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DE-ESCALATION OF ANTIBIOTICS-AN EFFECTIVE TOOL AMONG PATIENTS AT ADESH HOSPITAL, BATHINDA, Pb.

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ABSTRACT
Patients admitted to Intensive therapy units (ITU) are critically ill patients and most often associated with infection or gets associated with infection due to their prolonged stay in hospital and due to the various invasive treatment options like catheter, tracheotomy tube, ventilation etc that they are treated with and due to the prevailing hospital flora. Strategy of de-escalation practice can be an optimal approach in preventing spread of antibiotic resistance by optimizing the usage of antibiotic thereby reducing pressure on bacterial ecology; as each antibiotic used, appropriate or inappropriate affects bacterial ecology by exerting selective pressure and thus driving resistance and thereby causing potential public health consequences. The antibiotics must be used in a manner that will ensure not only minimum subsequent antimicrobial resistance but also ensure maximum favorable outcome for the individual patient. this strategy of de-escalation practice can be an optimal approach in preventing spread of antibiotic resistance by optimizing the usage of antibiotic thereby reducing pressure on bacterial ecology; as each antibiotic used, appropriate or inappropriate affects bacterial ecology by exerting selective pressure and thus driving resistance and thereby causing potential public health consequences (Deresinski, 2007). Though a number of factors are at root cause of the problem the core factor is surely correlated with the extensive and extensively inappropriate use of antibiotics in hospitals especially in the Critical Care Units, where infections are common day-to-day problem.

KEYWORDS: De-escalation, Antibiotics, Antimicrobial etc.

Objective: strategy of de-escalation practice can be an optimal approach in preventing spread of antibiotic resistance by optimizing the usage of antibiotic thereby reducing pressure on bacterial ecology; as each antibiotic used, appropriate or inappropriate affects bacterial ecology by exerting selective pressure and thus driving resistance and thereby causing potential public health consequences. The antibiotics must be used in a manner that will ensure not only minimum subsequent antimicrobial resistance but also ensure maximum favorable outcome for the individual patient. **Materials and Methods:** The study on de-escalation practice of antibiotics in hospital is a prospective observational one. Data on each eligible patient‘s demography, ITU admission dates, empirically administered antibiotic(s), cultures sent were collected. Once the culture reports were available, the culture reports served as information resources, and it was observed that whether the empirically administered antibiotic was changed \ or not was based on the culture report and the respective data were collected of each patient under study. **Results**: De-escalation (54%) was found to be most common practice of antibiotic use in ITU followed by no-change (29%) and escalation (17%). De-escalation was much higher in cases when no pathogen was isolated (67.06%) than cases where bacterial pathogens were isolated (30 %). **Conclusion:** The present study concluded that De-escalation was found to be most common practice of antibiotic use. Among the doctors, pharmacist and nurses the doctor were the one who were most aware and the nurses were the once who were least aware of De-escalation strategy. The practice of de-escalation of antibiotic can serve as an effective tool to cut down the unnecessary use of antibiotics and thus preventing antibiotic resistance.

1. INTRODUCTION
Patients admitted to Intensive therapy units (ITU) are critically ill patients and most often associated with infection or gets associated with infection due to their prolonged stay in hospital and due to the various invasive treatment options like catheter, tracheotomy tube, ventilation etc that they are treated with and due to the prevailing hospital flora. The initial antibiotic is usually a broad spectrum one as the sensitivity of the pathogen is initially unknown due to lack of relevant microbiological

data and the associated pathogen might be a resistant one. However once all the relevant clinical and microbiological data are available, depending on the microbiological data and condition of the patient the empiric antibiotic should be tailored to a narrower spectrum and if possible discontinued or in other words de-escalate the therapy. Thus this strategy of de-escalation practice can be an optimal approach in preventing spread of antibiotic resistance by optimizing the usage of antibiotic thereby reducing pressure on bacterial ecology; as each antibiotic used, appropriate or inappropriate affects bacterial ecology by exerting selective pressure and thus driving resistance and thereby causing potential public health consequences (Deresinski, 2007). Though a number of factors are at root cause of the problem the core factor is surely correlated with the extensive and extensively inappropriate use of antibiotics in hospitals specially in the Critical Care Units, where infections are common day-to-day problem. This has thus led to intense focus on optimization of antibiotic therapy. Various strategies have been developed to optimize the antibiotic usage in Critical Care Units in order to prevent resistance. However these strategies should provide a balance between the need to provide adequate initial antibiotic therapy in the severely ill patients who are at high risk to infections and the need to prevent the spread of antibiotic resistance. De-escalation of antibiotics is such a strategy that attempts to accomplish the above said balance i.e. to balance the need to provide appropriate and adequate initial antibiotic therapy to the high risk patients with the avoidance of unnecessary antibiotic usage (Kollef, 2003).

