



Research Article

STUDY ON ASSOCIATION BETWEEN EARLY ANTIBIOTIC ADMINISTRATION FROM EMERGENCY DEPARTMENT AND IN HOSPITAL STAY

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ABSTRACT

Objective : We aimed to study the association of early antibiotic administration with reduced length of stay (LOS) at hospital.

Methodology: We analyzed data from an emergency department register that had patient details that were brought to the emergency department (ER). We divided the patients into 3 groups depending upon the time they have received the antibiotic i.e, group who have received in one hour or less, between 1-3 hours and in 3 hours or more. Bonferroni test was performed for pair wise comparison.

Results: We had 42 patients who received the antibiotic within 1 hour or less, 89 within 1-3 hours and 22 patients who received it in 3 hours or more. The average age of our patients was 57.13 ± 16.4 , with 70.5% males and 29.41% females. The mean days to stay for ≤ 1 hour is 7.21 ± 2.38 days, for 1-3 hours it is 9.31 ± 6.04 and for ≥ 3 hour it is 11.45 ± 5.01 days. The difference is statistically significant for ≤ 1 hour and ≥ 3 hour (p value=0.006). The mean days to stay for 1-3 hour and ≥ 3 hour is not statistically significant (p value=0.248)

Conclusion: Antibiotic administration within three hours from the time of ER arrival was significantly associated with improved outcomes, including in-hospital survival, reversal of organ failure and shorter hospital LOS

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INTRODUCTION

Mortality rate is significantly increased when effective antimicrobial therapy is delayed by more than 1 hour in any cases of infections such as sepsis, community acquired pneumonia, nosocomial pneumonia and bacterial meningitis (McGarvey and Harper, 1993; Gacouin *et al.*, 2002; Meehan *et al.*, 1997; Proulx *et al.*, 2005; Iregui *et al.*, 2002; Mathevon *et al.*, 2002; Miner *et al.*, 2001). Therefore, an early antibiotic treatment is a crucial element for survival to discharge of the patient (Ferrer *et al.*, 2014). Early initiation of an empirical, broad-spectrum antimicrobial is associated with decreased mortality (Young *et al.*, 2014). Deaths may be the result of the severity of infection or a result of underlying medical conditions (Robert, 2000). According to the 2012 Surviving Sepsis Campaign (SSC) guidelines, antibiotic administration is recommended within 3 hours for patients in the emergency department (Dellinger *et al.*, 2013). While more studies are being focused on improving the outcomes in patients being treated for the above infections, it is equally important to decrease the costs of care for these patients. Bed charges were

responsible for the major cost followed by added charges including pharmacy, radiology and laboratory charges. According to an American study, the amount saved from the patient side is estimated to be \$680 for a 1-day reduction in length of stay (LOS) (Robert, 2000). In our study, we tried to identify the association of early antibiotic administration with reduced LOS in hospital.

METHODS

A retrospective study, data was analyzed from a registry comprised of patient details who presented to the emergency department (ER) with different complaints. The patient's details included the age, gender, diagnosis, the antibiotic that was initiated with its dose and infusion period.

Patient inclusion criteria

The subjects of this study were patients of any age, any diagnosis presented to the ER between January 2017 and June 2017. We excluded patients who previously signed "Do Not Attempt Resuscitation (DNAR)" order.

Data collection

The patients who were brought to the ER and received antibiotic injection were noted down in a registry kept for this purpose. The details such as patient specific hospital

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identification number, age, gender, antibiotic received and its duration, the status of the patient upon discharging was noted down.

Outcome measures

To identify the role of timing of antibiotic administration on survival.

Statistical analysis

The primary outcome variable was reduced LOS and its association with the median time to deliver of effective antimicrobial therapy following the patient’s admission to the ER. Bonferroni test was applied for pair wise comparison. Data are expressed as mean SD unless otherwise indicated.

RESULTS

In total, 153 patients were included in our study. The patients were divided into three groups depending on the time over they have received the antibiotic. We had 42 patients who received the antibiotic within 1 hour or less, 89 within 1-3 hours and 22 more than 3 hours. The average age of our patients was 57.13 ± 16.4, with 70.5% males and 29.41% females. The diagnosis with which patients were brought to the ER were sepsis pneumonia neutropenic fever and gastro-intestinal complaints. The number of deaths in each group were 2% (1 out of 42) in the group that received antibiotic in 1 or less than 1 hour, 8.98% (8 out of 89) among group who received antibiotic within 1-3 hours and 4.54% (1 out of 22) among the group that received antibiotic in more than 3 hours (Fig 1.)

