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AN INSIGHT ON EPIDEMIOLOGY OF HOSPITAL ACQUIRED PNEUMONIA IN A REFERENCE TERTIARY CARE HOSPITAL OF THE SAURASHTRA KUTCH AREA.

Microbiology

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ABSTRACT

HAP is the most common HAI, accounting for 22% of total HAIs & leading cause of morbidity & mortality. The rates are even higher in tertiary care hospitals and in developing countries like India. As incidence of HAP is not uniform and affected by several factors, study was conducted to survey the epidemiology of HAP in a reference tertiary care hospital of area. 2628 respiratory samples from suspected patients were studied. Out of 2628, 42.80% had shown growth of microorganisms, which were screened as per the CDC's criteria & 9.42% patients have diagnosed to have HAP. 15% developed NV-HAP & 83% developed VAP (19% Early & 81% late onset). Average HAP rate was 1.82 cases / 1000 admissions and developed within an average of 11 ± 8 days. Mean age of incidence was 50 ± 17 years with >50% cases occurring between 40–70 years of age & showing predominance in males (75%). 98% of isolates were gram negative bacilli. ***A. baumannii*** was the most common isolate recovered followed by ***K. pneumoniae*** and ***P. aeruginosa***. Hence, epidemiology of local clinical care setting is very helpful to initiate proper therapeutic and preventive measures.

KEYWORDS

HAP – Hospital Acquired Pneumonia, NV-HAP – Non Ventilator Hospital Acquired Pneumonia, VAP – Ventilator Associated Pneumonia, CDC – Center for Disease Control & Prevention

INTRODUCTION

Hospital Acquired Pneumonia is an acute lower respiratory tract infection that develops at least after 48 hrs. of hospitalization which was neither present nor was in incubation period at the time of admission. (Kalil AC et al, 2016). HAP includes two different clinical entity. (1) Non ventilator Hospital Acquired Pneumonia (NV-HAP) & (2) Ventilator Associated pneumonia (VAP) (James Davis B, Finley E., 2012), the later one is a more severe clinical form that develops in patients who are on mechanical ventilation after at least 48 hrs. of endotracheal intubation and is often associated with higher morbidity and mortality rates (American Thoracic Society guidelines, 2005)

HAP was previously considered as the second most common nosocomial infection after UTI and a leading cause of morbidity, mortality in US & thereby becoming a major factor that enhance the average length of stay of patients and resultant treatment cost (ATS guidelines. 2005; Craven DE et al, 1991; Tablan OC et al, 1994; Horan TC et al, 1986 & Craven DE, Steger KA et al, 1992) but due to improvements in prevention strategies of UTI, it has now become the most common nosocomial infection accounting 22% of the total HAIs (Tablan OC, Anderson LJ et al, 2003).

Incidence of HAP is found to occur approximately at a rate of 5 to 10 cases per 1000 hospital admissions, accounting for approximately 13 to 18% of all nosocomial infections. (Robert McEachern et el, 1998; Campbell GD et el, 1995). These rates are even higher in tertiary care reference hospitals than in community hospitals. (CDC's NNIS Report, 1996).

The Crude mortality rates for HAP are of up to 70% and attributable mortality rates as high as 33% to 50%.(Mandell LA & Campbell GD Jr., 1998) The rates are even higher in developing countries like India averaging 18 HAP cases per 1000 admissions with a crude mortality of 67.4% and an attributable rate of 40% in one study conducted in Bombay(Merchant M, Karnad DR & Kanbur AA, 1998) & 46 VAP cases (33% early onset & 67% late onset) in 51 critical care unit survey (Rakshit P, Nagar VS & Deshpande AK, 2005).

However, the incidence of HAP is not uniform and varies depending on several factors which is categorized into patient related, infection control related and intervention related factors as per American Thoracic Society statements. (Robert McEachern et el, 1998; Campbell GD et el, 1995).

So, present 5 years study was conducted to survey the burden and trend of hospital acquired pneumonia in a reference tertiary care hospital in the western area of the Gujarat - the Saurashtra Kutch after approval of administrative management.

