

Microorganism in the Linen of Public and Private Hospital in Bangladesh

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Abstract: Background and Aims: Hospital linen is widely acknowledged to be a potential reservoir for microorganisms and a vector of disease transmission. There are many types of microorganisms and they can be found in different types of hospital linen. This study attempted to investigate the types of hospital linen microorganisms and their distribution in hospital linen. **Methods:** This descriptive cross-sectional study was conducted in a public hospital namely Sher-E-Bangla Medical College Hospital (SBMCH), and in a private hospital namely Rahat Anower Hospital in Barishal district, Bangladesh. 64 (34 from public hospital and 30 from private hospital) swab samples were selected purposively from various wards and departments for microbiological test. Data processing and analysis were done using SPSS (Statistical Package for Social Science) version 23. **Results:** Public hospital's sample illustrated the higher microbiological growth 19 (56%) than private hospital's sample 10 (33%). Of these, public hospital showed 42% and 36.84% cocci and bacilli group, respectively. On the other hand, 50% and 40% cocci and bacilli group microorganism was found in the private hospital linen. The highest 4 (80%) positive microbiological growth was found in the Gynae operation theater, male surgery ward and female orthopedic ward of public hospital. In contrast, about 6 (40%) positive microbiological growth from the linen store of linen department of private hospital was noticed. **Conclusions:** It is concluded that different types of microorganisms such as cocci and bacilli can be found in every department and ward of both private and public hospital.

Keywords: Microorganism, hospital linen, private hospital, public hospital.

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INTRODUCTION

Microorganism are small living things that are too small to be seen with the naked eye [1]. Bacteria, viruses, fungi, protozoa and worms are the most widely discussed microorganisms in the scientific and medical literature. Its play both beneficial and detrimental roles for human health as it exists everywhere from human gut to water, air, soil, any solid surfaces and so on [2]. Hospital linen is no exception in the case of presence of

microorganisms. Hospital linen is clearly recognized as a potential reservoir for microorganisms and could be a vector of disease transmission [3]. Hospital linen includes bed sheets, blankets, towels, personal clothing, patient apparel, uniforms, gowns, drapes for surgical procedures, etc [4]. Since hospitals' linen comes in contact with various body fluids i.e. blood, urine, feces, saliva, sputum, therefore, pathogenic microorganisms are potentially to be stayed in it [5].

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Decades ago, Brady and his colleagues assessed the persistence of virus recovery from 0-10 hours for non-absorptive and absorptive surfaces in the hospitals and found virus can survive 4 hour on clothing such as hospital gown [4]. After some years later of above study, over 200 samples of hospital linen (sheets, pyjamas), as well as linen rooms and trolleys for transporting linen, were collected in the report by Bureau-Chalot and colleagues in 2005 [6]. The most common microorganisms discovered were those of human origin (coagulase-negative staphylococci) and those of environmental origin (*Bacillus* spp., moulds). The presence of microorganisms on hospital textiles is also discussed in Hota's report [7]. *Acinetobacter baumannii* was found on bed linen and curtains, as well as other parts of the inanimate environment, according to her review of the literature. On the other hand, Moravvej *et al.*, (2013) discovered a significant amount of *Staphylococcus Aureus* in healthcare providers' white coats [8]. Along with *Staphylococcus Aureus*, *Clostridium difficile*, and vancomycin-resistant enterococci (VRE) were found in the microbiological sampling of nurses' uniforms before and after duty, in a study conducted by Perry and colleagues [6].

Studies evident that pathogenic microorganism can transmit from uniforms to patients and bed linen [9], or from dirty bed linen to staff uniforms [10]. Medical textiles have been considered as one of the possible vehicles of transmission of hospital acquired infections. Dried and streamed reused towels was found as the source of *Bacillus cereus* nosocomial infections among patients in the summer from 2001-2005 in Japan [11]. Sasahara *et al.*, (2011) sought to identify the source of *Bacillus cereus* bacteremia outbreak at Jichi Medical University Hospital in 2006 and discovered that hospital linens were the main source of this contamination and *B. cereus* was transmitted from the linens to patients via catheter infection [12]. Hospital acquired infections (HAI) are significantly associated with the mortalities and morbidities of human being. In the USA, every year 99,000 death occurred due to HAI [13]. In Bangladesh, a significant amounts of patients were found to be developed HAI in a hospital based study [14]. In addition, ICDDR-B reported the occurrence of HAI among healthcare providers because of working at hospital [15]. By increasing the cost of hospitalization and treatment, HAI may cause huge physical, mental and financial damage to the patient. Healthcare providers may also face similar losses by taking sick leave or not going to work or incurring unwanted costs for treatment.

