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Original Article

Proportion of Three Types of Health Care Associated Infections among Hospitalized Patients in a Tertiary Care Hospital in Sri Lanka

Marapana M. B. M. R. D. T.¹, Dilrukshi K. S¹, Bandara M. G. S. D¹, Weerasekara M. M.², Kottahachchi J.².

¹ Department of Allied Sciences, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka

² Department of Microbiology, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka

Abstract

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Health care associated infections are considered as an indicator of quality and safety of health care institutions. The study aimed to determine the proportion of health care associated urinary tract infections, respiratory tract infections, surgical site infections, and to evaluate the association of medical devices and duration of hospitalization which predispose to health care associated infections.

Four hundred and twenty three patients who stayed more than 48 hours or readmitted to surgical, medical, pediatric and gynecology wards in a tertiary care hospital in Sri Lanka during the study period were included in the study. Data extraction sheets were used and were filled with information obtained from bed head tickets and laboratory reports.

A total of 79 (18.7%) patients had been diagnosed to have health care associated infection. The predominant type was respiratory tract infections 24 (30.4%) followed by urinary tract infections 21(26.6%), surgical site infections 17 (21.5%), and other infections 17 (21.5%). The highest proportion of urinary tract infections were seen in surgical wards (38.1%) whereas the highest proportion of respiratory tract infections were seen in medical wards (45.8%). Patients aged more than 60 were found to be affected most (27/94). Health care associated infections were significantly associated with usage of medical devices ($p<0.05$) and length of stay in hospital ($p<0.05$). The study concludes that these infections account for a noteworthy percentage in hospitalized patients and the predominant type was respiratory tract infections in this tertiary care hospital in Sri Lanka and elders were the mostly affected category compared to children and adults age groups.

Key words: HAI, TRI, UTI, SSI, Duration of hospital stay

Introduction

Surveillance of health care associated infections (HAIs) is useful in understanding the disease prevalence and to take necessary measures to minimize transmission. HAIs are considered as an indicator of quality and safety of a health care institutions¹ and the Center for Disease Control and Prevention (CDC) showed that surveillance is helpful to prevent HAIs (Garner, Jarvis, Emori, Horan & Hughes, 1988).

Surgical site infections (SSI) are defined as “any purulent discharge, abscess, or spreading cellulitis at the surgical site during the month after the operation. Definition for urinary tract infections (UTI) is “positive urine culture (1 or 2 species) with at least 10^5 colony forming units of bacteria / ml, with or without clinical symptoms”. “Respiratory symptoms with at least two of the signs: cough, purulent sputum, new infiltrate on chest radiograph consistent with infection appearing during the hospitalization” is considered as the definition for respiratory tract infections (RTIs) (Garner et al., 1988).

In Sri Lanka few studies have been conducted to assess the HAIs in different clinical settings and shown that SSIs, UTIs and RTIs are the most common types of HAIs (Gunaratne, Vidanagama, Wijayaratne, & Palanasinghe, 2011; Gunaratne, & Vidanagama, 2011; International Committee of the Fourth International 2002). A prospective study done in the intensive care unit (ICU) at Teaching Hospital Karapitiya has reported that the main types of HAIs were ventilator associated pneumonia (VAP) (26.4%) and UTIs (10.9%) (Gunaratne et al., 2011). In 1998 Athukorala SD recorded a gradual decrease in HAI from 1994-1997 (13.5% to 8.7%) after approving and monitoring infection control measurements in Sri Lanka.

It is found that in England and Wales the proportion of MRSA isolates increased from <2% in 1990 to 42% in 2002 (Reacher et al., 2000). Prevalence of HAIs in Uganda was also found to be high (28%). Most of the HAIs surveillances were done in Western countries and a very few local studies are found (Klevens et al., 2007; Allegranzi et al., 2011; Raymond & Aujard, 2000; Cunha, 2020; Custodio, 2020).