METHODOLOGY: -

All the patients admitted during the survey period were taken into surveillance for development of pneumonia during their stay in hospital. The respiratory tract samples like sputum, endotracheal aspirate, Broncho Alveolar Lavage (BAL) and pleural fluids of suspected patients were collected in a proper sterile manner as per the sampling protocol of the hospital and analysed in microbiology laboratory.

Specimens were processed as per the laid down SOP of the institution. They were cultured on sheep blood agar plates & MacConkey's agar plates and incubated at 37°C for 24 – 48 hrs. Specimens were considered as sterile (no growth) after this incubation interval. (Winn W. Jr., 2006) Identification and antimicrobial susceptibility testing of the isolates was carried out by Microscan Autoscan 4 ID & AST system (Beckman coulter, US FDA approved Automated microbiology analyser) Results of antibiotic susceptibility were obtained in form of MIC values and interpreted as per CLSI guidelines by in-built LABPRO software of the instrument. (NCCLS Document M7-A3). Histories of all the patients who have showed positive culture report were analysed and according to the inclusion criteria of the hospital acquired pneumonia published by CDC (CDC's Device associated PNEU criteria), the cases of Hospital Acquired pneumonia / Ventilator Associated Pneumonia were screened. All the data of HAP patients was analysed and shared with the hospital infection control committee to get the idea of trends of prevalent organisms and to direct further preventive measures pertaining to it.

RESULTS

Total 2628 respiratory samples (2066 samples of endotracheal secretions and 562 samples of sputum & Broncho Alveolar Lavage (BAL) samples) of suspected patients were tested during the period of January 2013 to December 2017, out of which 1125 samples have shown growth of microorganisms. (42.80% overall positivity ratio).

Out of these 1125 positive samples, 106 (9.42%) patients have diagnosed to have hospital acquired pneumonia.

Amongst these 106 patients, 16 patients (15%) belonged non ventilator

hospital acquired pneumonia (NV-HAP) who have acquired infection either through aspiration or due to oxygen supply post tracheostomy or have been put on non-invasive mechanical ventilation whereas 88 patients (83%) were diagnosed with ventilator Associated Pneumonia (VAP) who have been put on mechanical ventilation (19% Early onset & 81% late onset) & 2 patients (2%) have not shown any radiographic changes and hence might have developed Ventilator Associated Tracheobronchitis (VAT).

Average incidence of overall HAP was found to be 1.82 cases per 1000 hospital admissions and was found to develop within an average at 11 ± 8 days.

Incidence of HAP was found higher in males (75%) than in females (25%), showing predominance of infection in males. (Chart - 1.1). Table 1.1 shows the details of infection rates, mean age and average period of onset.

Predominance of gram negative bacilli isolates was observed in the HAP cases (98%) with ***Acinetobacter baumannii*** (33.33%, 36 isolates), ***Klebsiella pneumoniae*** (28.70%, 31 isolates) & ***Pseudomonas aeruginosa*** (21.30%, 23 isolates) are three major isolates recovered.

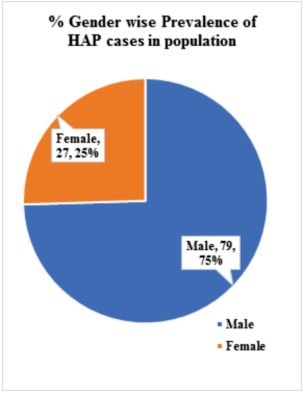

Chart – 1.1: - Gender wise prevalence of HAP cases in population

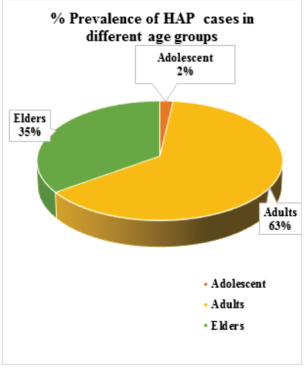

Chart – 1.2: Percentage prevalence of HAP cases in different age groups

Moreover, incidences of HAP showed predominance in both – adults and elders age groups, however, the incidence was higher in former age group. Almost half of the cases were found to occur between 40 to 70 years of age (62 cases, 58%) in both clinical variants of HAP. (Chart – 1.2, 1.3)

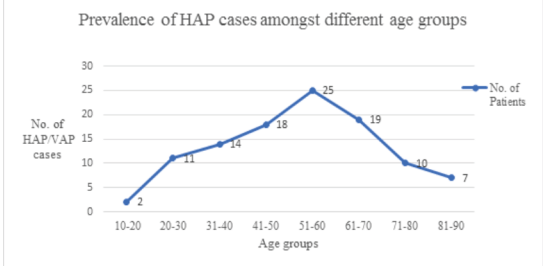

Chart – 1.3: Prevalence of HAP cases amongst different age groups.