Therefore optimizing the treatment of infectious diseases in the ICUs is crucial and requires the following:

- To be aware of the antimicrobial resistance pattern in the ITU, in order to guide the clinician in the choice of an optimal empiric antibiotic regimen. In fact, updated unit-specific antibiograms should be provided to the clinicians at least once a year to ensure that the data are current and useful.
- To be insured of the validity of the results of in vitro antibiotic susceptibility testing. There are various in vitro antibiotic susceptibility tests that will assist the clinician in the choice of an appropriate antibiotic for the treatment of infected patients.

2. MATERIALS AND METHODS

2.1 Study Site

Study was carried out at Adesh Medical College & Hospital, Bathinda, Pb. Hospital has 750 bedded General Medical Department which is well equipped with modern apparatus. Hospital has various departments with well qualified staff (Medicine, Surgery, Gynecology, Psychiatrics, Pediatrics, Dermatology and Orthopedics).

2.2 Study Design

A prospective observational study.

2.3 Study Duration

Study was conducted within time period of October 2018 to November 2019.

2.4 Study Subjects

The Inclusion and Exclusion criteria for study are as follow:

i. Inclusion Criteria

(A) Either of both sex (Male and Female); (B) Age of 18-75 years. (C) In-Patients Department would be included in the study only if the length of the stay of the patient is for at least three days and only if at least one empiric antibiotic is administered to the patient.

ii. Exclusion Criteria

(A) Patient having serious illness (E.g. Cancer patient); (B) Patient less than or more than Age of 18-75 years. (C) length of the stay of the patient in hospital is less than three days.

3. RESULTS

A total of 110 patients admitted to intensive therapy unit of Adesh Medical College, Adesh University Bathinda, Pb. was studied during the study period. 80 patients were male and 30 of them were female; male:female ratio is 2.6:1.Mean age of the patients were 60.27.

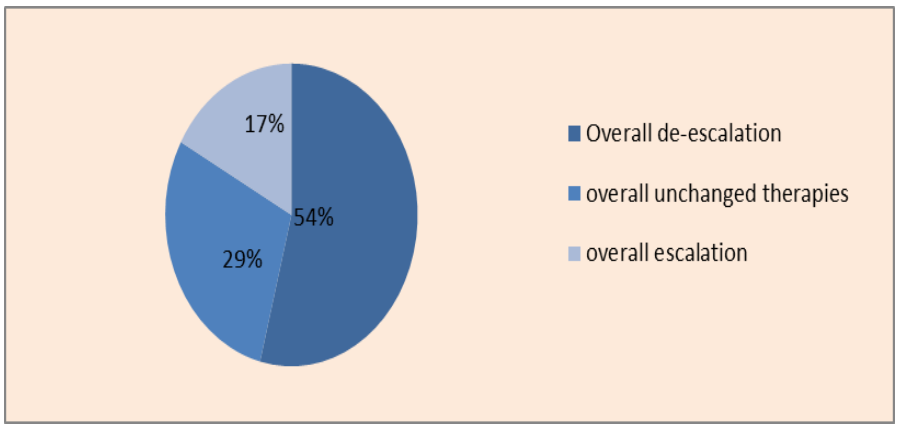

Figure 1: Overall antibiotic usage pattern in ITU. According to the result of the chart 54% (n= 59) of patients were de-escalated, 17% (n=19) patients were escalated and in the remaining there was no change 29% (n=32) in the therapy.

Table 1: Pattern of Antibiotic Change Among Patients in Those Cultures Were Sent *vs.* Patients in Those Cultures Were Not Sent.