Identification of problem may help minimizing or eliminating the disease transmission. In Bangladesh, there is no research regarding the nature of hospital's linen microorganism and their potential sources in hospital settings. Therefore, this study tried to explore the types of hospital linens' microorganism, and their location in hospitals' linen so as the concerned authority could take necessary steps for combating it.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted in two hospitals. One was a public hospital namely Sher-E-Bangla Medical College Hospital (SBMCH), and another one was a private hospital namely Rahat Anower Hospital in Barishal district, Bangladesh. Swab samples were collected for microbiological test from the selected two hospital. A standard formula was used for the selection of sample size of hospital linen for microbiological tests. According to this formula, the sample size of 73 swabs was found, but 64 (34 from public hospital and 30 from private hospital) swab samples were selected purposively for microbiological test as there was time restrictions. This study lasted for about one year from 1 January 2019 to 31 December 2019.

Microbiological test of the hospital linen (bed linen, pillow cover, surgeon gown, OT linen, and blanket) was carried out by taking swab culture from washed linen of the public and private hospital. The samples were taken purposively in the different OT and few wards of the public hospital and from the laundry department and general OT of private hospital. Then submitted to the microbiology department for investigation.

Before preceding the data collection, the details of study were thoroughly explained to the hospitals' concerned authority, and a written consent was taken from them. After collection of data, they were checked, verified, coded and edited. The data entry was started immediately after completion of data collection. Data processing and analysis were done by using SPSS (Statistical Package for Social Science) version 23. Data were analysed according to the objectives of study. Descriptive statistic was used for all variables. Values were expressed as frequencies and percentage. Prior to the commencement of this study, ethical approval of the research protocol from the Institutional Review Board (IRB) of National Institute of Preventive and Social Medicine (NIPSOM) was taken.

RESULTS

Table 1: Distribution of items (swab samples) of washed linen which were collected in the public hospital (n=34) and private hospital (n=30)

Samples	Public		Samples	Private	
	Frequency	Percentage		Frequency	Percentage
Bed sheet	7	20.5	Bed sheet	5	16.67
Pillow cover	5	14.7	Pillow cover	5	16.67
OT table cover	5	14.7	Patient’s hospital dress	7	23.33
Surgeon gown	7	20.5	Surgeon gown	6	20
OT cap	5	14.7	Blanket	7	23.33
OT mask	5	14.7			
Total	34	100.0	Total	30	100.0

Table 1 pictures the number of swab samples of washed linen which were collected in the selected government and private hospital. It is seen that a total of 34 swab samples were collected from washed linen of public hospital. Majority of samples were bed sheet 7 (20.5%) and surgeon gown 7 (20.5%). In addition, 5(14.7%) samples were taken from operation theatre, table cover, pillow cover, OT

cap, and OT mask separately. In contrast, about 30 swab samples were collected from washed linen of private hospital where majority of them were collected from patient’s hospital dress 7(23.33%) and blanket 7(23.33%). Further, 5(16.67%) samples were taken from bed sheet and pillow cover, respectively and rest of the number of samples were collected from surgeon gown 6(20%).

