

Original Article

Infection prevention and control situation in public hospitals of Islamabad

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Abstract

Introduction: Healthcare-associated infections represent a global public health challenge and are associated with significant mortality and morbidity. Infection Prevention and Control (IPC) is a neglected area in healthcare facilities across Pakistan. The objective of our study was to elucidate the current state of infection prevention and control practices in public sector hospitals of Islamabad to underscore potential areas for improvement.

Methodology: A cross-sectional survey was conducted between November and December 2019 at five public sector hospitals of Islamabad. The World Health Organization's Infection Prevention and Control Assessment Framework (IPCAF) was used to assess the strengths and weaknesses of hospitals regarding infection prevention and control. Adapted tools derived from Centers for Disease Control and Prevention and Infection Prevention Society were used for detailed assessment of various departments. Data was analyzed using Microsoft Excel 2016.

Results: In all five hospitals, the total IPCAF score was less than 200 denoting that infection prevention and control implementation is deficient and significant improvement is needed. The median IPCAF score was 117.5 with an interquartile range of 53.75. With the exception of central sterile services unit at one hospital, departments at all hospitals failed to meet even 50% of required IPC standards.

Conclusions: Significant change is needed to improve the existent situation of infection prevention and control in public sector hospitals of Islamabad. This would involve establishment of functional programs, development and implementation of infection prevention and control guidelines and provision of adequate supplies.

Key words: Infection prevention; infection control; healthcare-associated infection; Infection Prevention and Control Assessment Framework; IPCAF; Islamabad.

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Introduction

Healthcare-associated infections (HAIs) are a major public health challenge and one of the leading threats to safety of patients, healthcare workers and visitors in healthcare facilities [1]. They can occur in any healthcare setting including hospitals, primary care and long-term care facilities [2]. Consequences of HCAI include increased morbidity and mortality, prolonged hospital stays, economic burden on health systems and increased resistance to antimicrobials [3,4].

The burden of HCAI is significantly higher in low- and middle-income countries (LMICs) as compared to high-income countries [5]. According to the World Health Organization (WHO), at any given time, 7% patients in developed and 15% patients in LMICs will acquire at least one HCAI [6]. The precise burden of HCAI from developing countries cannot be estimated due to lack of surveillance activities and data [7] owing in part to limited expertise and resources [8]. Similar is the case of Pakistan where the burden of HCAI remains unknown. Infection Prevention and Control (IPC) is a

generally neglected area in healthcare systems and facilities across Pakistan. A variety of factors including lack of IPC policies, guidelines, resources, lack of education and training as well as overcrowding and understaffing in healthcare facilities contribute to inadequate infection prevention and control practices. Evidence alludes that 30%-70% of all HAIs are preventable [9] and IPC is a cost-effective strategy to reduce the incidence of HAIs [10-12]. The objective of our study was to illustrate the current state of application of key IPC aspects using the Infection Prevention and Control Assessment Framework (IPCAF) as delineated by the WHO core components in public hospitals across Islamabad. We also aimed to survey different departments at hospitals to uncover existent IPC practices and highlight potential areas for improvement.

Methodology

A cross-sectional survey was conducted between November and December 2019 at five government hospitals of Islamabad including Pakistan Institute of

Medical Sciences (PIMS), Polyclinic Hospital, Capital Hospital, National Institute of Rehabilitation Medicine (NIRM) and Federal Government Hospital (FGH). PIMS, a 1,254-bedded facility with 22 medical and surgical specialties is the largest tertiary care hospital in Islamabad, followed by Polyclinic hospital with 550 beds and Capital Hospital housing 280 beds. FGH is a 150 bedded secondary care hospital while NIRM is a 160 bedded rehabilitation facility catering mainly to the handicapped. Institutional approval from management of hospitals was obtained prior to the start of study. Hospital assessments were conducted by two infection prevention and control specialists i.e. an Epidemiologist and a Microbiologist from National Institute of Health. The WHO IPCAF tool was used to assess the strengths and weaknesses of all healthcare facilities regarding IPC. The IPCAF is structured according to the recommendations in the WHO guidelines on eight core components (CC) of IPC which are measured by 81 indicators [12]. The core components are as follows:

- IPC Program (CC1)
- IPC Guidelines (CC2)
- IPC Education (CC3)
- HAI Surveillance (CC4)
- Multimodal Strategies (CC5)
- Monitoring/Audit of IPC Practices and Feedback (CC6)
- Workload, Staffing and Bed Occupancy (CC7)
- Environments, Materials and Equipment for IPC (CC8)

For every CC the scores of the individual questions were aggregated. A minimum score of 0 and a maximum score of 100 per CC was assigned. The final IPCAF score was calculated by adding the scores of all eight core components. The maximum possible total score was 800. Based on the overall score, each hospital was assigned to one of four levels of IPC practice:

- I. **Inadequate (0–200 points):** Insufficient IPC implementation with significant improvement required;
- II. **Basic (201–400 points):** Only some functional IPC aspects without adequate implementation with additional improvement needed;
- III. **Intermediate (401–600 points):** Most IPC aspects are properly implemented;
- IV. **Advanced (601–800 points):** IPC CC are fully implemented according to WHO recommendations and apposite to the facility needs.

