

(17.3%) *Escherichia coli* (29.3%) & *Enterobacter aerogenes* (16.3%) were the most common isolates in blood stream infections. (Table-2).

86% of the gram negative isolates were resistant to commonly used antibiotics such as 3rd generation and 4th generation cephalosporins i.e. cefdinir (90.8%), cefepime (85.7%), ceftazidime (83.3%), cefotaxime (77.6%), ceftriaxone (73.3%) and other antimicrobials as ofloxacin (75.3%) ciprofloxacin (57.7%) & gentamycin (64.4%). Fairly low resistance was seen with imipenem (10.2%), piperacillin & tazobactam (23.4%) netilmicin (26.8%) & amikacin (29.3%). Majority of the gram positive isolates were susceptible to vancomycin (87.5%), linezolid (87.5%) & gentamycin (76.3%). 93.3% of *Staphylococcus aureus* were methicillin resistant. Resistance was also high for clindamycin (78.2%) & erythromycin (62.8%).

## DISCUSSION

Nosocomial infections have become an important public health issue & pose a critical threat to geriatric population. The vulnerability of this age group is related to defective host defenses, chronic underlying disease, poor tolerance to therapeutic procedures, prolonged time of hospitalization & indiscriminate use of antimicrobial agents<sup>7</sup>. In our study, prevalence of nosocomial infections in elderly patients was (29.3%). The relatively high prevalence of nosocomial infections may be due to excess length of hospital stay following high severity of illness, more intervention, irrational use of antibiotics and possibly poor adherence to aseptic techniques. Similar results were reported by a study done by Beaujean et al<sup>8</sup>. A study by Mukherjee et al showed incidence of nosocomial infections in 80 out of 405 elderly patients to be 19.7%<sup>4</sup>. This difference may be related to sample size taken for the study & healthcare setting.

The most frequent infections were urinary tract infections (48.3%) & skin & surgical site infections (36.9%), lower respiratory tract infections (10.7 %) & blood stream infections. In a similar study done by Mukherjee et al, urinary infection (45%) was the most common infection followed by pulmonary infections (30%), blood stream infections (16%) & skin infections (3.75%)<sup>4</sup>. Predominance of skin & surgical site infection in our study could be due to the reason that majority of patients were from surgical ward & were using invasive devices. Another study by Rosineide et al reported, skin & surgical site infection (56%) as the most frequent infection and most of the patients were from surgical wards<sup>9</sup>.

Use of invasive devices was a major risk factor for development of hospital acquired infections in elderly patients in our study. In 140 patients (66.3%) nosocomial infections were associated with use of invasive devices such as urinary & CVP catheters, ventilators & surgery. These findings indicate that nosocomial infections are often associated with the use of invasive devices. Therefore to effectively reduce burden of these infections, the use of invasive devices should be minimized and specific disinfection precautions should be taken during application of devices. The length of hospitalization, which is a well known risk factor related to severity of disease and affects health costs, was also a risk factor for development of hospital acquired infections. Use of antibiotics prior to infection (45.5%) and associated chronic morbidities (19.9%) were other risk factors for nosocomial infections in elderly patients. Similar risk factors were implicated in a study reported by Mukherjee et al.<sup>4</sup>

Microorganism distribution of nosocomial infections in our study was different from findings of other studies<sup>4,10</sup>. *Escherichia coli* (28.9%), *Pseudomonas*

*aeruginosa* (22.8%), *Klebsiella pneumoniae* (18.6%) & *Candida* (11.4%) were predominant in urinary, skin & respiratory infections while Coagulase negative staphylococcus (33.4%) & staphylococcus aureus (19.5%) were mostly encountered in blood stream infections. In our study *Escherichia coli* (52.5%) was the predominant cause of urinary infections in contrast to *Pseudomonas* reported by mukherjee et al<sup>3</sup> and *Candida* reported by Richards et al<sup>10</sup>. These differences could be explained by differences in geographic location & health care system. Our study also revealed that nosocomial infections were more frequently caused by multidrug resistant bacteria. Antibiotic resistance of gram negative isolates was quite high to commonly used antimicrobials such as cephalosporins (82.2%) and fluoroquinolones. Most of gram positive isolates (93.3%) were methicillin resistant. Almost similar antibiotic sensitivity pattern was obtained in a study done by Mohanasundaram et al<sup>11</sup>. The most likely explanation for this phenomenon can be extensive & indiscriminate use of antibiotics.

In conclusion, the vulnerable geriatric population plays a leading role in the scope of nosocomial & health care associated infections creating a significant burden for the elderly patients & public health. In our study most frequent site of nosocomial infections were urinary tract infections, surgical site infections & lower respiratory infections. Most of infections were resistant to commonly employed antibiotics. It was also observed that incidence of infection increases with use of antibiotics & invasive devices. In frail elderly patients with age related multiple severe disorders & cognitive impairment, early diagnosis and empirical treatment of nosocomial infections is challenging & a sound knowledge of the prevalent epidemiology of bacteria and their resistance pattern is necessary for the same. Hence multifactorial efforts i.e. early recognition of infections, restricted & short term use of invasive devices & implementation of effective infection control measures to reduce cross contamination by resistant organisms can contribute significantly towards decreasing the prevalence of nosocomial infections in geriatrics population.

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