

Hospital acquired infection among surgical patients in a selected secondary level hospital

Abstract

Introduction: Hospital-acquired infection is a major global issue for patient safety. Understanding the potential risk factors is important to appreciate the local context. At least 1.2 million people are affected globally by nosocomial infections at any one time, the vast majority of these occurring in low-income countries. This study aimed to assess the prevalence and contributing factors of hospital-acquired infections among surgical patients in a selected secondary level hospital.

Methodology: A hospital-based cross-sectional study carried out in the selected secondary level hospital; From October to 2019 December 2019 among 137 respondents. The purposive sampling technique was followed to select the study participants; the interview was taken by using a pre-tested semi-structured questionnaire. Statistical analysis was performed using SPSS program version 23. The level of significance was taken 95% and standard error 5%.

Result: Out of all 83.2% of the patients were admitted to Out Patient Department and 16.8% of respondents were admitted in an emergency. Among them, 0.7% of the respondents were found to develop the hospital-acquired infection. About 44.5% having infection before admission and more than three visitors visit a patient per day 65.7%. The scanty number of patients had used blood transfusion, a urinary catheter for their treatment. The provisional and final diagnosis was almost the same.

Conclusion: Hospital-acquired infections usually only receive public attention when there are epidemics. Although hidden from public attention, HAIs are a very real endemic and on-going problem. Maintaining a safe and hygienic work environment prevents the spread of HAIs.

Keywords: HAIs, Prevalence, contributing factors and selected secondary level hospital

UNDER PEER REVIEW

Introduction

Hospital acquired infections constitute an important health challenge worldwide in low and middle income countries, this challenge is more highlighted because disease prevention and control policies are either nonexistent, poorly adapted or insufficiently funded by governments¹. The rates of hospital acquired infections within a hospital represent the best indicator for the quality of services offered, where a high frequency of HRIs is evidence of a poor quality of health service delivery. Hospitals are main facilities for the risk of acquiring an infection during the delivery of care. Therefore infection control and prevention activities are focused mainly at the hospital level. But, since their occurrence is increasing in outpatient clinics and in nursing homes, nowadays term hospital related infections is used interchangeably with the term health care-associated infections (HAI) or previously nosocomial infections. Hospital infections include iatrogenic infections, which are related to health-care worker's errors during health care and also occupational infections among staff of the facility². The time frame for diagnosis of a hospital acquired infections is at least 48 hours after hospital admission, 3 days after hospital discharge, within 30 days after an operative procedure or one year after implants. HRIs are the most frequent in intensive care units and acute care surgical wards. Intensive Care Units (ICU) treat a minority of patients, but have the highest incidence of hospital acquired infections³. Infection rates even in highly resourced units ranged from 25-35% with mortality exceeding 25%. Hospital acquired infections pose a significant risk not only for patients, but also for health-care workers, students and visitors. Many different bacteria, viruses, fungi and parasites may cause hospital acquired infections, with multi-resistant bacteria being predominant⁴. There are two groups of bacteria causing hospital acquired infections: (1) commensal bacteria (endogenous), which are part of the normal flora and cause infections if the natural host is compromised (cutaneous coagulase-negative staphylococci and Gram-negative bacteria in the digestive tract) and (2) pathogenic bacteria (exogenous), which are more virulent and cause infections regardless of the host immune status methicillin resistant *S. aureus*(MRSA), Vancomycin resistant Enterococci(VRE) and Gram-negative bacteria producing extended spectrum beta-lactamases (ESBL). Some bacteria survive well in the hospital environment such as water, damp areas and even in sterile products or disinfectants (*Pseudomonas spp.*, *Acinetobacterspp*, etc.). Microorganisms can be transmitted within health care facilities by several routes: direct contact,

droplet contact (respiratory route) or vehicle transmission⁵. Many factors have been shown to be associated with the risk of acquiring hospital acquired infections. These factors can be related to the infectious agent, host and environment. The most important risk factors for acquiring infections in the hospital include underlying disease, invasive diagnostic-therapeutic procedures and improper use of antimicrobials. Hospital acquired infections can affect any part of the body, but most frequent are urinary tract infections associated with use of urinary catheters, followed by respiratory tract infections related to mechanical ventilation, bloodstream infections derived from intravascular devices and wound infections after surgical interventions or trauma. Hospital acquired infections impact on the population in many ways⁶. They affect patients directly, causing increased morbidity and mortality; they may lead to disability and may reduce quality of life⁷. They also impact on the healthcare system by extending hospitalization of affected patients and driving up the costs of diagnosis and treatment. Hospital acquired infections is very common problem in Bangladesh. We have tried to explore existing condition of Hospital acquired infection in tertiary level hospital.

