



## Evaluation of seasonal variation in the incidences of bacterial infection among surgical patients

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**Basnet RB**

Department of Surgery, Bir Hospital, Mahaboudha, Kathmandu, Nepal

### ABSTRACT •

**Introduction:** Although a lot of attention has been paid to the prevention of nosocomial infections, surgical site infections (SSIs) continue to comprise a major proportion of all adverse events in surgical patients. So this study is designed to evaluate the common pathogens prevalent in surgical patients and find its seasonal trend.

**Method:** This is a prospective analytical study of all operated cases in General Surgery Unit III, Bir Hospital from March 2010 to February 2011. Evaluation of bacteriological culture pattern among patients with wound infection 0 to 30 days after the operation was done.

**Result:** There were total of 564 elective and 292 emergency operations. Surgical site infection rate was 12.1%, 18.2%, 12.2% and 10.7% respectively in spring, summer, autumn and winter seasons. Staphylococcus and Enterococcus were the most common gram positive organisms isolated which were lower in colder seasons as compared to the other seasons while gram negative E coli, Acinetobacter, Pseudomonas and Enterobacter showed predominance in the warmer season.

**Conclusion:** If further validated, our findings could have important implications for future infection prevention intervention studies and for choice of empirical antimicrobial therapy among hospitalized adults.

**Keyword :** seasonal variation, surgical site infection

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### CORRESPONDENCE •

Dr. Robin Bahadur Basnet  
Registrar, Department of Surgery  
Bir Hospital  
Email: robinbasnet@gmail.com

## Introduction

Although a lot of attention has been paid to the prevention of nosocomial infections, surgical site infections (SSIs) continue to comprise a major proportion of all adverse events in surgical patients. There have been only few studies of seasonal variation in the incidences of nosocomial infection, with most of the reports limited to intensive care units.<sup>1,2</sup> Recognition of seasonal variation in the incidence of infection can influence diagnosis strategies, empirical therapies, and infection control prevention programs, thus improving patient care.<sup>3</sup>

The aim of our study was to assess which pathogens occurred most commonly in our hospital and whether seasonal variation existed in the incidence of these pathogens.

## Method

We conducted a prospective analytical study of all operated cases in General Surgery Unit III, Bir Hospital in between March 2010 to February 2011. A swab for culture and sensitivity from the wound was taken from any patient who developed surgical site infection in between 0 and 30 days after the operation. A tabulation of the organisms isolated was made and analysed for seasonal variation. The months March to May was considered as spring season, June to August as summer, September to November as Autumn and December to February as winter and analysis was made.

## Result

A total of 564 patients were operated on elective basis and 292 emergency operations were performed during the study period. (Table 1)

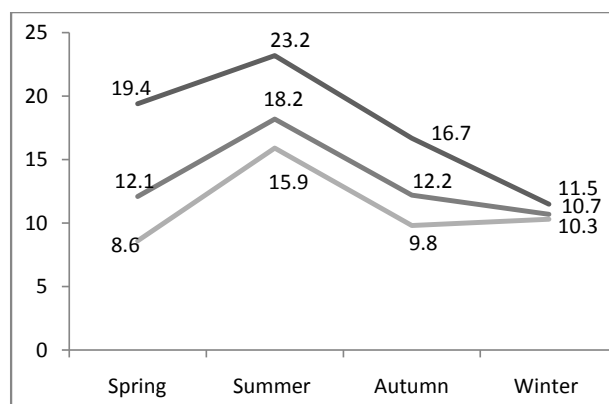
**Table 1.** Total number of cases according to season

Season	Elective	Emergency
Spring	128	62
Summer	119	56
Autumn	143	78
Winter	174	96

Highest number of surgical site infection occurred in summer season (23.2% in emergency, 15.9% in elective and average of 18.2%). Lowest occurred in winter season (11.5% in emergency, 10.3% in elective and average of