Group	Number of Cases whom cultures were Sent (87.66%)		Number of Cases whom cultures were Not sent (12.34%)	
	Number (n)	Percentage (%)	Number (n)	Percentage (%)
De-escalated group	51	54.07%	8	52.63%
Escalated group	19	17.78%	1	10.53%
No change group	26	28.15%	5	36.84%
Total patients	96	100%	14	100%

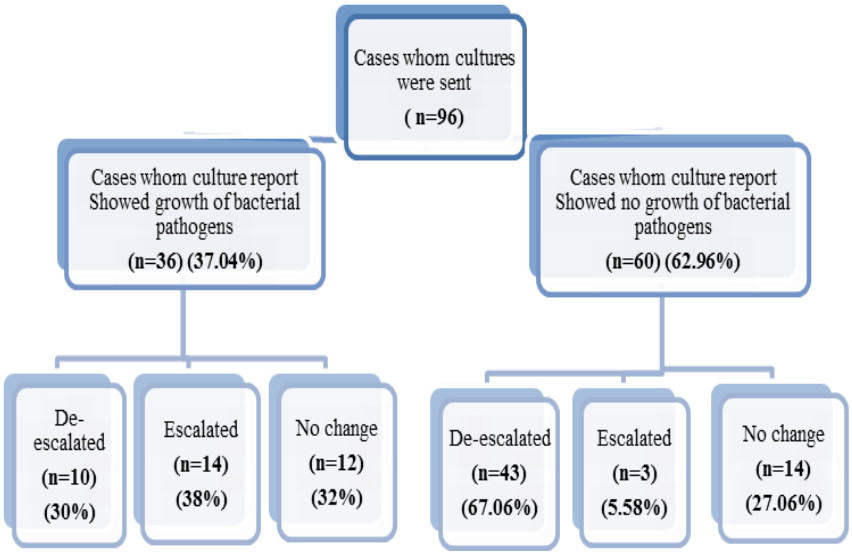

Figure 2: Pattern of Antibiotic Change Among Patients in Those Cultures Were Sent vs. Patients in Those Cultures were Not Sent.

The results in table 4 shows that cultures were sent in 87.66% (n=96) of patients; of which de-escalation was done in 54.07% (n=51) of patients, escalation in 17.78% (n=19) of patients and in rest of the cases therapy remained unchanged even after the culture reports were available. Among the patients in whom cultures were not sent, 52.63% (n=8) of the patients were de-escalated, 10.5% (n=1) of the patients were escalated and in rest of the patient therapy remained unchanged.

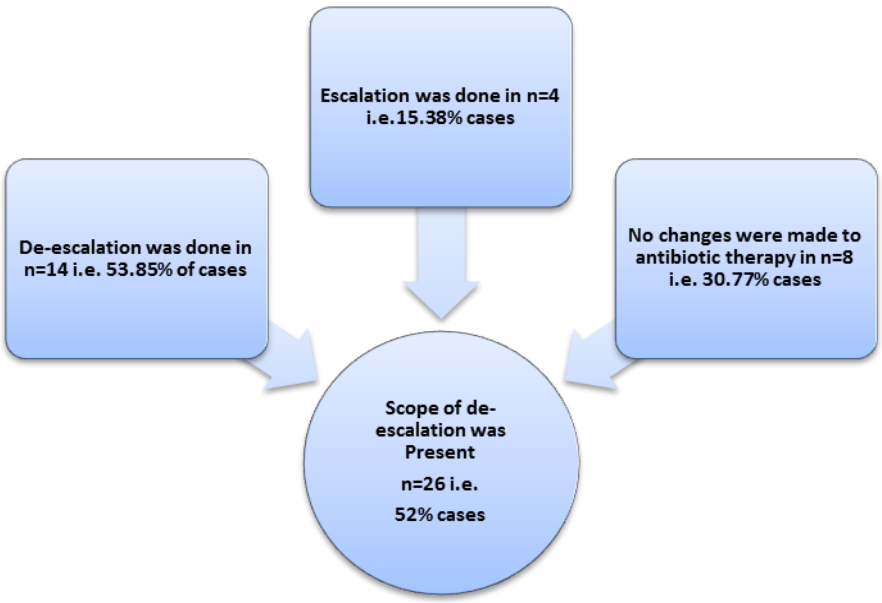

Figure 3: Antibiotic Change Patterns According To Scope of De-Escalation Present.

96 patients in whom cultures were sent, bacterial pathogens were isolated in 37.0% cases; among which 30% (n=10) of cases were de-escalated, 38% (n=15) of cases were escalated and in the remaining 32% cases antibiotics were not changed. In the remaining 62.96% cases where according to culture report no bacterial pathogens were isolated, 67.06% of cases were de-escalated and only 5.58% cases were escalated and in rest antibiotics were not changed. Among the patients in whom bacterial pathogens were isolated, in 52% (n=26) patients de-escalation was possible; but despite the presence of scope of de-escalation 15.38% (n=4) patient were escalated and in 30.77% (n=8) patient no change, whereas 53.85% (n=14) were de-escalated to antibiotic therapy.