As the data related to surveillance of HAIs in Sri Lanka is sparse, there is a greater need to investigate the

health care associated infections in different clinical settings in the country. The study aimed to determine the proportion of health care associated UTIs, RTIs, SSIs, and to evaluate the association of the use of medical devices and the duration of hospitalization which predispose to HAIs in Sri Lanka. We consider that this data will help to discuss the challenges associated and opportunities to improve HAIs in the country.

Methodology

The study is a descriptive cross sectional study which was conducted in a tertiary care hospital (Colombo South Teaching Hospital) in Sri Lanka which has a bed capacity around 1000. Four hundred and twenty three patients who stayed more than 48 hours or readmitted to surgical, medical, pediatric and gynecology wards during the study period from July to August 2012 were taken as the study population”.

A validated data extraction sheet was used as the study instrument. The data extraction sheets contained patients’ demographic, sociologic factors, length of stay in the hospital and a check list for details of medical devices used and to diagnose three types of infections. All the data were collected according to WHO definitions of HAIs.

The proportion of health care associated UTIs, RTIs (including those recovering from VAP) and SSIs were calculated as a percentage. SPSS 16.0 software was used for data analysis. Chi square test and t-test were employed with a chosen significance level of 0.05 to describe the association of HCAIs with the usage of medical devices and the length of stay.

Results

Out of 423 patients, 203 (48%) were males while 150 (35.4%) were in surgical wards, 142 (33.6%) were in medical wards, 54 (12.8%) were in pediatric wards and 77 (18.2%) were in gynecology wards. Patients were categorized in to three age groups where 61 (14.4%) were children (age below 15 years), 268 (63.4%) were adults (16 – 60 years) and 94 (22.2%) were elders (age more than 60 years).

Seventy-nine patients (18.7 %) were identified as having HAIs. Among the patients who were diagnosed having HAIs, 24 (30.4%) had respiratory tract infections, 21 (26.6%) had urinary tract infections, 4%17 (21.5%) had surgical site infections and 17

(21.5%) other infections. Diarrhoea, sepsis and device related infections were noted as other common health care associated infections in this surveillance.

All the patients with SSIs were from the surgical wards.

UTIs were reported from all the wards and it was highest reported in surgical wards with 8 (38.1%) whereas 7 (33.3%) was reported in medical wards, 5 (23.8%) in pediatric wards and 1 (4.8%) in gynecology wards.

RTIs were reported from all the wards, with 5 (20.8%) from surgical wards, 11 (45.8%) from medical wards, 6 (25.0%) from pediatric wards and 2 (8.3%) from gynecology wards. The highest proportion of RTIs was recorded in medical wards (Table 1).

Ward type	SSIs		UTIs		RTIs		OIs	
	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Surgical	17 (100.0)	133 (32.8)	8 (38.1)	142 (35.3)	5 (20.8)	145 (36.3)	3 (17.6)	147 (36.2)
Medical	0 (0.0)	142 (35.0)	7 (33.3)	135 (33.6)	11 (45.8)	131 (32.8)	12 (70.6)	130 (32.0)
Pediatric	0 (0.0)	54 (13.3)	5 (23.8)	49 (12.2)	6 (25.0)	48 (12.0)	2 (11.8)	52 (12.8)
Gynecology	0 (0.0)	77 (19.0)	1 (4.8)	76 (18.9)	2 (8.3)	75 (18.8)	0 (0.0)	77 (19.0)
Total	17 (21.5%)	406 (100.0)	21 (26.6%)	402 (100.0)	24 (30.4%)	399 (100.0)	17 (21.5%)	406 (100.0)

Table 1: Percentage of HAIs according to types of wards

Of 79 HAI, 13 (21.3%), 39 (14.6%) and 27 (28.7%) were children, adults and elderly patients respectively according to the proportion of sample. However elderly were reported to be the most affected age group to acquire HAIs in this population. (Table-2).

Age groups	HAIs		Total (%)	Infected/ Total
	Yes (%)	No (%)		
<15 years	13 (16.5)	48 (14)	61 (14.4)	13/61 (21.3)
16 – 60 years	39 (49.4)	229 (66.6)	268 (63.4)	39/268 (14.6)
>60 years	27 (34.2)	67 (19.5)	94 (22.2)	27/94 (28.7)
Total	79 (100.0)	344 (100.0)	423 (100.0)	(18.7)

Table 2: Proportion of HAIs according to the age groups.