Table – 1.1: Details of age and incidence of HAP

Details	HAP
No. of cases	106 (9.42%)
Average incidence rate	1.82 cases per 1000 admissions
Mean age of incidence	50 ± 17 years
Average days of incidence	11 ± 8 days

[Note: - HAP – Hospital Acquired Pneumonia]

DISCUSSION: -

The study provided the idea of prevalence of hospital acquired pneumonia in different groups of population of the Saurashtra Kutch area along with local aetiological parameters involved. The study also given idea about the average no. of days in which the infection was acquired in a reference tertiary care setting located in the region.

In our study, we have found the overall prevalence of HAP to be 9.46% which corresponds to the rate of 1.82 cases per 1000 admissions which was lower than the study done by Dr. Rajesh Chawla (18 per 1000 admissions) (Rajesh Chawla, 2008), Vijayanarayana K. et. al. (28.8% prevalence) (Vijayanarayana K & Rau NR, 2013), Vasuki V. (10.3% Prevalence) (Vasuki V., 2016) & Col Shivinder singh et al (50% Prevalence)

The NV HAP contributed 15 % where as VAP contributed 83% of the total HAP cases. However, the study conducted by Karen K. Giuliano et al showed 1.6% prevalence of NV-HAP in US (Karen K. Giuliano, Dian Baker & Barbara Quinn, 2017) and the study done by Jordi rello et al showed 9.3% prevalence of VAP in the US (Jordi rello, Montserrat Vera-Llonch & Merin H. Kollef, 2001) which were lower than the rates found in our location. The study done in tertiary care hospital of Bangalore, India by Saroj Golia et al showed VAP contribution of 35.14%. (Saroj Golia, Sangeetha K.T., Vasudha C.L., 2013).

The study also showed 81% of VAP cases were late onset which revealed that the risk of acquiring pneumonia increases with the day of mechanical ventilation. This was comparable with the study done by Saroj Golia et al which also showed higher percentage of late onset of VAP (55.77%) (Saroj Golia, Sangeetha K.T., Vasudha C.L., 2013) and also in the study done by Rakshit P et al which showed 67% late onset VAP. (Rakshit P, Nagar VS & Deshpande AK, 2005).

In our study, the incidences of HAP were predominantly found higher in males (75%) than in females (25%). Similar findings have been observed in other studies conducted at different places and time. (Rajesh Chawla, 2008; Vasuki V., 2016; Saroj Golia et al, 2013, Vijayanarayana K. et al, 2013 & Karen K et al, 2017).

The majority of cases were found to occur at an age of 40 – 60 years (43 isolates, 41.34%) with mean age of incidences being 50 ± 17 years whereas Vijayarayana et al showed mean age of 54.7 ± 16.5 years with predominant infection in elder individual (> 60 years) (Vijayanaraya K. et al., 2013). Vasuki V. also showed mean age of 59.96 years with predominant involvement of elder individuals (55.73%) (Vasuki V., 2016).

Acinetobacter baumannii was found the most common isolate in HAP cases. This was similar to other studies. (Golnar Abbasi Farid et al, 2018; Peerawong Werarak et al, 2012; Tuhina Banerjee et al, 2018)

CONCLUSION: -

As stated earlier, incidence of HAP is not uniform. Various factors affect the incidence of HAP in different clinical setting. Different clinical settings have different microbial flora and other associated factors and therefore a proper mapping of a clinical setting is very crucial in identifying local epidemiology and trends of infections and resistance prevalent in that particular area of society. The study also confers advantage to the clinicians in starting more reliable empirical antibiotic therapy which in turn increases the prognosis of the patient and hence reduces average length of stay and treatment cost.

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