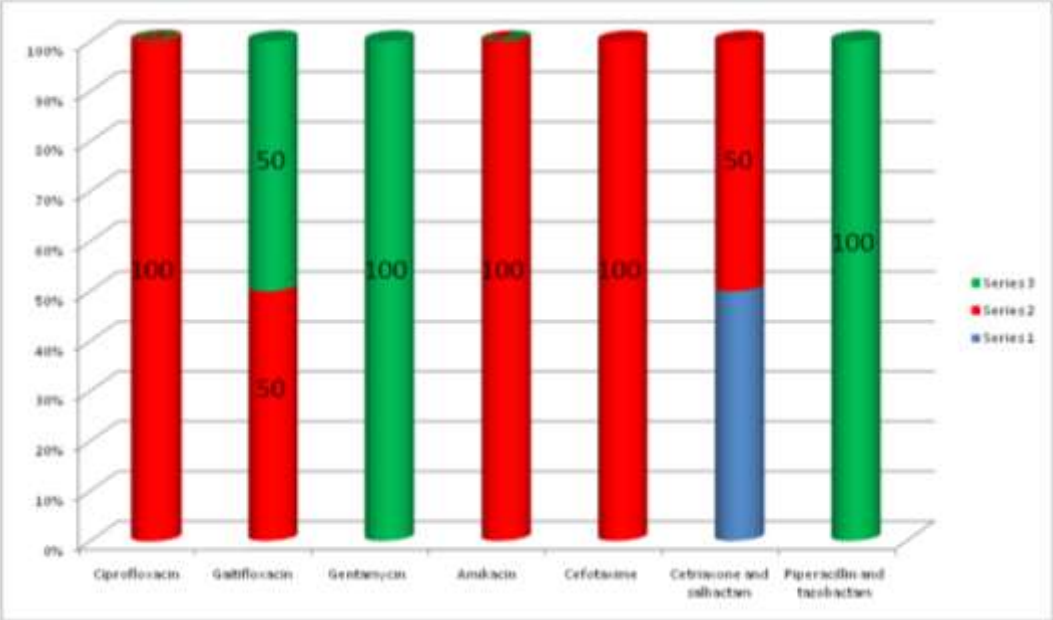

Fig 10: Proteus

DISCUSSION

The present study comprising 50 cases of tracheostomized patients was done to find out causative organisms and their sensitivity to antimicrobials. These patients were from different wards of a tertiary care hospital. Period of study was from June 2007 to October 2009. Criteria for selection of patients were any tracheostomized patient whether elective or emergency. Patient who were already having an episode of LRTI or those who had had a stay in hospital for more than two days before tracheostomy were excluded from the study

Of these 50 cases 36 patients were male and 14 patients were female. According to age group in study patients were from 5 yr to 72 yrs with maximum belonging to 5th decade followed by second decade.

Pathological conditions requiring tracheostomy in these patients were as follows, most common cause was carcinoma of larynx and hypo pharynx as tobacco smoking and chewing is very common in middle aged patient and a well known etiological factor for development of carcinoma of aero digestive tract. Out of 50, 23(46 %) cases were belonging to this class. Clinical diphtheria was the next cause in about 8 (16 %) cases particularly in children's. Long term respiratory support was required in cases of Polytrauma to maintain respiration, for that tracheostomy was done in about 6 (12%) cases. 5 (10%) cases of cut throat injury had laryngo tracheal injury, tracheostomy was done to prevent aspiration and to maintain the adequate airway. 4 (8%) cases belonged to tetanus group particularly in children and young adults due to their more exposure to external environment and injury. Tracheostomy was done preoperatively for giving general anesthesia in one case each of bilateral vocal cord papillomatosis, retropharyngeal schwannoma and plasmacytoma.

52 % samples were positive for bacterial growth and 48 %were negative for any kind of growth. In this study pseudomonas was the most common organism isolated from culture which was 42.3%.this result is consistent with the study of Bartlett et al who demonstrated similar results in his study of 16 patients i.e. showed Pseudomonas and Serratia species to be the predominating potential pathogens.

Another study conducted by Niederman *et al.;* in 14 patients showed Pseudomonas species to be predominant organism isolated. Following pseudomonas. Klebsiella sps another gram negative bacterium was the next common pathological organism in 19.23%.

Streptococcus a gram positive catalase negative bacteria was positive in 15.3% cases it is of two type Beta hemolytic and Alpha hemolytic. It is an aerobe, its growth occurs in medium having fermented carbohydrates. On blood agar small circular semitransparent low convex disc like colony forms. Virulent strain produces a matt colony while a virulent glossy colony.

Staphylococcus gram positive cocci were present in 11.53 % of cases. Rest of 11.53 % of culture is positive for Proteus Sps. P. mirabilis can utilize urea and citrate.

Antibiotic Sensitivity was as follows

Pseudomonas –Ciprofloxacin 55%R 28%S, Gaityfloxacin45%S 55%R, Gentamicin36%S 64%R, Amikacin19%S 73%R, Cefotaxim18%S 82%R, Ceftrixone+sulbactam55%S 45%R,Pipearacillin+tazobactum73% S27R.