According to the above findings children were more susceptible to have health care associated RTIs. SSIs, UTIs and other infections (OIs) were detected mostly in elderly patients (Table 3).

Age group	SSIs (%)	UTIs (%)	RTIs (%)	OIs (%)
<15 Years	0/61 (0.0)	5/61 (8.2)	6/61 (10.0)	2/61 (3.3)
16-60 Years	9/268 (3.4)	8/268 (3.0)	11/268 (4.1)	11/268 (4.1)
>60 Years	8/94 (8.5)	8/94 (8.6)	7/94 (7.4)	4/94 (4.3)
Total	17/79 (21.5%)	21/79 (5.0)	24/423 (5.7)	17/423 (4.0)

Table 3: Proportion of type of infection with the groups of ages.

Ninety two (21.7%) patients of the study group were connected to medical devices (Table 4) and 34 (37.0%) of them developed HAIs. Out of the patients who were not connected to any medical device 11.2% acquired HAIs. There was a statistically significant association between the prevalence of HAIs and the usage of medical devices as the chi square test was highly significant ($p < 0.001$).

Device usage	HAIs		Total (%)
	Yes (%)	No (%)	
Yes	42 (45.7)	50 (54.3)	92 (21.7)
No	37 (11.2)	294 (88.8)	331 (78.3)
Total	79 (18.7)	344 (81.3)	423 (100.0)

$$\chi^2 = 34.3, \text{ df} = 1, p = .000$$

Table 4 : Association of HAIs with the usage of medical devices.

Patients who developed HAIs in this health care institution had a mean length of stay of more than 12 days (12.52), whereas those who did not acquire HAIs had a mean length of stay of less than 5 days (4.88) (Table 5). It proves that there is a statistically significant association between the length of stay in the health care setting and acquiring HAIs.

Group statistics			
HAIs			
Length of stay	Yes	79	
	No	344	
$t = 5.758, df = 421, p = .000$			

Table 5 : Association of length of stay with the prevalence of HAIs

Discussion

Estimating the prevalence of HAIs is useful to identify the magnitude of the problem in terms of risk factors, death rates and to develop measures to mitigate the infections including outbreaks. Further, it measures the effectiveness of the infection control program employed in individual health care institutions. Several studies have been conducted in Sri Lanka related to HCAs, and the prevalence had varied from hospital to hospital and from time to time.

Local data regarding HAI is scarce and it is proven by an article reporting that surveillance of HAI and AMR is done only in few hospitals in Sri Lanka (Jayatilleke, 2017). According to our results, the total prevalence of HAIs was 16.8 %. A study done in intensive care presented a prevalence of HAI of 41.58% (n=42) (Pemasinghe, et al., 2012). whereas in another study, childhood healthcare associated respiratory syncytial viral RTI were detected in 86 out of total of 818 (Jayaweera & Reyes, 2019). A study conducted in Uganda showed the total prevalence of HAIs as 28% suggesting better health care in local settings . The highest UTIs percentage was recorded in surgical wards and medical wards had the highest percentage of RTI in the study conducted in Uganda (Rosenthal, et al., 2006).

A recent research conducted in Nepal reports 22.66% SSI out of 300 patients who underwent lower segment caesarean section which is significantly higher than seen in this study (Shrestha & Pradhan, 2019). Further, a meta-analysis performed covering 22 countries including Sri Lanka published a pooled period prevalence of VAP as 12.7% (Bonell, et al., 2019). The authors consider that the lower rates of their study may be due to the time it was carried out.

When comparing the prevalence of infections

according to gender, females preponderance was noted in SSIs, UTIs and RTIs. However a study conducted in 55 ICUs of eight developing countries did not report any sex difference for HAI (Custodio, 2020).

When comparing the prevalence of infections with age groups, elders were the most vulnerable for HAIs. Elders were more susceptible for SSIs and UTIs and adult patients in the age group of 16-60 years were less vulnerable to UTIs when compared to the other two age groups. Further, adults and children had the highest percentage of RTIs. However, a study conducted in United States reported that RTI was most common in elderly patients and RTI and UTIs were the predominant type in children (Custodio, 2020).