Table 2: Major pathogens isolated and their prevalence

S.no.	Major Pathogens Isolated	Prevalance (%)
1.	*Staphylococcus aureus*	23.33%
2.	*Escherichia coli*	20%
3.	*P aeruginosa*	16.67%
4.	*Acinetobacter sp.*	15%
5.	*K pneumonia*	13.33%
6.	*Enterococcus faecalis* (HLAR)	1.67%
7.	*Coagulase negative staph aureus*	1.67%
8.	*S pneumonia*	1.67%
9.	*Others*	6.66%

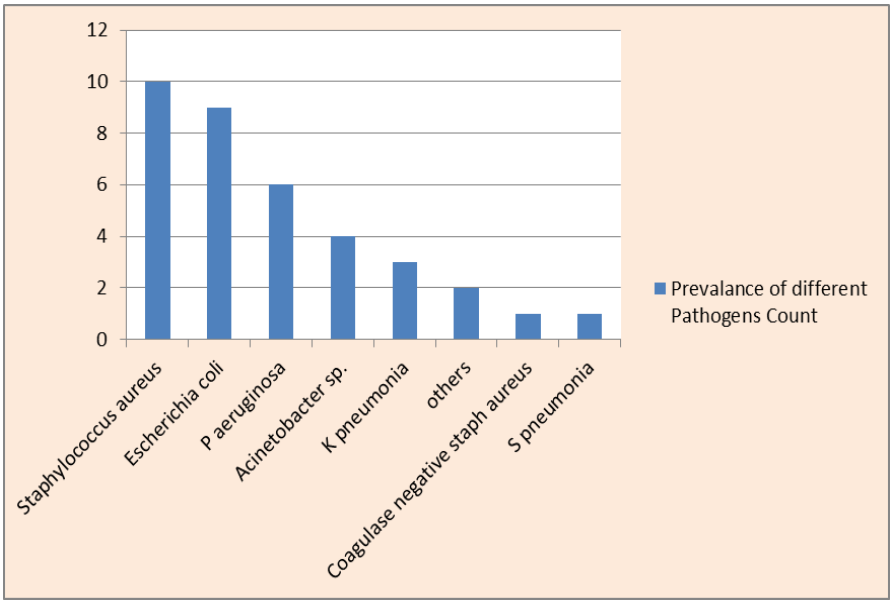

Figure 4: Major Pathogens Isolated and Their Prevalence.

It is clear from the above table that the major pathogen isolated was *Staphylococcus aureus* (23%) followed by *E Coli.* (20%), *Pseudomonas aeruginosa* (16.67%), *Acinetobacter sp* (15%), *K pneumonia* (13.33%) and the rest.

Table 3: Antibiotic Usage Pattern In Major Isolated Pathogen.

S.N.	Major Pathogens Isolated	De-escalated n (%)	Escalated n (%)	No change n (%)
1.	*Staph aureus* (total) (n=10)	5 (50%)	1 (14.29%)	4 (35.71%)
2.	*E. coli* (total) (n=9)	1 (16.67%)	3 (25%)	5 (58.33%)
3.	*P. aeruginosa* (total) (n=6)	2 (30%)	3 (50%)	1 (20%)
4.	*Acinetobacter sp.* (n= 4)	1 (11.11%)	2 (77.78%)	1 (11.11%)
5.	*K .pneumoniae* (total) (n=3)	1 (37.5%)	2 (62.5%)	___
6.	*Coagulase negative staph aureu* (n=1)	1 (100%)	___	___
7.	*S pneumoniae* (n=1)	1 (100%)	___	___
8.	Others (n=2)	2 (100%)	___	___

Table represent number and percentage of de-escalated cases, escalated cases and number of cases where therapy remained unchanged for each of the pathogen isolated.

