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ORIGINAL ARTICLE

# Nosocomial infection in a tertiary military hospital in Dhaka

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## Abstract

***Background:*** *Microbial agents in the hospital environment and other patients increase the morbidity and mortality of the hospitalized patients and cause increase in cost of care, wastage of scarce medical resources prolonged hospitalization and render non availability of scarce hospital beds to the needy.*

***Objective:*** *To find out the prevalence of Nosocomial Infection (NI), its risk factors and pattern of organisms.*

***Method:*** *This descriptive cross sectional study was conducted among the surgical patients of all age and sex at Combined Military Hospital, Dhaka. The study was conducted from 5 April 2014 to 12 April 2015.*

***Results:*** *A total of 360 respondents were available in different surgical wards during data collection period and 30 respondents developed nosocomial infection, thus the prevalence rate was 8.33%. The mean age of the respondents was 36.89 years with standard deviation of (±) 14.54 years. Among the nosocomial infection cases, 53.33% were surgical site infections and 50% were caused by Escherichia coli. The study found that frequency of nosocomial infection was more common among those who required assistance for most activities (40%), who had visitors more than 3 per day (81.3%), who had underlying illness like diabetes mellitus (25%), who had invasive devices (9.5%), who were admitted in ICU (12.9%), who received immunosuppressive therapy (23.5%), who had immunosuppressive conditions (28.1%), who had emergency operation (34.8%), and who had undergone general surgery (19.0%). Findings suggest that association between nosocomial infection and number of visitors, admission in ICU, immunosuppressive conditions, use of immunosuppressive therapy, use of invasive devices, and different functional state of patients were statistically significant ($p<0.05$).*

***Conclusion:*** *Measures are required for increasing awareness of hospital staffs, formulation of policy on use and duration of use of invasive devices establishing a surveillance system and controlling visitors for effective control of nosocomial infection.*


***Key words:*** *Nosocominal infection, Prevalence, Control.*

## Introduction

The effect of Nosocomial Infection (NI) is among the major causes of death and increased morbidity in both developed and developing countries. The World Health Organization (WHO) carried out a study in 2002 in 55 hospitals of 14 countries and found an average of 8.7% of hospital patients with NI. The situation is worst in Eastern Mediterranean and South East Asian region and accounted for 11.8% and 10.0% respectively.[1] The involvement of high cost as an outcome of antibiotic intake, prolonged hospital stay and loss of work effect the health and weaken the economy too. In a few situations, NI lead to septicaernia having a mortality rate of 80%.[2]

In Bangladesh, a few studies have been conducted in this field. A study in 1990, found the rate of NI in Dhaka Medical College Hospital as 30%.[3] In 2003, the rate of infection in the same hospital was found to be 11.34%.3 Moataz M et al, in Saudi Arabian Military Hospital in 2004, found 48 3% NI rate.[4]

Mikael Rahmqvist et al, found that of the total bed days, 9.3% was considered to be excess days attributed to the group of patients with N1.5 Estimated cost of these infections in 2002 prices suggests $ 6.7 billion in each year in USA and $ 1.7 billion in UK. It also found that in USA, average treatment cost for a patient with NI was more than $29,000, compared to $8,300 for an average patient without NI.[6,7]

The present study is an attempt within constraints

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of money and time to provide with information related to hospital acquired infection in CMH Dhaka. The findings, discussions and recommendations of this study may provide an insight to effective planning for prevention and control of N1.