For survey of different departments, adapted IPC tools derived from Centers for Disease Control and Prevention (CDC) [13] and Infection Prevention

Table 1. Total IPCAF Scores.

Hospital	Total IPCAF Score (%)
PIMS	135 (16.87%)
Polyclinic Hospital	77.5 (9.68%)
FGH	165 (20.62%)
NIRM	117.5 (14.68%)
Capital Hospital	115 (14.37%)

Society (IPS) [14] were employed which were revised according to local needs and requirements. The followings hospital department were assessed:

- Emergency Department
- In Patient Departments
- Out Patient Departments (OPDs)
- Laboratory
- Blood Bank
- Operation Theatre
- Central Sterile Services Department (CSSD)
- Kitchen
- Laundry
- Intensive Care Units (ICUs)
- Endoscopy

Polyclinic, NIRM and FGH do not have certain departments which are not included in the study results. Polyclinic hospital does not have a CSSD, NIRM does not have an Emergency Unit, ICU and CSSD while FGH does not have an ICU and Endoscopy Unit. Scoring was done on a scale of 0 to 2; 0 denoting that required IPC standards are *Not Met*, 1 indicating *Partially Met* IPC standards and 2 signifying *Fully Met* IPC standards. The total percentages for met IPC standards were also calculated for different departments at each hospital. Data was collected using structured, close ended questionnaires by means of observations. To ensure confidentiality, all questionnaires were kept in a safe place and electronic data was stored in password protected files. Data was analyzed using Microsoft Excel 2016.

Results

IPCAF Tool

Table 1 depicts the total IPCAF scores obtained for each hospital. The median score was 117.5 and interquartile range was 53.75.

Figure 1 illustrates IPCAF core components scores for all hospitals.

IPC Program (CC1)

There was no formal IPC Program at Polyclinic Hospital, NIRM and Capital Hospital. PIMS and FGH have an infection prevention and control program but without clearly defined objectives and activity plans.

Although all hospitals barring NIRM and Polyclinic had IPC committees, these groups were largely dormant with no regular meetings and did not include management and administrative personnel. IPC teams and focal persons had been nominated at all hospitals, but with the exception of FGH (full-time dedicated IPC nurse) there were no full-time personnel dedicated for IPC.

IPC Guidelines (CC2)

Although there were well qualified doctors and nurses who could take up the responsibility of developing or adapting guidelines (7.5 score), no IPC guidelines were in place at any hospital. There were no standard operating procedures (SOPs) for standard precautions and transmission based precautions. Policies regarding antimicrobial stewardship and healthcare worker (HCW) safety were non-existent.

IPC Education (CC3)

No internal trainings regarding IPC have been conducted at PIMS, Polyclinic, NIRM and Capital hospital although competent personnel exist to conduct health education sessions. At FGH, rudimentary sessions regarding hand hygiene and waste segregation have been recently conducted.

HCAI Surveillance (CC4)

There was no system of surveillance to determine the rate of HCAI at any hospital. Likewise, there were no personnel dedicated for this purpose. Only PIMS, Polyclinic and Capital Hospital have a microbiology laboratory but they were not functioning reliably.

Multimodal Strategies (CC5)

Multi-modal strategies (including system change, education and training, monitoring and feedback, communications and safety culture) recommended by WHO for implementation of IPC interventions were not employed at any hospital resulting in zero score for all five hospices.

Monitoring/Audit of IPC Practices and Feedback (CC6)

All hospitals attained zero for this core component as no audits or monitoring of IPC practices have been conducted at any hospital.