Methodology:

A hospital-based cross-sectional study was conducted from October 2019 to December 2019 to determine the prevalence and contributing factors of hospital-acquired infections among surgical patients in a selected secondary level hospital. A total of 137 patients enrolled from the Norsingdi District Hospital. All patients were discharged from surgical departments of the secondary level hospital who had taken services from the secondary level hospital. Non-probability purposive sampling method was used for data collection. A pretested standardized questionnaire was used to collect data for determining the prevalence and contributing factors of hospital-acquired infections. Isolated bacterial results of corresponding patients were taken from the Microbiology department of the hospital. The data was collected after the ethical approval of the NIPSOM Institutional Review Board. The written inform consent was obtained from each study participant. Collected data were entered and analyzed using IBM Statistical Package for Social Science version 20. Descriptive statistics were performed. The results were recorded as frequencies, percentages, and means \pm standard deviations (SD).

Result

Table-1. Distribution of respondents by socio-demographic characteristic. (n=137)

Socio-demographic characteristic	Frequency	Percent
Age of the respondent		
Below 18 years	9	6.6
19-28 Years	36	26.3
29-38 Years	19	13.9
39-48 Years	22	16.1
48-58 Years	43	31.4
Above 59 Years	8	5.8
Gender		
Male	85	62
Female	52	38
Religion status		
Islam	121	88.3
Hindu	16	11.7
Education status		
Illiterate	4	2.9
Literate (Class 5-10)	67	48.8
SSC	35	25.5
HSC	29	21.2
Graduate	2	1.5
Place residence		
Urban	29	21.2
Rural	108	78.8
Occupation		
Unemployed	2	1.5
Housewife	41	29.9
Service	55	40.1
Business	11	8.0
Driver	2	1.5
Student	17	12.4
Others	9	6.6
Monthly income		
Below 7000 Thousand Taka	52	38.0
8000-14000 Thousand Taka	55	40.1
Above 15000 Thousand Taka	30	21.9

During the study period a total of 137 patients were admitted in surgical wards. The present study revealed that 62% (n=85) of the study populations were males and 38% (n=52) were females. Maximum study subjects (31.4%) belonged to 48-58 years of age groups and mean age was 38.5 ± 14.360 years. Majority of the study population were the Muslim (88.3%); residing in rural area (78.8%). Most of the study participants (48.8%) was literate. The majority of the respondents were service holder (40.1%) and housewife (29.9%); monthly income on average 10, 000 BDT.

A total of 6(4.37%) patients experienced HAInfection after admission and rest 131(95.63%) of the respondents were safe (**Fig-1**). On average 3 visitors visit a patients per day 65.7% (**Fig-2**). The most common pathogen was Escherichia coli (50.0%) which usually found in surgical wards (**Fig-3**).

