

Original article

Fact-finding Survey of Nosocomial Infection Control in Hospitals in Kathmandu, Nepal—A Basis for Improvement

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Abstract: The purpose of this study was to investigate the actual conditions of nosocomial infection control in Kathmandu City, Nepal as a basis for the possible contribution to its improvement. The survey was conducted at 17 hospitals and the methods included a questionnaire, site visits and interviews. Nine hospitals had manuals on nosocomial infection control, and seven had an infection control committee (ICC). The number of hospitals that met the required amount of personal protective equipment preparation was as follows: gowns (13), gloves (13), surgical masks (12). Six hospitals had carried out in-service training over the past one year, but seven hospitals responded that no staff had been trained. Eight hospitals were conducting surveillance based on the results of bacteriological testing. The major problems included inadequate management of ICC, insufficient training opportunities for hospital staff, and lack of essential equipment. Moreover, increasing bacterial resistance to antibiotics was recognized as a growing issue. In comparison with the results conducted in 2003 targeting five governmental hospitals, a steady improvement was observed, but further improvements are needed in terms of the provision of high quality medical care. Particularly, dissemination of appropriate manuals, enhancement of basic techniques, and strengthening of the infection control system should be given priority.

Key words: Fact finding survey, nosocomial infection control, Kathmandu, Nepal

INTRODUCTION

Recently, nosocomial infections have become a global concern recognized as a major patient safety issue. They not only cause a significant burden on patients but also lower the quality of medical care. In addition, prolonged hospitalization due to nosocomial infections increases costs and unnecessary expenses for the hospital [1, 2]. In the healthcare setting, particularly in developed countries, various measures including the organization of infection control teams (ICTs), preparation of manuals, strengthening of surveillance systems, and training of staff have been taken to assure effective control. However, it is only some decades ago that importance was attached to nosocomial infection control and effective measures were employed, even in developed countries [3].

In developing countries, where the incidence of infectious diseases is high and environmental conditions of

healthcare facilities are poor, nosocomial infections may frequently occur, and some studies have reported a high incidence at healthcare facilities in these countries [4–6]. Effective nosocomial infection control is crucial in the healthcare facilities of developing countries, but in actual fact, attention to it is still limited and control measures are not functioning well in many facilities. Furthermore, as implementation of control measures seems to be costly and to consume resources, nosocomial infection control is often given a low priority.

Severe acute respiratory syndrome (SARS), which originated in Guangdong Province, China in November 2002, spread to more than 30 countries. In many hospitals where SARS cases were encountered, nosocomial infections also broke out, causing many casualties along with economic havoc [7, 8]. It is not overstatement to say that such outbreaks have heightened awareness regarding nosocomial infection control even in developing countries. In

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more recent years, epidemics of novel influenza have also posed a threat of nosocomial infections [9]. These facts made many people realize again the importance of strengthening nosocomial infection control at hospitals in developing countries.

Some of the authors of the present paper have been engaged in technical cooperation for nosocomial infection control with hospitals in developing countries, recognizing the importance of strengthening control measures in order to enhance the quality of medical care. Between 2000 and 2009, they have contributed to the promotion of nosocomial infection control in Vietnam in collaboration with leading hospitals [10, 11].

Since 2010, in response to the growing concern regarding nosocomial infections, we have focused our efforts in Nepal through collaboration with Tribhuvan University Teaching Hospital (TUTH) in Kathmandu City, where a technical cooperation project by Japan International Cooperation Agency (JICA) had been implemented to strengthen the hospital. Following studies including those on hospital-acquired diarrheal diseases [12] and the prevalence of multiple drug-resistant pathogens [13], this survey was carried out as a baseline study aiming to contribute to the improvement of nosocomial infection control at TUTH and consequently in Kathmandu City. The primary purpose of this study was to evaluate nosocomial infection control conditions and to prepare the basic information needed to provide technical guidance.

MATERIALS AND METHODS

1. Fact-finding survey of nosocomial infection control

The subjects of this survey are 17 leading hospitals in Kathmandu City (five national hospitals, nine private hospitals, and three other hospitals). The national hospitals included three general hospitals (one out of three was a university hospital; i.e. TUTH), one pediatric hospital and one obstetric hospital. All the private hospitals were general hospitals, while three other hospitals included one semi-governmental hospital and two non-profit organization hospitals (these three hospitals were general hospitals). The 17 hospitals play a crucial role in medical care in Kathmandu City.

