



ORIGINAL ARTICLE

Antibiotic prophylaxis in organophosphorus poisoning: A study of health and economic outcomes



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Abstract *Objective:* Organophosphorus poisoning (OPP) is a major concern for developing countries. There are no guidelines for the prophylactic use of antibiotics in the management of OPP which in such critical cases might add to the economic burden of the patients as well as antibiotic resistance. We compared the health and economic outcomes in patients prescribed with prophylactic antibiotics with respect to the patients not prescribed with any antibiotics. *Methods:* A retrospective observational study was carried out for two years for patients admitted to ICU with OPP. Patients were graded for severity of OPP, and divided into two groups based on prophylactic prescription and no prescription of antibiotics. The length of stay (LOS), hospitalization cost and outcomes were measured and compared between the two groups using statistical tests. *Results:* Out of the 254 patients observed, 108 were prescribed with prophylactic antibiotics and 94 were not prescribed with any antibiotic. There was a significant difference between LOS, cost of treatment and outcomes in the two groups ($p < 0.001$). When antibiotics were not prescribed, the odds of improvement was 1.854 times higher compared to those who received prophylactic antibiotics although after adjusting for severity of poisoning, significance was lost. On an average, 2–3 antibiotics were prescribed to every patient in the first group. *Conclusion:* OPP is an important health concern where issues of antibiotic misuse and overuse are practiced. Our study suggested that

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systemic antibiotic prophylaxis did not offer any advantage over non-use of any antibiotics in patients with OPP.

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1. Introduction

Organophosphorus (OP) compounds are popularly used as insecticides and pesticides in agriculture in the developing countries. OP compounds are toxic when consumed and cause severe poisoning via inhibition of acetyl cholinesterase enzymes and sustained cholinergic neurotoxic effect. OP poisoning (OPP) as either accidental occupational hazard, or intentional suicidal consumption is a common reason for admissions to intensive care units (ICU) in India. OPP management guidelines stress on the quick administration of anticholinergic antidote after gastric decontamination and gastric lavage along with management of respiratory distress by mechanical ventilation (Eddleston et al., 2008, 2004, 2002; Roberts and Aaron, 2007). However, there is no evidence to support beneficial role of prophylactic antibiotics in such patients. On the contrary, prophylactic antibiotics add to the burden of antimicrobial resistance and carry risk of *Clostridium difficile* diarrhea (Riddle and Dubberke, 2009). Heightened concern about the impact of antimicrobial resistance on health and economic outcomes has prompted health-care personnel to establish guidelines on appropriate use of antimicrobial agents through antimicrobial stewardship programs. Economic burden of illness associated with OP poisoning in developing nations is further compounded by additional and probably unnecessary antimicrobial therapy. Thus it is essential to study the antibiotic prescription practices in the management of OP poisoning to provide scientific basis for antibiotic usage guidelines. We sought to assess the antibiotic utilization, health and economic burden of prophylactic antibiotics among patients admitted to ICU with OP poisoning in a large tertiary care center (see Fig. 1 and Table 1).

2. Methodology

We carried out a retrospective review of all the cases of OP poisoning admitted to ICUs of Kasturba hospital, Manipal, from January 2013 to December 2014. The patients were classified into mild, moderate and severe poisoning cases according to the clinical presentation of OPP referring to Namba's criteria (Namba et al., 1971). Medical records of patients were screened for antibiotics prescribed during their hospital stay. Patients who were transferred from other hospitals or with prior antibiotic exposure were excluded from the study. Patients who received antibiotics at any instance during their hospital stay were later categorized into three sub-categories according to the type of antibiotic therapies such as prophylactic, empirical and definitive. Antibiotic prescription was categorized as prophylactic when the antibiotic was prescribed from the first day of admission to the ICU without a clinical or microbiological evidence of infection, empirical when the antibiotic was prescribed during the ICU stay based on the clinical manifestations of the patient without a conclusive microbiological evidence of infection and definitive when the

antibiotic was prescribed based on the results of a microbial culture and sensitivity test.

For the purpose of analysis, patients were grouped into two categories A and B. Group A comprised of all the patients prescribed with prophylactic antibiotics on the first day of their hospitalization and Group B consisted of the patients admitted with OP poisoning but were not prescribed any antibiotic throughout their hospital stay.

The outcome of the patients with OPP was also noted at the time of discharge.

2.1. Statistical analysis

The statistical analysis was performed by using the Statistical Package for Social Sciences (SPSS) version 15.0. A univariate test of association was used to study the association of the two groups and the different factors such as gender, severity of poisoning and the outcome. A Mann-Whitney U test was used to test for the difference in Length of stay as well as total hospitalization cost across both groups of patients. To study the impact of the significant factors, we performed multiple logistic regression analysis, with Improvement status as a dichotomous outcome, and antibiotic use and severity of poisoning as independent variables. A p -value < 0.05 was considered significant.

3. Results

A total of 254 patients were admitted to the ICU with OP poisoning over a period of two years. Out of these patients, we analyzed 202 patients distributed under Group A (108, 42.5%) and Group B (93, 37%). Fifty-two (20.5%) patients were treated with either empirical or definitive antibiotic therapy and were excluded from analysis. The patient population comprised predominantly of males (66.8%) and the average age was 30 years. Out of the 202 patients, 58 (28.7%) had mild, 81 (40.1%) moderate and 59 (29.2%) severe grades of poisoning. The distribution of moderately poisoned patients was almost similar in both the groups. Severely poisoned patients were more in the Group-A than in Group-B.

The median length of stay of a patient in group-A was 9 days and was found to be significantly higher ($p < 0.001$) in Group A compared to patients in Group B. The hospitalization costs and the total medicine costs were also significantly higher in the Group-A patients compared to Group-B patients.

There was a significant variation among the outcomes in the Group-B patients as compared to Group-A patients as shown in Table 2. Patients with favorable outcomes were significantly more in Group-B whereas patients with unimproved or deceased status were more in the Group-A patients. The results also showed that when antibiotics were not prescribed, the odds of improvement was 1.854 times higher compared to those who received prophylactic antibiotics although after adjusting for severity of poisoning, significance was lost.

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