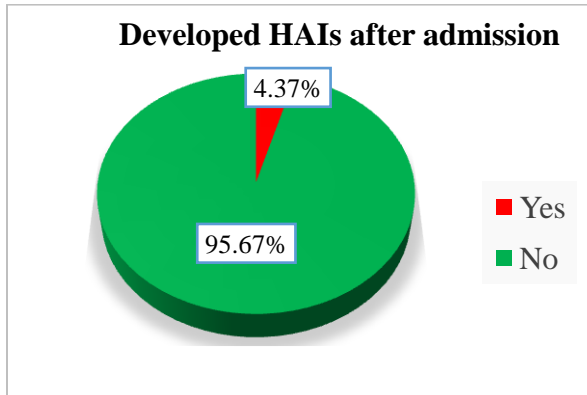


Fig-1: Developed HAIs after admission

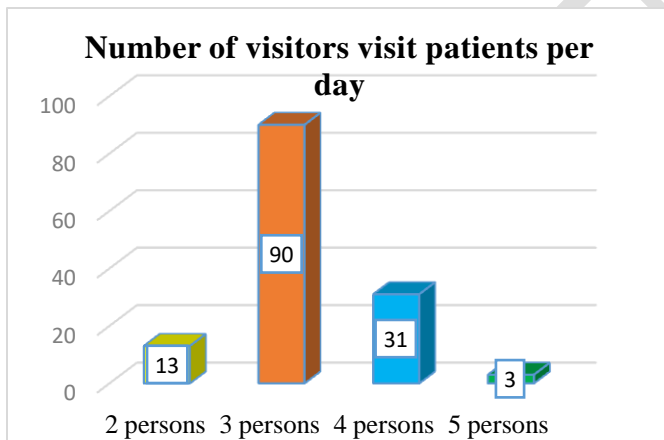


Fig-2 Number of visitors visit patients per day

Identified pathogens among the infected patients

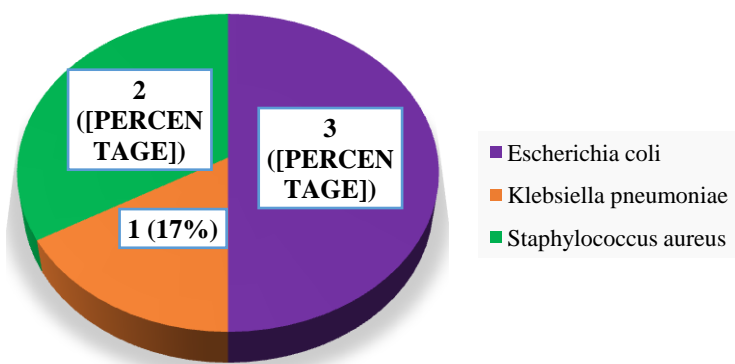


Fig-3 Identified pathogens among the infected patients

Table-2. Distribution of respondent's use of Drain tube. (n=137)

	Frequency	Percent
Types of patients admission		
OPD	114	83.2
Emergency	23	16.8
Use of Urinary Catheter		
Yes	30	21.9
No	107	78.1
Use of Drain tube		
Yes	25	18.2
No	112	81.8
Blood Transfusion		
Yes	4	2.9
No	133	97.1
Duration of stay in Hospital		
<5 days	88	64.24
≥5 days	49	35.76

It has been found that, most 114(83.2%) of the patients were admitted in OPD and rest 23(16.8%) of the respondents were admitted in emergency. Among all admitted patients just 21.9% required urinary catheter and just 18.2% required drain tube. Out of all respondent's only 4(2.9%) of the respondents required blood transfusion. The majority of the admitted patients (64.24%) stayed in the hospital for less than 5 days (**Table-2**).

Discussion

These hospitals were frequently overburdened with patients. Wards with higher bed occupancy rates seemed to pose an increased risk to patients. In Bangladesh, hospitals are likely sites of transmission of infections. Wards are overcrowded with patients as well as patient's attendants, who provide the majority of care to patients⁸. Wards have a limited supply of running water and soap, patients have poor personal hygiene practices, and many hospitals lack adequate routine infection control activities⁹. A pilot study in three tertiary care hospitals in Bangladesh estimated the incidence of hospital-acquired respiratory infections (HARI) to be six cases per 1,000 patient-days, but the etiology of those infections was not investigated¹⁰.

In this study, the majority of the subjects (31.4%) belonged to the 48-58 years of age group, and the mean age was 38.5 ± 14.360 years. This result is comparable to Razineet al¹¹. (2012). Among the total 137 study participants, 62% were male and 38% were female. This result is similar to the result of Yallewet al¹². (2017). The majority 88.3% (n=121) of the respondents are Muslim and the rest of the respondents are Hindu 11.7% (n=16) which is similar to Afroz H et al¹³., (2017). Most of the study participants (48.8%) were literate. The majority of the respondents were housewives (29.9%) this result is similar to the result of Afroz H et al¹³. (2017); the average monthly income was 10, 000 BDT per month.

In this study, we found only 4.37% of the respondents developed the infection after admission. This finding represents that waste management and infection control practices were followed by this hospital staff and the inside, outside and surrounding environment of the hospital was neat and clean. According to a WHO report, hospital-acquired infection rates in developing countries vary from 5.7% to 19.1% (but mostly >10%)¹⁴. The present study also found that the cumulative incidence rate (attack rate) of hospital-acquired infections was 19.6%. In most cases, 3 visitors visit a patient per day 65.7%, and 4 visitors visit patients per day 22.6% and they followed personal protective equipment. The most common pathogen was Escherichia coli (50.0%) which is usually found in surgical wards.