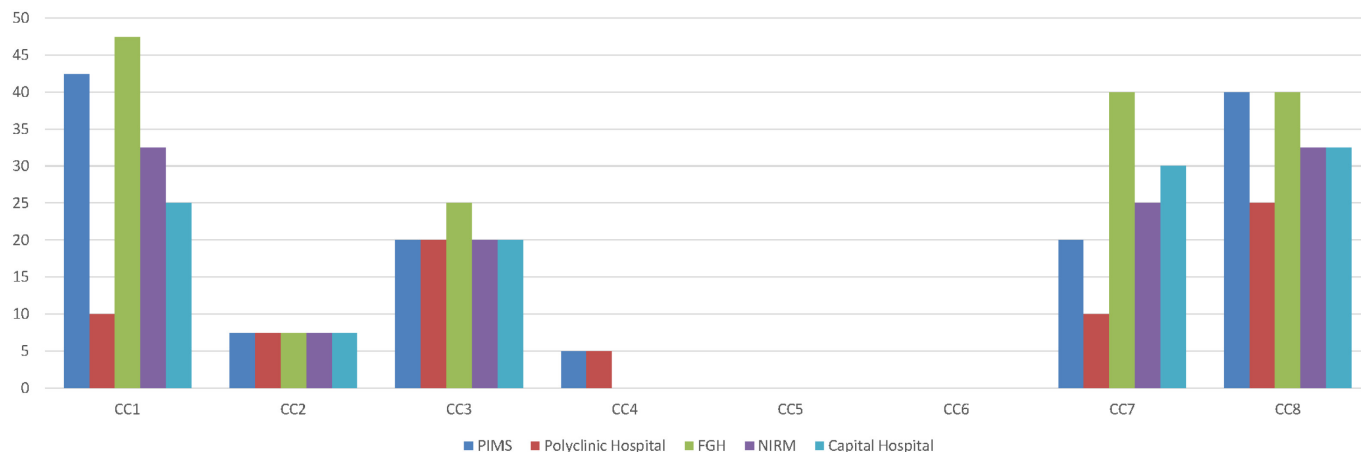
Workload, Staffing and Bed Occupancy (CC7)

With the exception of FGH where patient influx is low, all hospitals were understaffed. The WHO recommended spacing of > 1 meter between patient beds was not consistently followed in all wards and departments. At times, bed occupancy exceeds one patient per bed. Furthermore overcrowding leads to beds being placed in corridors at times. There was no system at any hospital which takes into consideration staffing needs assessment when staffing levels are low or when bed capacity is exceeded.

Environments, Materials and Equipment for IPC (CC8)

The materials, environment and equipment for IPC were inadequate at all hospitals and the least satisfactory for Polyclinic hospital with lowest score of 25. Water services were not readily available at most hospitals. Hand hygiene stations were inadequate in number. Where present, there was lack of paper towels. PPE (personal protective equipment) was not available in sufficient quantities. There was no proper isolation of patients suffering from infectious diseases at all

Figure 1. IPCAF Core Components Scoring.



hospitals. Segregation, collection, storage and transport of waste was unsatisfactory at all health facilities. Improper labelling and overfilling of bags was a common sight. FGH and NIRM do not have an onsite-incinerator. Polyclinic hospital does not have a dedicated CSSD.

Departments Survey

Figure 2 depicts department wise IPC standards at study hospitals. In all hospital departments, proper cleaning, disinfection and sterilization of tools and equipment using appropriate agents was not being done. Appropriate insertion and maintenance of catheters and cannulas, injection practices and other medical services was not performed in accordance with IPC standards. Daily temperature monitoring of fridges was only performed at FGH. It was noted that food and drinks were stored in fridges alongside medication at all hospitals. At all healthcare facilities, brooms were utilized to clean floors. Phenyl was the most widely used cleaning agent. Cotton balls pre-soaked in alcohol solution were stored in containers for use on patients.