Klebsiella-Ciprofloxacin100%R, Gaityfloxacin100%R, Gentamicin 100%R, Amikacin100%R, Cefotaxim40%S 60%R, Ceftriaxone + sulbactam 60% S 40% R, Piperacillin + tazobactum60%S 40%R.

Streptococcus- Ciprofloxacin25%S 75R, Gaityfloxacin75%S 25%R, Gentamicin100%R, Amikacin100%R, Cefotaxim100%R Ceftriaxone + sulbatam 100% R, Piperacillin + tazobatum 50% S 50%R,

Staphylococcus- Ciprofloxacin 100% R, Gaityfloxacin 33% S 66% R, Gentamicin 100% R, Amikacin 100% R, Cefotaxim 100% R, Ceftriaxone + sulbactam 66% S 33% R, Piperacillin + tazobactum 66% S 33% R

Proteus- Ciprofloxacin 100% R, Gaityfloxacin 50% S 50% R, Gentamicin 100% S, Amikacin 100% R, Cefotaxim 100% R, Ceftriaxone + sulbactam 50% S 50% R, Piperacillin+tazobactum100%S

CONCLUSION:

The conclusion derived from study

- There is a high risk of development of LRTI in tracheostomized patients as the protective mechanism of upper air way has been bypassed and during suction cleaning hygiene of equipment is not maintained.
- The most common organism grown is pseudomonas. May be because savlon is the most commonly used disinfectant in the health care centers, and is a culture medium for Pseudomonas.
- Organisms isolated are not endogenous, they are exogenous, and as the normal flora of the upper airway are Streptococcus, Neisseria, Anaerobe, Candida albicans.
- Sensitivity for antibiotic shows that cultured bacteria are resistant to the conventionally used antibiotic like Ciprofloxacin ,Gatifloxacin ,Gentamicin ,Amikacin and sensitive to higher antibiotic group as Piperacillin + Tazobactum ,Ceftriaxone Sulbactum.
- This puts extra financial burden over health care infrastructure and on the patient.
- Quality of life of the patient may be affected by prolonged lower respiratory tract infection.

REFERENCES:

1. Allen JR, Hightower AW, Martin SM, Dixon RB; Secular trends in nosocomial infections: 1970-1979. Am J Med 1981; 70:389-392.
2. American Thoracic Society. Hospital-acquired pneumonia in adults: diagnosis, assessment of severity, initial antimicrobial therapy, and preventative strategies; a consensus statement. Am J Respir Crit Care Med 1996; 153, 1711-1725.
3. Britt MR, Schleupner CJ, Mat sumiya S; Severity of underlying disease as a predictor of nosocomial infection. JAMA 1978; 239:1047-1051.
4. Craven DE, Kunches LM, Lichtenberg DA, Kollisch NR, Barry MA, Heeren TC, *et al.;* Nosocomial infection and fatality in medical and surgical intensive care unit patients. Arch Intern Med 1988; 148(5): 1161-1168.
5. Gross PA, Neu HC, Aswapokee P, Van Antwerpen C, Aswapokee N; Deaths from nosocomial infections: Experience in a university hospital and a communit y hospital. 1980; Am J Med 68:219.
6. Cross AS, Roup B; Role of respiratory assistance devices in endemic nosocomial pneumonia. Am J Med 1981; 70: 681-685.
7. Fagon JY, Chastre J, Domart Y, Trouillet JL, Pierre J, Darne C *et al.;* Nosocomial pneumonia in patients receiving continuous mechanical ventilation: prospective analysis of 52 episodes with use of a protected specimen brush and quantitative culture technique. Am Rev Respir Dis 1989; 139(4): 877-884.
8. George DL, Falk PS, Wunderink RG, Leeper Jr KV, Meduri GU, Steere EL *et al.;* Epidemiology of ventilator-acquired pneumonia based on protected bronchoscopic sampling. Am J Respir Crit Care Med 1998; 158(6):1839-1847.
9. Hayon J, Figlioloini C, Combes A, Trouillet JL, Kassis N, Dombret MC *et al.;* Role of serial routine microbiologic culture results in the initial management of ventilator-associated pneumonia. Am J Respir Crit Care Med 2002; 165(1):41–46.
10. Huxley EJ, Viroslav J, Gray WR, Pierce AN; Pharyngeal aspiration in normal adults and patients with depressed consciousness. Am J Med 1978; 64:564-567.
11. Kollef MH, von Harz B, Prentice D; Patient transports from intensive care increases the risk of developing ventilator associated pneumonia. Chest 1997; 112:765–773.
12. Kollef MH; The prevention of ventilator-associated pneumonia. N Engl J Med 1999; 340: 627-634.
13. Leu HS, Kaiser DL, Mori M, Woolson RF, Wenzel RP; Hospital-acquired pneumonia: attributable mortality and morbidity. Am J Epidemiol 1989; 129(6): 1258-1267.
14. Niederman MS, Merrill WW, Ferranti RD, Pagano KM, Palmer LB, Reynolds HY; Nutritional status and bacterial binding in the lower respiratory tract in patients with chronic tracheotomy. Ann Intern Med 1984; 100(6):795–800.