## Materials and methods

This observational, descriptive cross sectional study was conducted among all admitted patients of surgical units (General surgery, Neurosurgery, Urology, Orthopedics, Gynaecology and Obstetrics wards, surgical intensive care units, Post operative wards) of CMH Dhaka irrespective of their age and sex and those who were willing to participate in the study. A total 360 patients who fulfilled the inclusion criteria and were not admitted 48 hours before data collection were included. This study attempted to find the prevalence rate of NI in CMH Dhaka, along with analysis of personal factors, socio demographic factors, and hospital related factors in relation to NI. Research instrument which contained mainly structured questionnaires was developed and pre tested among ten subjects of surgical ward of CMH Savar for clarity, accuracy and face validity. Operationally, NI was defined as infection that occurred in a patient while in the hospital, in which infection was not present or incubating at time of admission. The infection has been considered as hospital acquired, when it first appeared more than 48 hours after admission. History sheets were thoroughly checked for evidence of infection during admission into hospital; if found were excluded from the study. Those who were found to be having symptoms and signs of infections, appropriate samples were collected for culture and diagnosis was confirmed. Those already admitted in hospital before the date of data collection, diagnosis of NI was confirmed basing on history, judgments of surgeons and by culture report. Data were processed in SPSS version 16. Descriptive and inferential statistics of the data were performed and pattern of organisms identified from culture were analyzed. Ethical approval was obtained from Directorate General Medical Services (DGMS), Bangladesh Armed Forces.

## Results

A total 360 (n=360) respondents were studied who were admitted in surgical wards of Combined Military Hospital (CMH), Dhaka during the study period. The mean age of the respondents was 36.89 years (SD= ± 14.53) (Table I)

**Table I**

Age distribution of the respondents (n=360)

| Age (In years) | Frequency (n=360) | Percentage |
|---|---|---|
| 15-19 | 18 | 5.0 |
| 20-29 | 103 | 28.6 |
| 30-39 | 119 | 33.1 |
| 40-49 | 35 | 9.7 |
| 50-59 | 48 | 13.3 |
| ³ 60 | 37 | 10.3 |
| Total | 360 | 100.0 |

Among 360 respondents, 30 (8.33%) developed HAI. Among them, 53.3% were surgical site infection (SSI), 33.33% urinary tract infection (UTI), 6.67% soft tissue infection (STI), 3.3% respiratory tract infection (RTI), and 3.3% developed blood stream infection (BSI) (Figure 1).

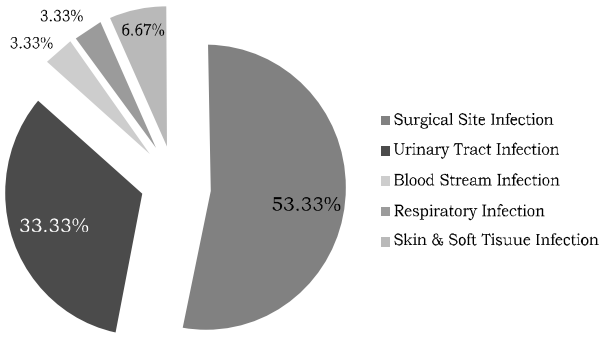


Fig. 1: Types of NI, in relation to site (n=30)

Distribution of NI by various surgical wards shows, highest in ICU (12.9%), and in chronogical order, general surgery ward (11.%), orthopaedic ward (9.7%), post operative ward (6.5%) and obstetric & gynaecology ward (5.6%) (Table II).

**Table II**

Distribution of NI among various surgical wards (n=360)

| Surgical ward | NI Frequency (%) Present | Total Frequency (%) Absent |
|---|---|---|
| Urology | 3(6.7) | 42(93.3) 45(100) |
| ICU | 4(12.9) | 27(87.1) 31(100) |
| Post operative | 2(6.5) | 29(93.5) 31(100) |
| General surgery | 6(11.1) | 48(88.9) 54(100) |
| Neurosurgery | 0(00) | 7(100) 7 (100) |
| Gynae & Obs | 5(5.6) | 84(94.4) 89(100) |
| Orthopaedics | 10(9.7) | 93(90.3) 103(100) |
| Total | 30(8.33) | 330(91.67) 360(100) |

By functional state, respondents who required assistance, 40% of them had infection, those who required some assistance 6.8% of them had infection and those who could perform activities at own, 4.9% of them developed infections. Association between different functional state and nosocomial infection was statistically significant ($p < 0.001$).