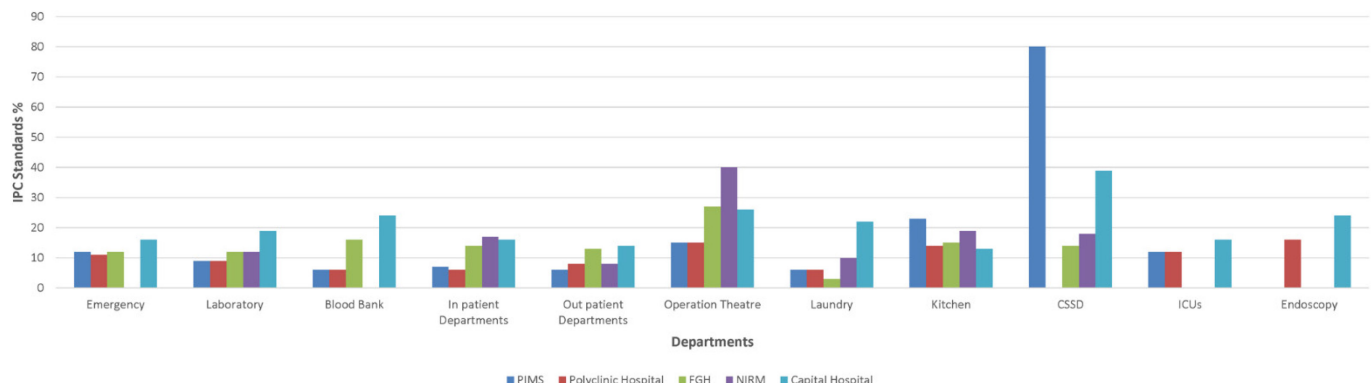
The CSSD at PIMS fulfilled 80% of required IPC standards. However, it was underutilized as other departments were sterilizing instruments in their own autoclaves. The CSSD at Capital Hospital was also well-maintained as compared to other departments and scored 39%. Physical indicators were used for monitoring of autoclaves. In Capital Hospital and PIMS, chemical indicators were also used. Biological indicators were not used to monitor autoclaves in any facility. At all healthcare facilities, laundry departments were substandard with regards to IPC. At FGH, the unit was dirty and disorganized with unhygienic handling, cleaning, and storage of clothing meeting only 3% of the required IPC standards. Laboratories at all hospitals lacked adequate supplies of Personal Protective Equipment (PPE). When available, laboratory staff was

not using PPE. Hand hygiene was not practiced. Aseptic technique was not employed during blood sampling. Laboratories at PIMS and Polyclinic hospital scored the lowest with 9% and the highest percentage (19%) was obtained by laboratory at Capital hospital. The kitchen at PIMS scored the highest (23%) as compared to kitchens of other health facilities as it was only department where annual medical examination of kitchen staff was performed and work surfaces were clean. At all surveyed health facilities, kitchen staff did not wear adequate PPE and there was generally no observance of hand hygiene. Food handling, storage, preparation and distribution was also unsatisfactory. The operation theatre at NIRM fulfilled the greatest number of IPC standards (40%) due to highest compliance with hand hygiene, use of appropriate PPE and environmental cleanliness as compared to other hospitals’ operation theatres. PIMS and polyclinic scored the lowest with 15%. Outpatient departments were unsatisfactory with regards to IPC measures with all health facilities achieving less than 15% of required IPC standards. There was an endoscopy unit at the three tertiary care hospitals; PIMS, Polyclinic and Capital Hospital but they were all substandard with regards to IPC. In the latter two facilities, an automated washed disinfector was available. As per recommendations, high level disinfectants (HLD) were used for disinfection. However, their minimal effective concentration was not being measured. Storage of endoscopes in PIMS and Polyclinic was improper. Furthermore, it was noted that endoscopic accessories were disinfected by the same HLD used for endoscopes and were not sent to CSSD for sterilization.

Discussion

In all five hospitals, the total IPCAF score was less than 200 signifying that the level of infection prevention and control is inadequate and significant

Figure 2. Department wise IPC Standards at hospitals.



improvement is needed. Polyclinic hospital scored the least with 77.5 out of 800. This was due to lack of IPC Committee, non-support of senior facility leadership for IPC and absence of dedicated sterile supply department as stipulated by WHO [12]. Our results are in contrast to developed countries like Germany, where a nationwide study was conducted using the IPCAF tool in 736 hospitals. Only three facilities fell into the category of basic (score between 200 and 400) and 622 facilities were in the advanced group (score between 600 and 800) [15]. The classification of inadequate was not assigned to any healthcare facility. The results clearly indicate the stark difference in infection prevention and control practices between developed and developing countries like Pakistan. An established IPC Program in hospitals is a prime factor for safe, high-quality health service delivery. In our study, there was no formal IPC Program at three hospitals while two had an IPC program but without clearly defined objectives and activity plans. A WHO global survey published in 2015 exposed major flaws in national IPC capacity of 133 countries [16]. According to this survey, only 54 countries had an existing national IPC Program (41%) and merely 39 countries (29%) had a program at all tertiary hospitals [16]. WHO strongly recommends that an IPC Program should be in place in all healthcare facilities [16] as assessment of evidence reveals that IPC programs incorporating devoted, trained personnel are effective in reducing healthcare associated infections in acute care facilities [17]. Although there are well qualified doctors and nurses who can take up the responsibility of developing or adapting IPC guidelines, no such guidelines were in place at any hospital in Islamabad. Updated technical guidelines are crucial to provide a strong scaffold to encourage good infection prevention and control practices. It is also imperative that these guidelines are adopted and implemented. Evidence reveals that guidelines on IPC practices and procedures play an effective role in reducing HCAI especially when implemented in combination with healthcare workers' education and training [18]. In our study, we found that no internal training sessions regarding IPC had been conducted at four hospitals while at the fifth only a few basic sessions had been conducted. Likewise, a study conducted in Nepal, a developing Asian country, reported that only 27% of the participants (doctors and nurses) had received infection prevention and control training [19]. This is in stark contrast to results of a study conducted in a developed country where high proportion (> 99%) of the healthcare facilities imparted educational courses about infection prevention and control [15]. Health