A questionnaire was developed based on the form used in the previous surveys in Vietnam [11]. The form consisted of the following items: “general information of the hospitals, control system including manual and infection control committees (ICC), equipment and facility preparedness, training conditions, surveillance conditions, expectation for international cooperation and current problems. The contents of each item in the questionnaire are shown in Table 1.

The questionnaire was distributed to the 17 hospitals in October 2011 and filled out by the hospital staff members who were responsible for nosocomial infection control or the director of the hospital. The recovered data were processed using SPSS Ver19 for Windows. In some hospitals, to determine the actual situation of ICC, manuals, current problems and awareness level of hospital staff regarding nosocomial infection control, direct observations were conducted along with a brief interview with the hospital staff responsible for nosocomial infection control or hospital di-

Table 1. Questionnaire items and contents for 17 hospitals

S.N.	Questionnaire items	Contents of questionnaire
1	General information on hospital	Type of hospital, number of beds, number of clinical departments
2	Control system	Existence of nosocomial infection control committee, nosocomial infection control department, infection control team, manual for nosocomial infection control
3	Surveillance conditions	Surveillance according to the report from clinical departments or not, Bacteriological testing on nosocomial infection cases
4	Training conditions	Staff who have received training on nosocomial infection control, Hospitals held in-service training* on nosocomial infection control or not. Hospitals held in-service training on novel influenza or not, Plan of holding “in-service training”
5	Equipment and facility preparedness	Current situation of the preparation for disinfectants and PPE; Existence of negative rooms, Isolation rooms in the case of novel influenza/SARS, Plan of zoning in the hospital according to the risk of infection
6	Expectations for assistant partners	Hospital wishes to cooperate with foreign assistant partners or not. What cooperation does the hospital expect?
7	Current problems	Requested the hospital to describe the current problems.

* Training organized by the hospital for the staff

rector in addition to the information obtained by the questionnaire.

2. Comparison with the survey results in 2003

In 2003, a questionnaire survey was conducted at five national hospitals in Kathmandu City [10]. These five hospitals were included in this study (2011). The results of the 2003 questionnaire were compared with those of this study (2011), including manuals, ICCs, in-service training and preparedness of personal protective equipment (PPE). A comparative statistical analysis of the 2003 and 2011 results was carried out by the Fisher's exact method using SPSS Ver19 for Windows.

3. Outline of the technical cooperation project and fact-finding survey at TUTH

TUTH was established in 1980 with the assistance of a grant-aid from the Japanese government as the first medical school in Nepal, followed by the implementation of a technical cooperation project supported by the JICA from 1980 to 1996 (the corresponding author participated as a team leader). The purpose of the project was to strengthen medical and educational services at TUTH. During the above period, technical guidance was conducted in the field of hospital management, clinical medicine, nursing management, laboratory management and medical education. However, nosocomial infection control was not included in the project, probably because awareness regarding nosocomial infection control was still poor in those days even in developed countries including Japan. Currently TUTH is playing a leading role in medical care as well as human resource development in Nepal as the oldest and one of the most advanced medical schools.

In this study, the current situation of nosocomial infection control at TUTH was investigated in detail as a basis for further improvement. During the JICA project period, technical guidance was provided, not on nosocomial infection control, but on bacteriological testing as a priority subject. In this study, investigation was performed by direct observation and interviews with heads of the departments of clinical microbiology and pharmacology and doctors of internal medicines, focusing on whether bacteriological testing was utilized for implementation of nosocomial infection control, in addition to detailed observation of the hospital and the questionnaire survey.

4. Ethical approval

Ethical approval was obtained from the Institute of Medicine, Kathmandu, Nepal prior to using the questionnaire in the target hospitals.

RESULTS

1. Fact-finding survey of nosocomial infection control

The 17 hospitals responded to most of the questionnaire items, but for some items, a response was obtained from only 16 hospitals.

General information on hospitals

The average number of beds in the surveyed hospitals was as follows: national hospitals; 372 (150–497), private hospitals; 206 (50–750), other hospitals 328 (156–500). The average number of clinical departments was as follows: national hospitals (excluding the two specialized hospitals); 18.0 (14–22), private hospitals 9.7 (6–15); other hospitals 17.5 (15–20). TUTH, which is one of the national hospitals, had 468 beds and 22 clinical departments.