In our study. 30 out of 360 respondents developed nosocomial infection, thus the prevalence rate of nosocomial infection was calculated and found to be 8.33% (Figure. 2)

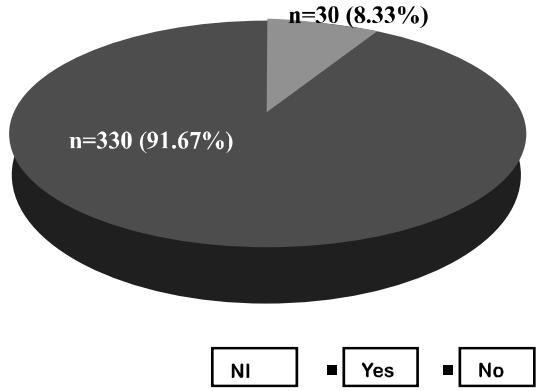


Fig. 2: Prevalence of Nosocomial infection

It was evident that those who had more than 3 visitors per day, they constituted 81.3% of HAI cases, whereas 18.8% developed HAI, who had 3 visitors per day, and those who had I and 2 visitors per day, constituted each 1.6% of the HAI cases. About 3% of HAI cases had no visitors. Association between visitors and HAI was found statistically significant ($p < 0.001$) (Table III)

**Table III**

NI cases in relation to number of visitors (n=360)

| Average visitors per patient per day | NI Frequency (%) | | Total Frequency (%) |
|---|---|---|---|
| | Present | Absent | |
| 1 | 2(l.6) | 122(98.4) | 124(100) |
| 2 | 2(1.6) | 121(98.4) | 123(100) |
| 3 | 12(18.8) | 52(81.3) | 64(100) |
| > 3 | 13(81.3) | 3(18.8) | 16(100) |
| No visitor | 1(3) | 32(97) | 33(100) |
| Total | 30(8.33) | 330(91.67) | 360(100) |

X2=136.245, df=4, p<0.001

Among the respondents (n=360), 27 (9.5%) who applied invasive devices developed NI, whereas only 3 (4.0%) of the respondents who did not use any device, developed infections. Association between invasive device and NI was found statistically significant ($p < 0.05$)].

The study found that 15 (22.7%) among 66 respondents who were admitted in ICU developed infections, whereas only 15 (5.1%) among 294 respondents who were not admitted in ICU developed infections. Association between NI and admission in ICU was found statistically significant ($p < 0.001$)].

Out of 30 NI cases, 50% were caused by E Coli, 27% were by Ps aeroginosa, 7% were by Staph aureus, 7% organisms could not be grown in culture in spite of having the features of infections (Which may be due to antibiotic effects), 3% each by Proteus, Candida, albicans and mixed infection which included E Coli and Ps aeruginosa (Figure 3).

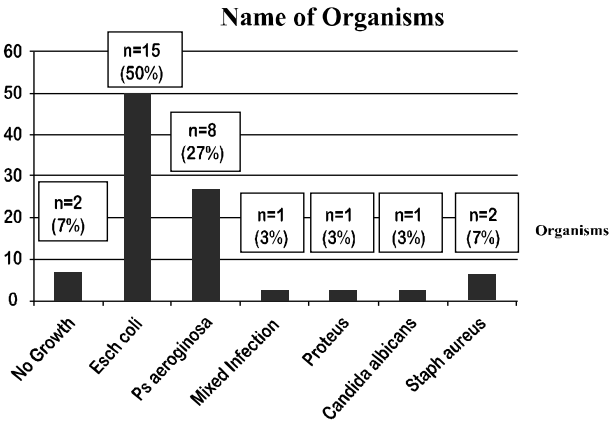


Fig. 3: Organisms causing NI (n=30)

## Discussion

The study aimed at describing the state of nosocomial infection in Combined Military Hospital, Dhaka. In doing so, it tended to fill a major gap in current knowledge of extent of NI and related factors.