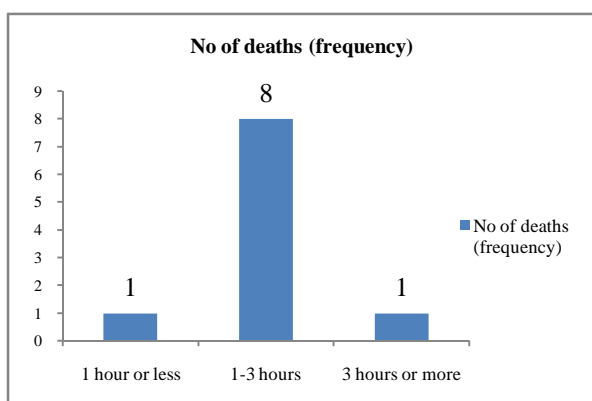


Fig 1 showing the number of deaths in each category

The mean days to stay for ≤ 1 hour is 7.21 ±2.38 days, for 1-3 hours it is 9.31±6.04 and for ≥ 3 hour it is 11.45 ±5.01 days. The difference is statistically significant (p value=0.007). The mean days to stay is not significantly different for ≤1 hour and 1-3 hour (p value=0.092). The difference is statistically significant for ≤1 hour and ≥ 3 hour (p value=0.006). The mean days to stay for 1-3 hour and ≥ 3 hour is not statistically significant (p value=0.248)

Table 1 showing mean days of stay and the hour to receive the antibiotic

Hours	N	No of days to stay		p value
		Mean (days)	Std. Deviation	
≤1 hour	42	7.21	2.38	
1-3 hour	89	9.31	6.04	0.007
≥ 3 hour	22	11.45	5.01	

DISCUSSION

This study analysed the effect of timely administration of a broad-spectrum antibiotics to patients who were admitted at the ER for infections such as sepsis, pneumonia, febrile neutropenia etc. The correlation between timely administration of antibiotic and reduced length of stay in hospital was shown to be statistically significant in our study. Administration of the antibiotic in 1 hour or less was associated with reduced length of stay (p value 0.007). Study by Min Joo *et al.* has demonstrated that early antibiotic administration is associated with reduced hospital stay with a p-value of < 0.01(Young *et al.*, 2014). Study by McGarvey and Harper has reported that the administration of antibiotic within 4 hours in patients with community acquired pneumonia was significantly associated with reduced mortality rate McGarvey and Harper, 1993. Studies by Kumar *et al*, Ferrer *et al* has shown the importance of early initiation of appropriate antibiotic therapy in cases of septic shock as there lies a quantitative relationship with mortality rates (Ferrer *et al.*, 2014; Kumar *et al.*, 2006). Study by Kumar *et al* has highlighted the importance of early initiation of antibiotic therapy as every one hour delay in its administration is associated with increased mortality rate (Kumar *et al.*, 2006). Further, study by Young MJ *et al* has shown that delayed administration is also associated with higher risk for complications, prolonged hospitalization associated with increased medical costs (Young *et al.*, 2014) . A number of studies have demonstrated on the importance of rapidity of antimicrobial therapy in serious human infections such as the community-acquired pneumonia, ventilator-associated pneumonia, meningitis, bacteraemia and septic shock. It has been understood that following any serious human infections including community-acquired pneumonia (McGarvey and Harper, 1993; Meehan *et al.*, 1997; Kang *et al.*, 2003; Houck *et al.*, 2004), ventilator-associated pneumonia (Iregui *et al.*, 2002) , meningitis (Proulx *et al.*, 2005; Miner *et al.*, 2001), bacteremia (Kumar *et al.*, 2006; Lodise *et al.*, 2003) and septic shock (Larche *et al.*, 2003) , rapidity of antimicrobial therapy is a critical determinant of outcome.

Our study has several limitations

- 1) Single-center study
- 2) The timing of initial antibiotic administration was only evaluated and not the appropriateness of the antibiotic initiated.

CONCLUSION

Antibiotic administration within three hours from the time of ER arrival was significantly associated with improved outcomes, including in-hospital survival, reversal of organ failure and shorter hospital LOS. According to our study reports, initiation of antibiotic within 1 hour of admission is associated with reduced stay at hospital with early discharge and better outcome. Li XQ, Tan, A., Voegtline, M., Bekele, S., Chen, C.S. and Aroian, R.V. 2008. Expression of Cry5B protein from Bacillus thuringiensis in plant roots confers resistance to root-knot nematode. Biol. Control., 47: 97-102.

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