Control system

Manuals for infection control were used in 52.9% (9/17) of the hospitals (national 4/5, private 3/9, and other hospitals 2/3). However, most of these manuals were more than five years old and some of their contents were not considered suitable for recent infectious diseases and antibiotic use. The manuals at three hospitals were considered obsolete. Two national hospitals had good manuals with up-to-date contents. Only three hospitals had manuals for novel influenza.

An infection control committee (ICC) was established in 41.2% (7/17) of the hospitals (Fig. 1). However, a regular ICC meeting was held in only two hospitals (once a month, and every three months) and the remaining hospitals held meetings when requested. It was noted that the operations of these committees were far from adequate. No hospitals had an infection control team (ICT).

Equipment and facility preparedness:

The number of hospitals which met the standard quantity requirements for disinfectants and personal protective

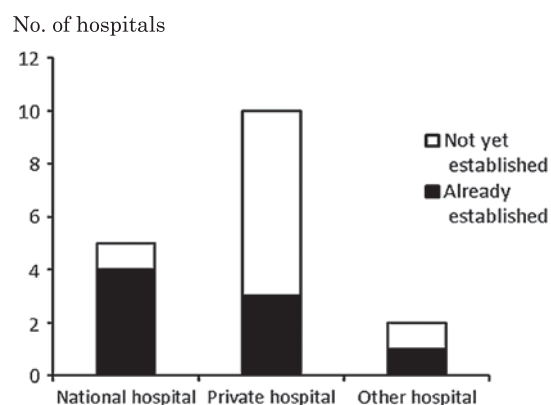


Fig. 1. Hospitals with infection Control Committee (17 hospitals were investigated).

equipment (PPE) is shown in Fig. 2. No hospital was equipped with a sufficient quantity of N95 masks and goggles. Eleven and 12 hospitals responded that N95 masks and goggles were unavailable, respectively.

A total of 81.3% (13/16) of hospitals responded that the preparation level for novel influenza was poor or slight. Four hospitals responded that they could prepare isolation rooms to deal with novel influenza/ SARS, but no hospital was equipped with negative pressure rooms. Only one hospital had a plan of zoning formulated according to the risk of infection.

Training conditions:

Current training conditions are summarized in Table 2. Six hospitals (four national hospitals, one private hospital and one other hospital) were organizing training programs for their staff (in-service training). Regarding future plan, five hospitals responded that they planned to conduct in-service training, and eight hospitals responded that they did not have any plans at the present time but hoped to in the future. Among all the hospitals, one had already conducted a

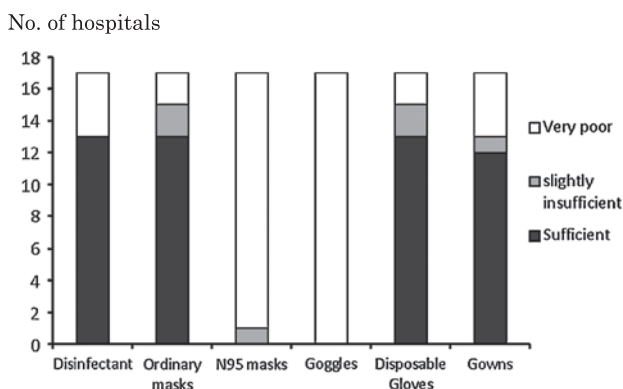


Fig. 2. Hospitals satisfying standard requirements for personal protective equipment (PPE) and disinfectants (17 hospitals were investigated).

Table 2. Training activities

Training		No. hospital
Hospital staff received training for nosocomial Infection control	None	7
	A small number	7
	Majority of staff	2
Hospital held in-service training for nosocomial infection control	No	10
	Yes	6
Hospital held in-service training on novel influenza	No	15
	Yes	1

Training: training programs including those organized by other hospitals and the hospital that the staff belong to. In-service training: training programs organized by the hospital to which the staff belong (16 hospitals were investigated)

training program on SARS and/or novel influenza and three hospitals intended to conduct training.

Surveillance conditions:

Bacteriological testing was regularly performed for nosocomial infection cases at 62.5% (10/16) of the hospitals and 6.3% (1/16) of the hospitals for some cases. Surveillance of nosocomial infections according to reports from clinical departments on clinical signs such as fever, respiratory signs, diarrhea, etc. was regularly carried out in 43.8% (7/16) of the hospitals in the survey (Fig. 3).