We found that among 360 population at risk, total cases of NI was 30, making a prevalence rate of 8.33%, did not conform to findings of Sridhar MR et a1, which found 10% prevalence rate of NI among South East Asian countries.[8] Our study also did not conform to the findings of Khan HM et al, where rate of NI at Dhaka Medical College Hospital was 11.34% and the findings of Faruquazzaman where infection rate at surgical wards of Dhaka Medical College Hospital was 30.0%.[3,9] The differences with these studies, may be due to that fact that in any Military Hospitals, usually strict compliance to aseptic precautions are

maintained, which to certain extent may bring down the rate of HAI in comparison to national average or other public hospitals. The result is broadly consistent with the finding of Anne Mette Koch et al where HAI rate in Norway was 8.5%.[10]

We found site wise NIs as follows: 53.3% were surgical site infections (SSI), 33.3% urinary tract infection (UTI), 6.57% skin & soft tissue infection (SSTI), 3.3% blood stream infection (BSI), 3.3% were respiratory tract infection (RTI). Our study did not conform to the findings of Yaowen Zhang et al, where RTI was the most common type of HAI (64.7%), followed by UTI (12.6%), BSI (5.4%), SSI (4.8%), DT1 (3.6%) SSTI (3.0%) and other infections accounted for 6.0%.11 Our finding is broadly consistent to the finding of Faruquzzaman where HAI as per site was as follows: highest 38.7% SSI, 26.6% UTI, 8.8% SSTI and 19.2% RTI.[9]

We found that respondents who had more than 3 visitors per day, 81.3% of them had developed NI, those who had 3 visitors, 18.8% of them had developed NI. Afroz H et al found that 60% of the patients with more than 3 visitor had developed NI which is in conformity with our findings.12 This study result found strong association between number of visitors per patients and development of NI and the relation had high statistical significance ($p<0.001$), which almost conformed to the findings of Khan HM et al, where number of visitors per day per patient was associated with developing NI ($p <0.001$).[3]

We found that 285 (79 2%) of the respondents had applied invasive devices as part of treatment and among them 27 (9.5%) developed NI. It found that there was association between use of invasive devices and development of HAI ($p <0.05$) which corroborate with the findings of Klavs I et al.[13]

We found that those who needed assistance for most activities, 40% of them had developed NI whereas those who could perform activities at own, only 4.9% of them had developed NI. This study was in accord with the finding of Maziere S, which revealed that physical disability was a predictor of nosocomial infection.14 We also found that there was strong association between different functional abilities and development of NI ($p<0.001$), which also conforms with the findings of Vivian GL et al.[15]

We found that among all the cases of NI, 50% were by Esch coli, 27% by Ps aeroginosa, 7% by Staph aureus, no growth could be yielded in 7% cases (Might be due to antibiotic effects), 3% each by Proteus, Candida albicans and mixed infection (Combined Esch coli and Ps aeroginosa). This finding conforms to the finding of Oncul et al.[16]

The study was conducted in selective surgical units, where other departments of surgery were not included (eg Eye, ENT etc), because of time constraints. Also this study is not truly representative of the population of the country, which only included the personnel serving or retired from Bangladesh Armed Forces and their families. In addition, many important variables related to HAI were not considered (eg. hand washing, over crowding, general cleanliness, food hygiene, appropriate device handling, house keeping services, hospital days, antibiotic policy, sterilization, fame of the year etc), as these did not fall within the purview of this study.

## Conclusion

It can be safely inferred from the study that hospital acquired infection rate (8.33%) is relatively low in relation to the WHO study finding for South East Asian region (10%); but is much higher than CDC recommendation where infection rate is assigned to be less than 3%. To attain further decrease of NI needs appropriate house keeping, visitors' control, training and education of both hospital staffs, patients & their attendants and finally, raising awareness at all level.

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