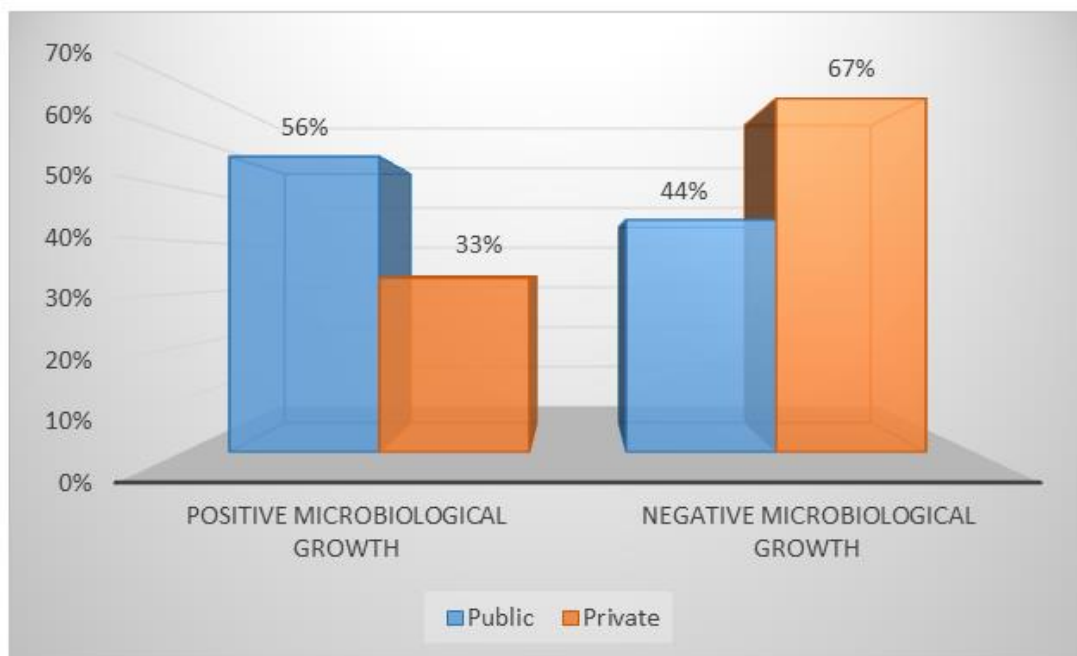


Figure 1: Distribution of microbiological growth in the samples collected from washed linen in public (n=34) & private hospitals (n=30)

Figure 1 presents the microbiological growth in washed linen samples collected from public and private hospitals. Public hospital’s sample show the higher microbiological growth 19 (56%)

than private hospital’s sample 10 (33%). As opposed, there were more negative microbiological growth in private hospital’s sample 20 (67%) compared to public hospital’s sample 15 (44%).

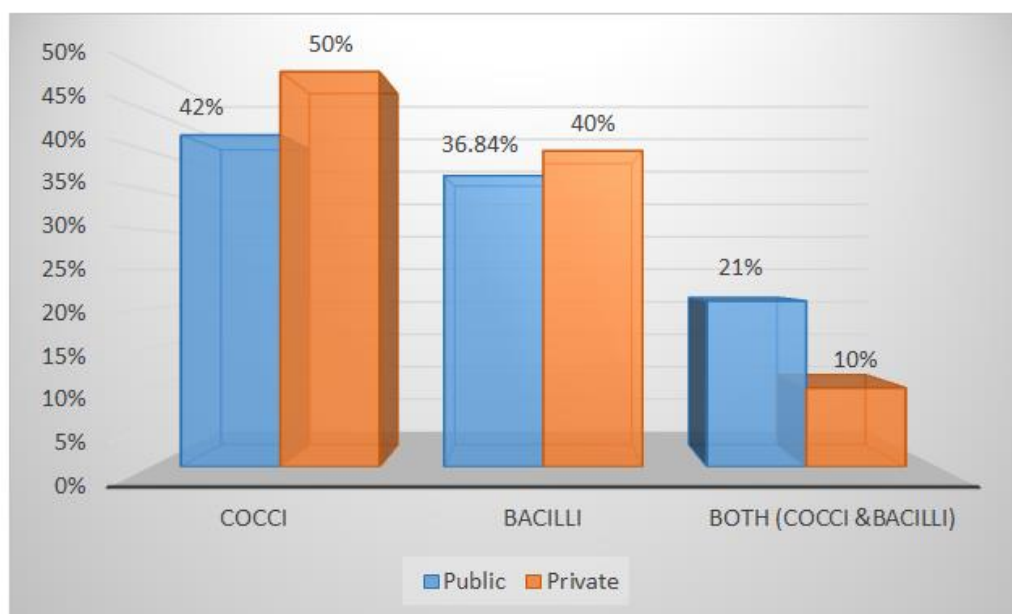


Figure 2: Distribution of the microorganisms found from culture sensitivity test of samples collected from washed linen in public (n=19) & private hospitals (n=10)

Figure 2 shows the presence of different microorganism in percentage in washed linen in both public and private hospital. Public and private hospital’s sample contained about 8 (42%) and 5(50%) cocci group microorganism, respectively. On the other hand, 7 (36.84%) and 4(40%) of public

and private hospital’s sample possessed bacilli group microorganism, successfully. Both cocci and bacilli microorganism was found in the rest of 4(21%) and 1(10%) of sample in public and private hospital, respectively.