Expectation for international cooperation:

Seven hospitals had a strong interest in cooperating with foreign hospitals. A particularly strong expectation was observed regarding research support, information supply, PPE provision, and guidance in constructing an effective control system (Table 3).

Current problems:

Among the problems observed in the study were weak ICC function, few training opportunities among the hospital staff, inadequate use of antibiotics, shortage of infection control staff, shortage of doctors and nurses and their overload in daily medical practice, shortage of fundamental equipment including PPE, inadequate practice of basic tech-

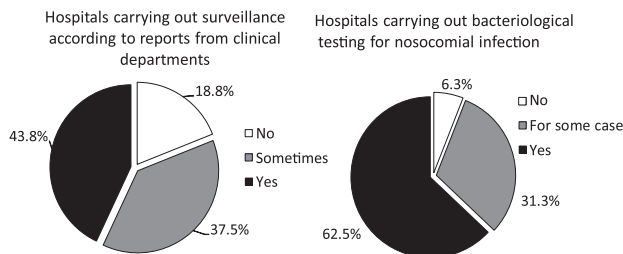


Fig. 3. Surveillance conditions (17 hospitals were investigated).

Table 3. Expectations for international cooperation

S.N.	Description	No. of Hospitals
1.	Support in research	7
2.	Information provision	6
3.	Supply of personal protective equipment	5
4.	Improvement in the nosocomial infection control system	4
5.	Supply of ICU and emergency equipment	4
6.	Guidance in accepting patients	3
7.	Training for the staff	3
8.	Supply of disinfectants	3
9.	Supply of laboratory equipment	2
10.	Renovation of hospital facilities	2

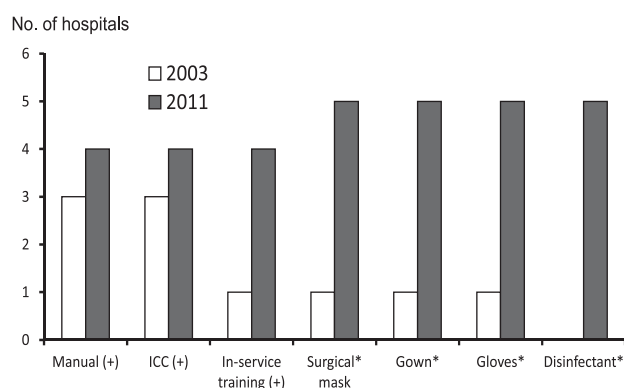


Fig. 4. Comparison of infection control conditions between 2003 and 2011.

* Hospitals with sufficient or nearly sufficient amounts of PPE, disinfectants based on Ministry of Health standards; five national hospitals were investigated.

niques such as standard precautions, inappropriate use of surveillance results, improper disinfection and sterilization methods, and low awareness regarding nosocomial infection control.

2. Comparison of 2003 and 2011 survey results

Comparison of nosocomial infection control conditions between 2003 and 2011 at five national hospitals showed an improvement trend. Particularly, preparation of PPE and disinfectants remarkably improved as shown in Figure 4 ($P = 0.0238$ and $P = 0.004$, respectively), categories in which all five hospitals met the standard quantity. In 2011, four out of five hospitals (except for one specialized hospital) were conducting in-service training, while only one hospital was conducting such training in 2003 ($P = 0.099$). Among these four hospitals, manuals were on hand and an ICC was established ($P = 0.4167$).

3. Nosocomial infection control situation at TUTH

The first ICC in Nepal was established in 1988 at TUTH. Since then, an ICC meeting has been held once a month. A comparatively good infection control manual was prepared and has been revised according to necessity. In-service training has been conducted for most of the staff at TUTH. This study showed a good situation regarding equipment preparedness including disinfectant (sufficient amount), PPE (sufficient amount of ordinary masks, disposable gloves and gowns) along with preparation of isolation rooms. However, incomplete observance of basic techniques such as standard precautions, as well as the need to further strengthen the function of ICC, have been pointed out as challenges.

Performance of bacteriological testing was well carried out in the clinical microbiology department of TUTH, and the results were passed on to the clinical side through the drug information office. However, the interview suggested that increased bacterial resistance to antibiotics was a growing issue at TUTH.

DISCUSSION

Appropriate nosocomial infection control is a key strategy in providing high quality medical care, and effective measures are particularly required in developing countries, where the frequency of infectious diseases is high and environmental conditions of hospitals are poor [14, 15]. However, nosocomial infection control is generally not given high priority, and awareness among medical practitioners is still low, a situation that jeopardizes health care functions.