In the current survey all HAIs studied (UTIs, RTIs and SSIs) were present in all the wards except in the gynecology ward. High prevalence of HAIs reported in surgical, medical and pediatric wards than in gynecology wards can be attributed to the highly crowded situation in former mentioned wards in this health care setting. Devise related infections were predominant among the category of other HAIs.

In the current study a strong statistical relationship between the usage of medical devices and the prevalence of HAIs was seen. A previous study done at intensive care settings at Teaching Hospital Karapitiya, Sri Lanka indicated that the percentage of VAP and UTIs as 26.4% and 10.9% respectively (Gunaratne, et al., 2011) . In the current study the percentages of RTIs and UTIs were below than the above mentioned study and it may be due to less usage of devices in selected wards than in intensive care units. Another study done in developing countries during the period of 2002-2005 states that the percentage of VAP was 14.7, central venous line related bloodstream infections were 30% and catheter associated UTIs were 29% (Rosenthal, et al., 2006).

The hypothesis of association between long length of stay in the hospital and the prevalence of HAIs among hospitalized patients was significantly verified in this study. A retrospective cohort study done in China also showed that HAIs is seen with increased length of stay and thereby increasing the total cost per patient (Chen, Chou, & Chou, 2005).

Limitations

Only the patients who fulfil the WHO criteria corresponding with HAI were selected, as only symptomatic patients were valid for the study. All the patients who have readmitted due to an infection acquired at home within one week after previous discharge were considered as hospital acquired infected patients and it cannot be ascertained whether it is hospital or community acquired.

Conclusion

Based on the results of the study, respiratory tract infections were the commonest type of HAI and elderly population was affected most. HCAs were significantly associated with usage of medical devices and with the length of the hospital stay.

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Conflict Of Interest

There are no conflicts of interests.

Ethical Statement

Ethical approval was granted from the Ethics Review Committees of Faculty of Medical Sciences, University of Sri Jayewardenepura, in 2012 and Colombo South Teaching Hospital.

References

- Allegranzi, B., Bagheri Nejad, S., Combescure, C., Graafmans, W., Attar, H., Donaldson, L., & Pittet, D. (2011). Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *Lancet* (London, England), 377(9761), 228–241. [https://doi.org/10.1016/S0140-6736\(10\)61458-4](https://doi.org/10.1016/S0140-6736(10)61458-4)
- Athukorala, S.D. (1998). Monitoring effectiveness of controlling hospital acquired infections by prevalence survey. *Ceylon Medical Journal*, 43:3:134-137. <https://www.ncbi.nlm.nih.gov/pubmed/9813930>
- Bonell, A., Azarrafiy, R., Huong, V., Viet, T. L., Phu, V. D., Dat, V. Q., ... Nadjm, B. (2019). A Systematic Review and Meta-analysis of Ventilator-associated Pneumonia in Adults in Asia: An Analysis of National Income Level on Incidence and Etiology. *Clinical infectious diseases : an official publication of the Infectious Diseases Society of America*, 68(3), 511–518. <https://doi.org/10.1093/cid/ciy543>
- Chen, Y. Y., Chou, Y. C., & Chou, P. (2005). Impact of nosocomial infection on cost of illness and length of stay in intensive care units. *Infection control and hospital epidemiology*, 26(3), 281–287. <https://doi.org/10.1086/502540>
- Cunha, BA. (2020). What is healthcare-associated pneumonia (HCAP)? [Internet]. *Medscape.com*. [cited 3 May 2020]. Available from: <https://www.medscape.com/answers/234753-38422/what-is-healthcare-associated-pneumonia-hcap>
- Custodio, HT. 2020 Hospital-Acquired Infections: Practice Essentials, Background, Pathophysiology [Internet]. *Emedicine.medscape.com*. [cited 3 May 2020]. Available from: <https://emedicine.medscape.com/article/967022>
- Garner, J. S., Jarvis, W. R., Emori, T. G., Horan, T. C., & Hughes, J. M. (1988). CDC definitions for nosocomial infections, 1988. *American journal of infection control*, 16(3), 128–140. [https://doi.org/10.1016/0196-6553\(88\)90053-3](https://doi.org/10.1016/0196-6553(88)90053-3)
- Gunaratne, A. & Vidanagama, D. (2011). An audit on ventilator associated pneumonia in the Intensive Care Unit at Teaching Hospital Karapitiya, Galle, Sri Lanka. *Anesthesia, Pain & Intensive Care*; 2011:15:1:38. <http://www.apicareonline.com/index.php/APIC/article/view/975/1645>
- Gunaratne, A., Vidanagama, D., Wijayaratne, W. & Palanasinghe, S. (2011). Nosocomial infection in the Intensive Care Unit at Teaching Hospital Karapitiya, Galle; an audit. *Galle Medical Journal*, 16(2), pp.13–16. DOI: <http://doi.org/10.4038/gmj.v16i2.3746>
- International Committee of the Fourth International (ICFI). 2002. Sri Lanka: Cross infections kill seven children at pediatric hospital. Retrieved