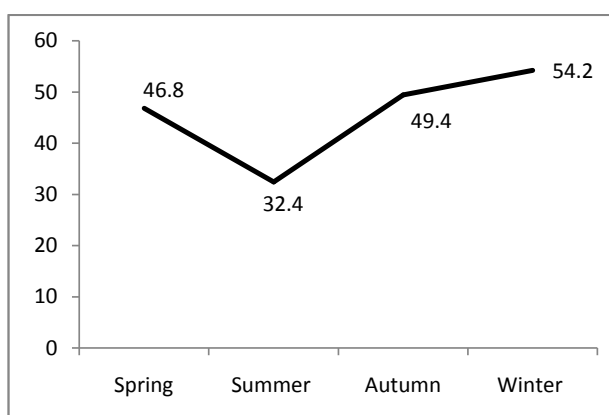
10.7%). The incidences of surgical site infections were 12.2 % and 12.1 % in autumn and spring respectively. (Figure 1)

**Figure 1.** Incidences of surgical site infections according to season.

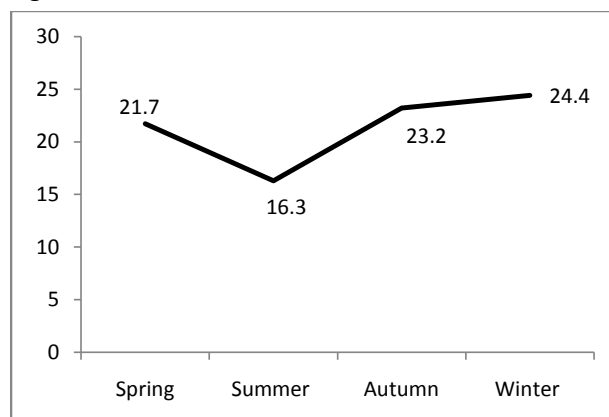


Staphylococcus was isolated in 54.2 % of the cultures during the winter season while lowest incidence was in the summer season in 32.4 %. (Figure 2)

**Figure 2.** Incidences of Staphylococcus

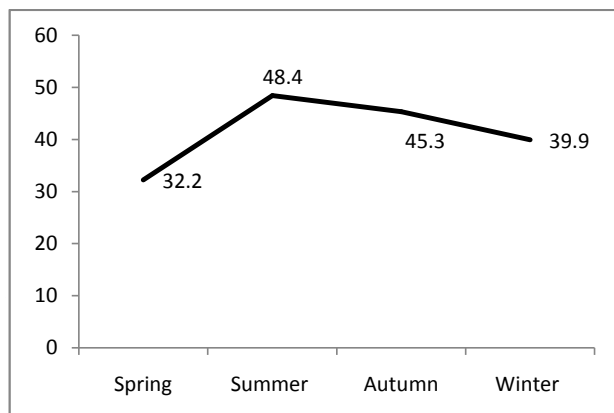


**Figure 3.** Incidences of Enterococcus.



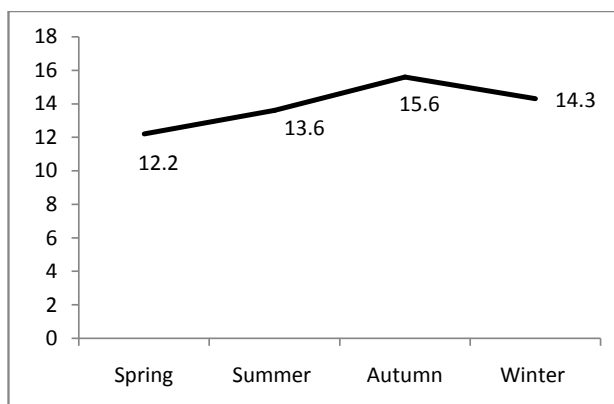
E coli were isolated in 48.4 % of the cultures during the summer season while lowest incidence was in the spring season in 32.2 %. (Figure 4)

**Figure 4.** Incidences of E coli

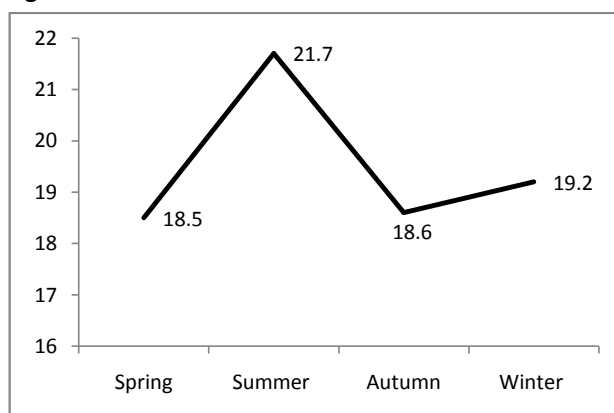


Enterobacter was isolated in 15.6 % of the cultures during the autumn season while lowest incidence was in the spring season in 12.2 %. (Figure 7)