Out of 137 patients, It has been found that most 114(83.2%) of the patients were admitted in OPD, and the rest 23(16.8%) of the respondents were admitted in an emergency. Among all admitted patients just 21.9% required urinary catheters and just 18.2% required drain tubes. Out of all respondents, only 4(2.9%) of the respondents required blood transfusion. The majority of the admitted patients (64.24%) stayed in the hospital for less than 5 days.

This study has limitations. We focused on a relatively small number of risk factors for hospital-acquired infections. Some of the clinical data in the hospital recording system were incomplete. This may introduce bias in statistical analysis. The other limitation in this study was that controls did not match by type of ward and length of stay with cases. This may minimize the power of the study to identify confounders in the study.

Conclusion

Hospital Acquired infection is an alarming problem in Bangladesh as well as worldwide. This study provides a short glimpse of current situation of the problem and large scale studies including larger sample size should be employed to find out the overall magnitude of the problem. A proper surveillance system should be established to determine the pattern of nosocomial infection in hospital so that a long term program should be undertaken to control the problem and to determine sources of

nosocomial infection for effective control measures to be taken for the prevention of nosocomial infections in Bangladesh.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

References

1. Burke JP. Infection control-a problem for patient safety. *New England Journal of Medicine*. 2003 Feb 13;348(7):651-6.
2. Ayliffe GA. *Control of hospital infection. A practical handbook*. 1992.
3. Corona A, Raimondi F. Prevention of nosocomial infection in the ICU setting. *Minerva anestesiologica*. 2004 May 1;70(5):329-37.
4. Ramirez JA. Controlling multiple-drug-resistant organisms at the hospital level. *Expert opinion on pharmacotherapy*. 2006 Aug 1;7(11):1449-55.
5. World Health Organization. *Prevention of hospital-acquired infections: a practical guide*. Geneva, Switzerland: World Health Organization; 2002.
6. Mitchell BG, Russo PL. Preventing healthcare-associated infections: the role of surveillance. *Nursing Standard* (2014+). 2015 Feb 4;29(23):52.
7. Allegranzi B, Nejad SB, Combescure C, Graafmans W, Attar H, Donaldson L, Pittet D. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *The Lancet*. 2011 Jan 15;377(9761):228-41.
8. Islam MS, Luby SP, Sultana R, Rimi NA, Zaman RU, Uddin M, Nahar N, Rahman M, Hossain MJ, Gurley ES. Family caregivers in public tertiary care hospitals in Bangladesh: risks and opportunities for infection control. *American journal of infection control*. 2014 Mar 1;42(3):305-10.
9. Rimi NA, Sultana R, Luby SP, Islam MS, Uddin M, Hossain MJ, Zaman RU, Nahar N, Gurley ES. Infrastructure and contamination of the physical environment in three Bangladeshi hospitals: putting infection control into context. *PloS one*. 2014 Feb 19;9(2):e89085.
10. Gurley ES, Zaman RU, Sultana R, Bell M, Fry AM, Srinivasan A, Rahman M, Rahman MW, Hossain MJ, Luby SP. Rates of hospital-acquired respiratory illness in Bangladeshi tertiary care hospitals: results from a low-cost pilot surveillance strategy. *Clinical infectious diseases*. 2010 Apr 15;50(8):1084-90.
11. Razine R, Azzouzi A, Barkat A, Khoudri I, Hassouni F, Chefchaoui AC, Abouqal R. Prevalence of hospital-acquired infections in the university medical center of Rabat, Morocco. *International archives of medicine*. 2012 Dec;5(1):1-8.

12. Yallew WW, Kumie A, Yehuala FM. Risk factors for hospital-acquired infections in teaching hospitals of Amhara regional state, Ethiopia: a matched-case control study. *PloS one*. 2017 Jul 18;12(7):e0181145.
13. Afroz H, Fakruddin M, Masud MR, Islam K. Incidence of and risk factors for hospital acquired infection in a tertiary care hospital of Dhaka, Bangladesh. *Bangladesh Journal of Medical Science*. 2017 Jun 9;16(3):358-69.
14. Daschner FD, Dettenkofer M. Protecting the patient and the environment—new aspects and challenges in hospital infection control. *Journal of Hospital Infection*. 1997 May 1;36(1):7-15.

UNDER PEER REVIEW