In this survey in Kathmandu City, steady progress was observed in national hospitals in comparison with the results in 2003. It is particularly noteworthy that awareness among staff and the level of training activities increased with an improvement in the preparedness of essential infection control equipment such as PPE and disinfectants. Regarding private hospitals and other hospitals, a comparative study was not conducted using this survey, but an improvement in infection control similar to that of the national hospitals is assumed.

However, further efforts to strengthen nosocomial infection control at the target hospitals are still considered necessary. The results showed that the majority of hospitals did not have an up-to-date nosocomial infection control manual, that the surveillance system was not established sufficiently, and that preparations against SARS and novel influenza were poor. It is crucial to improve these fundamental systems. Moreover, special emphasis should be placed on observance of basic techniques (standard precautions) such as hand hygiene, effective use of PPE and appropriate practice of disinfection [16–18]. Enlightenment activities, such as distribution of manuals and teaching materials and the organization of training courses for medical staff, are very useful and effective for the improvement of nosocomial infection control. An increasing number of hospitals have been establishing ICCs in recent years, but the management and implementation of activities need further improvement to achieve effective control measures. Hereafter, ICTs also need to be set up in leading hospitals. Furthermore, the detailed status of nosocomial infections and their causative agents should be strictly monitored and properly utilized in clinical practice.

Among the targeted hospitals in this survey, TUTH

showed comparatively good results. Bacteriological testing, supervised by the JICA project, was functioning well and contributing to the surveillance of nosocomial infection based on bacteriological examination and reports from clinical departments for suspected nosocomial infection cases. However, our previous study on pathogens associated with nosocomial lower respiratory infections showed a high frequency of gram negative bacilli such as *Escherichia coli*, *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, *Klebsiella pneumoniae*, as well as a high multiple drug resistance rate for isolated bacteria. In addition, a high rate of extended stratum beta lactamase (ESBL) producing bacteria was observed [13]. The spread of multi-resistant bacteria reported by many developing countries is considered to be a facilitating factor in nosocomial infection [19–21]. Methallo β lactamase (MBL) producing bacteria, which originated from India, is also suspected to be spreading to Nepal [13, 22]. These findings suggest the need for more aggressive measures to tackle this global threat. The appropriate use of antibiotics based on accurate bacteriological testing, along with appropriate guidelines, is a worldwide challenge.

Nepal, fortunately, has not experienced a SARS outbreak, and no human case of avian influenza has been reported to date. On the other hand, awareness of nosocomial infection control seems to be lagging behind countries where a SARS outbreak did occur as shown in the 2003 study [10]. When a novel influenza becomes an epidemic and human to human infection is common, nosocomial infections may easily occur as seen in the Spanish influenza pandemic of 1918–1919. Appropriate nosocomial infection control is also considered useful for novel influenza control. Special importance should be placed on setting up a foundation for appropriate nosocomial infection control in daily practice, training medical staff and establishing a control system, before nosocomial infections become a frequent occurrence.

Nosocomial infection control is crucial in providing high quality medical care. Greater efforts should be focused on training medical staff to enhance basic techniques and establish control systems at ordinary times, not waiting until after an outbreak or epidemic. With such a foundation, it will be possible to promptly apply stringent nosocomial infection control in the event of an outbreak of novel influenza, SARS or other emerging infectious disease. These measures will contribute to the reduction of unnecessary costs and can improve the financial condition of the hospital.

Based on the results of this survey, the authors intend to collaborate with Nepalese authorities and further contribute to the improvement of nosocomial infection control.

Currently, our collaborative activities at TUTH are related to basic studies on bacterial resistance to antibiotics and the appropriate use of antibiotics. In addition, guidance on the promotion of standard precautions and surveillance systems is currently being prepared. The results of the present survey are expected to provide baseline data for monitoring the progress of the nosocomial infection control situation at TUTH as well as that in hospitals in Kathmandu.

In this survey, only hospitals in Kathmandu City were investigated. Infection control conditions are improving in these hospitals but further improvement in the software aspect is still needed to assure high quality medical care. In Nepal as well as other developing countries, a significant disparity in the conditions of medical care and the health system exists between major cities and rural areas. In the future, the expansion of nosocomial infection control to hospitals in remote areas will be needed along with the implementation of guidance for hospitals in those areas.

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CONFLICT OF INTEREST

None.

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