**Figure 7.** Incidences of Enterobacter

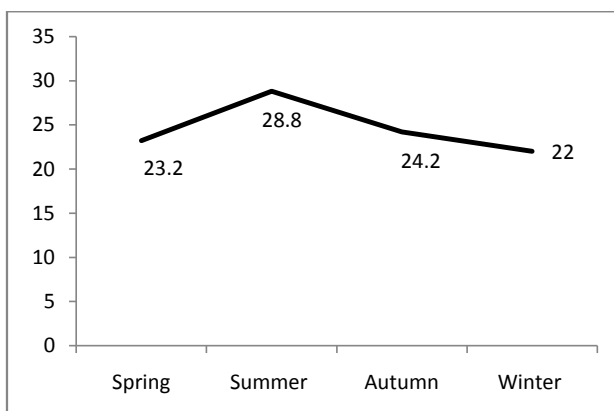


**Figure 5.** Incidences of Acenatobacter



Pseudomonas was isolated in 28.8 % of the cultures during the summer season while lowest incidence was in the winter season in 22 %. Spring and autumn seasons also had similar incidences. (Figure 6)

**Figure 6.** Incidences of Pseudomonas



Seasonality, a periodic occurrence of events over the course of the year, is a well-described aspect of infectious disease epidemiology and has been recognized at least since the time of Hippocrates.<sup>4</sup> Recognized seasonal variation in the incidence of human infection can profoundly influence diagnosis strategies, empirical therapies and infection control prevention programs, thus improving patient care.<sup>5</sup> If significant seasonal variation exists in the incidences of infection among hospitalized patients, it would be necessary to recognize and adjust for this seasonality in quasi-experimental investigations that seek to determine the impact of infection prevention interventions.<sup>1,3</sup> Without such recognition and adjustment, spurious estimates of the effects of risk factors and intervention studies would occur. In addition, seasonal variation in the incidences of infection may also have important implications for the implementation of infection prevention interventions and for the choice of empirical antimicrobial therapy.<sup>5</sup>

Although many literatures debate on the seasonal variation in frequency of surgical site infection, we had slightly higher incidence in the summer season. This could be due to several confounders such as rain, humidity, poorer sanitation etc. Ying et al in a study of 1878 intra-abdominal operations have also stated summer season as a risk factor for surgical site infection.<sup>6</sup> Staphylococcus was the most common organism isolated in all seasons in our study as consistent with most medical literatures.<sup>7</sup> Staphylococcal infections were found to be higher in winter seasons. This is consistent with Al-jasser's

study<sup>8</sup> although only a few literatures are available on the seasonal variation of staphylococcal infections and most of them do not find any seasonal variation.<sup>9</sup>We had higher growth of enterococcus during the winter season. Bakaet al<sup>9</sup> has reported highest occurrence in the summer season while Okeke et al<sup>10</sup> has reported the same during the autumn.

Among the gram negative organisms, the most prevalent was *E. coli*, which was more in the warmer months. Prevalence of gram negative organisms in the summer season had been widely explained in the literatures.<sup>11,12</sup>We had highest incidence of *Acinetobacter* in the summer season. *Acinetobacter* is a gram negative bacilli that grows best in wet environment.<sup>13</sup> This has also been found in our study. Similar findings and rationale is true for *Pseudomonas* as well. Slightly higher growth of enterobacter was found in the autumn. No significant difference in growth of enterobacter in any season compared to rest of the year has been reported.<sup>14</sup>

## Conclusion

Observations were made that higher incidences of surgical site infections occurred during the summer season. *Staphylococcus* remained the most common organism causing surgical site infection. Gram negative organisms dominated during the warmer seasons while gram positive organisms predominated the colder seasons. If further validated by multi-institutional and multi – departmental studies, our findings could have important implications for future infection prevention intervention studies and for choice of empirical antimicrobial therapy among hospitalized adults.

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