Table 2: Distribution of the Positive microbiological growth of washed linen in different wards and operation theatres in the public hospital (n=34) and private hospital (n=30)

Public				Private			
Name of Wards	Total sample number	Positive microbiological growth	Percentage	Name of Wards	Total sample number	Positive microbiological growth	Percentage
Orthopedic OT	5	3	60	Linen department store	15	6	40
Gynae OT	5	4	80	General OT	15	4	26.66
General OT	5	1	20	--	---	----	---
E.N.T OT	4	1	25	--	---	----	---
Post-operative store room	5	2	40	--	---	----	---
Male surgery ward	5	4	80	--	---	----	---
Female orthopedic ward	5	4	80	--	---	----	---

Table 2 presents the distribution of positive microbiological growth on washed linen in various wards and operating rooms in the public and private hospitals. Total 34 number of samples were collected from washed linen of different wards and operation theatres of public hospital. Among them, the highest 4 (80%) positive microbiological growth was found in the Gynae OT, male surgery ward and female orthopedic ward. In contrast, about 6 (40%) positive microbiological growth from the linen store of linen department and 4 (26.66%) positive

microbiological growth from general operation theatre was found among 30 samples of private hospital.

DISCUSSION

In order to accomplish the study objectives, it sought to determine the location and nature of microorganisms in hospitals’ different linens. A total of 64 swab samples of washed linen were collected for microbiological test in this study where 34 was

from public hospital and 30 was from the private hospital.

At the public hospital, swab samples were collected from 6 items namely bed sheet, pillow cover, OT table cover, surgeon gown, OT cap, and OT mask, on the other hand, swab samples were collected from 5 places of private hospital such as bed sheets, pillow covers, patient's hospital clothes, surgeon's gown and blankets. Items were collected on the basis of availability at the selected hospital during data collection. Nonetheless, this study's collected items represent the healthcare textiles without towels and grapes for the surgical procedure mentioned by the previous author [4]. In addition, bed sheet, patients' cloth, hospital gown, blanket, pillow, surgical gown, hat and mask were identified as the possible places of presence of microorganism in some prior reports [16, 17].

Presence of microorganism in the hospital linen is not uncommon. This study's both public and private hospital illustrates the presence of microorganism in their linen. Although microorganisms' percentage was higher in public than private hospital. This means that government hospital authorities are indifferent to the microorganisms in the hospital's linen. A recent report found that more than half of the participants at a government hospital in Bangladesh were dissatisfied with its service due to the cleanliness of linen. It was also mentioned that the linen of the government hospital was not cleaned before it got dirty [18]. Hospital authorities are therefore requested to arrange linen laundry services in hospitals as per standard guidelines.

There are many genre of microorganism which can be found in the linen of hospital [7]. The study identified two types of microorganisms, such as cocci and bacilli, from microbiological tests of swab samples. The existence of these two microorganism is very common in the hospital linen as bacilli and coccus was the two most found microbes among 13 different genera in a total of 900 samples in a study conducted by Moravvej *et al.*, (2013) [8]. Although, there were many other types of microorganism in their findings but the current study did not find any other pathogens than cocci and bacilli. Small sample size can be the reason of this finding, as a consequence, a depth research along with comprehensive sample size is suggested to carry out in this regard.

In regards to the location of microorganism, the running study noted that gynaecological OT, female orthopaedic ward and male surgery wards of public hospital contain more than three quarter

positive microbes than other wards. On the other hand, proportion of microorganism was more in the linen department store than general OT in private hospital. Linen in the operating theatre is more likely to have more blood and body fluids than other departments in the hospital, resulting in higher levels of contamination and germs. Except gynaecological OT, this study did not find much percentage of microbes in ENT OT, orthopaedic OT and general OT (public and private hospital), which is little bit suspicious. Therefore, a comprehensive study about the epidemiology of microorganism in the hospital linen is advised to carry out.

CONCLUSIONS

It is concluded that both public and private hospital textiles contain pathogenic microorganisms. Of these microorganisms, cocci and bacilli can be the two significant microbes in the hospital linen. This is not to say that the linen of a particular ward or department of a hospital may contain more microorganisms, but it may be equally present in the linen of all wards and departments.

Conflict of Interests: The authors declare that there is no conflict of interests.

Ethical Approval

Ethical considerations in this study included obtaining permission from the Ethics Committee of the Institutional Review Board (IRB) of National Institute of Preventive and Social Medicine (NIPSOM) and obtaining written consent to collect swab samples from the concerned authority of the two selected hospitals.

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