- from:
www.worldsocialist.com.https://www.wsws.org/en/articles/2002/07/sril-j23.html
- Jayatilleke, K. (2017). Infection prevention and control in Sri Lankan hospitals in relation to WHO Guidelines. Sri Lanka Journal of Infectious Diseases, 7(1), pp.2–9.
DOI: <http://doi.org/10.4038/sljid.v7i1.8131>
- Jayaweera, J.A.A. & Reyes, M. (2019). Childhood nosocomial viral acute respiratory tract infections in teaching hospital Anuradhapura, Sri Lanka. BMC Res Notes 12, 581.
<https://doi.org/10.1186/s13104-019-4624-2>
- Klevens, R. M., Edwards, J. R., Richards, C. L., Jr, Horan, T. C., Gaynes, R. P., Pollock, D. A., & Cardo, D. M. (2007). Estimating health care-associated infections and deaths in U.S. hospitals, 2002. Public health reports (Washington, D.C.: 1974), 122(2), 160–166.
<https://doi.org/10.1177/003335490712200205>
- Pemasinghe, K.A.M.S., Vithanage, V.M.D., Fonseka, T.S.N., Kandearachch, K.A. M.S.P., Fernando, U.C.P., & Jayasinghe, P.P. (2012). Prevalence of Nosocomial infections and associated factors among patients in the Intensive Care setting of the Colombo North Teaching Hospital, Sri Lanka. ISSN 2012-9916 ©
The Open University of Sri Lanka.
<https://ours.ou.ac.lk/wp-content/uploads/2018/01/OURS2017-all-part-3-17-20.pdf>
- Raymond, J. & Aujard, Y. (2000). Nosocomial infections in pediatric patients: a European, multicenter prospective study. European Study Group. Infection control and hospital epidemiology, 21(4), 260–263.
<https://doi.org/10.1086/501755>
- Reacher, M. H., Shah, A., Livermore, D. M., Wale, M. C., Graham, C., Johnson, A. P., George, R. C. (2000). Bacteraemia and antibiotic resistance of its pathogens reported in England and Wales between 1990 and 1998: trend analysis. BMJ (Clinical research ed.), 320(7229), 213–216.
<https://doi.org/10.1136/bmj.320.7229.213>
- Rosenthal, V. D., Maki, D. G., Salomao, R., Moreno, C. A., Mehta, Y., Higuera, F., International Nosocomial Infection Control Consortium (2006). Device-associated nosocomial infections in 55 intensive care units of 8 developing countries. Annals of internal medicine, 145(8), 582–591.
<https://doi.org/10.7326/0003-4819-145-8-200610170-00007>
- Shrestha, A. & Pradhan, N. (2019). Analysis of the risk factors and microbial etiology of surgical site infections following lower segment caesarean section. Sri Lanka Journal of Obstetrics and Gynaecology, 41(1), pp.15–19. DOI: <http://doi.org/10.4038/sljog.v41i1.7828>