education and training is crucial to impart knowledge regarding IPC and thereby improve IPC implementation. In our study, according to the IPCAF tool, all hospitals obtained zero score for surveillance. Hospital-based surveillance systems, particularly when connected to national surveillance networks, are associated with a decrease in overall HCAI [16]. Surveillance systems allow the estimation of the local burden and incidence of HCAI and Antimicrobial Resistance (AMR) and can detect outbreaks [16] thereby allowing IPC teams to plan measures according to requirements of their healthcare facility. Regular monitoring of infection prevention and control practices along with feedback is important to increase compliance to care practices so that the burden of healthcare associated infections can decrease [20]. Storr *et al* reported that majority (72%) of countries across WHO regions have recognized the need for monitoring and evaluation as reflected in their national IPC documents [5]. With the exception of FGH where patient influx is low, hospitals in our study were understaffed. Additionally, there was no system at any hospital to determine staffing needs assessment when staffing levels are low or when bed capacity is exceeded. Overcrowding and understaffing influence infection prevention and control practices significantly. Research has demonstrated that healthcare staff burnout [21] and low staffing levels [22] are associated with increase in healthcare associated infections. The materials, environment and equipment for IPC were not adequate at any of the five hospitals in our study. Evidence suggests that a favorable environment and adequate supplies of basic amenities like water leads to increased compliance with IPC practices [23,24]. In wards of all hospitals, it was observed that infection prevention and control practices are unsatisfactory. In all facilities, brooms and phenyl were being used to clean floors which are not recommended [25]. This points out to the lack of knowledge about accurate cleaning supplies amongst hospital staff. An inappropriate practice noted at all hospitals was the use of pre-soaked cotton balls in containers which is not endorsed by WHO due to high risk of bacterial contamination [26]. Several studies have recognized hurdles to infection prevention and control prevalent in hospitals in developing countries. Barriers in Indian hospitals include lack of PPE [27,28] lack of training of new staff members, language barriers amongst staff members and heavy workloads [29]. In public sector hospitals of Pakistan, we are faced with similar problems. Lack of education coupled with lack of resources as well as overcrowding and understaffing

contribute to the current dismal situation regarding IPC. Departments at all five public hospitals included in the study scored poorly in terms of IPC standards. With the exception of CSSD at PIMS, departments at all hospitals failed to meet even half of the required IPC standards. Smaller hospitals i.e. NIRM and FGH fared better in terms of overall cleanliness which may be due to low number of patients and smaller facility size.

Limitations of this Study

The study was conducted in public sector hospitals of Islamabad. Infection prevention and control situation in private sector hospitals is likely to be different as private hospitals generally have functional IPC programs, adequate staff numbers and greater amount of resources as compared to public hospitals.

Conclusion

In view of the existent grave scenario of infection prevention and control at public sector hospitals of Islamabad, substantial work is needed for improvement to meet international IPC standards. Active IPC programs and functional IPC teams should be established at all hospitals. A dedicated budget should be allocated for IPC and adequate supplies including PPE, hand hygiene stations and cleaning supplies should be available at all times. Infection prevention and control policies and SOPs should be developed and implemented at all hospitals. Surveillance of HCAs and regular monitoring of IPC practices should be undertaken.

Next Steps

The next step is to conduct IPC training in hospitals included in the study to enhance knowledge and thereby improve attitudes and practices related to infection prevention and control. This training should cater to different cadres of health care workers including doctors, nurses, paramedics and housekeeping staff. Hospital managements should also ensure that all newly inducted staff receive training in this discipline. In future, infection prevention and control should be a part of the undergraduate and post graduate curriculum to build a strong foundation for IPC amongst healthcare professionals.

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Authors' contributions

Saba Savul, Farida Khurram Lalani and Aamer Ikram designed the study. Saba Savul and Farida Khurram Lalani participated in data collection. Saba Savul analyzed the data and drafted the manuscript. Farida Khurram Lalani and Aamer Ikram reviewed and edited the manuscript. Muhammad Amjad Khan, Mumtaz Ali Khan and Jamil Ansari revised the manuscript critically for important intellectual content. All authors read and approved the final manuscript.

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