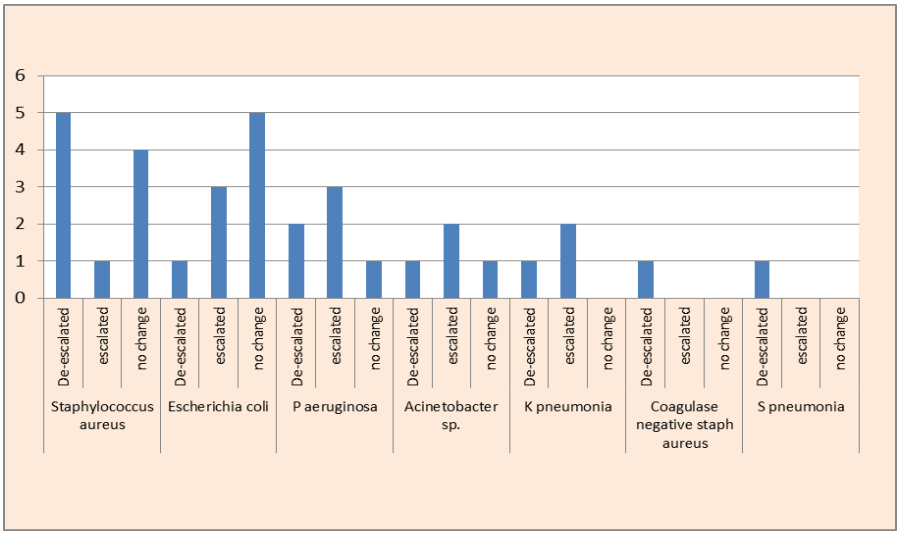

Figure 5: Antibiotic Usage Patterns In Major Isolated Pathogens.

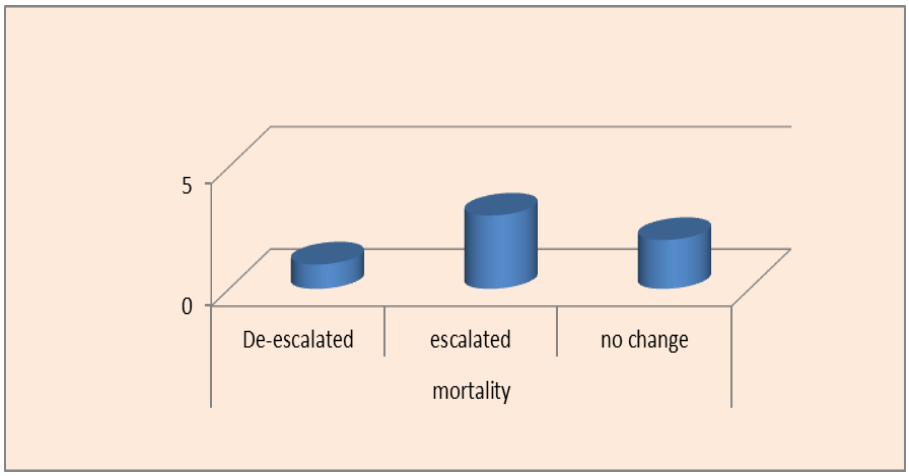

Figure 6: Mortality Rate.

The results of the above figure 8 represent mortality rate of de-escalated cases (n=1), escalated cases (n=3) and number of cases where therapy remained unchanged (n=2). So, it is clear from this that mortality is less in patients were therapy was de-escalated.

DISCUSSION

De-escalation n=59 (54%) was found to be most common practice of antibiotic use followed by no change of antibiotic n=32 (29%) and escalation n=19 (17%). In contrast to our observation a study shows that the rate of de-escalation, rate of escalation and rate of cases where therapy neither escalated nor de-escalated was n=35 (22.1%), n=23 (15.3%) and n=92 (61.6%) respectively from total sample of 150 patients and study revealed that the rate of de-escalation was n=62 (31.4%) rate of escalation was n=50 (24.8%) and the rate of cases where therapy remain unchanged was n=88 (43.8%) (Rello *et al.*, 2007).

So in comparison to other studies the rate of de-escalation was higher in our study, Cultures were sent in n=96 (87.66%) of patient who received empiric antibiotic therapy; among which n=51(54.07%) cases were de-escalated, n=19 (17.78%) were escalated and in n=26 (28.15%) cases where therapy was neither de-escalated nor escalated. (Table 2) also shows that in n=14 (12.34%) cases culture were not sent at or before initiation of antibiotic therapy. Therefore we can say that cultures were sent in majority (almost 90%) of patients and in cases where cultures has been sent antibiotic has been changed (either de-escalated or escalated) majority of cases n=62 (71.85%) depending on the culture report.

Patients from whom cultures were sent, n=36 (37.04%) of cultures showed the growth of major pathogens; among which n=10 (30%) of cases were de-escalated, n=15 (38%) of cases were escalated and in the remaining n=11 (32%) cases antibiotics were not changed. Thus maximum cases were escalated among these cases. In the remaining n=60 (62.96%) cases according to culture report no bacterial pathogens were isolated and among these cases n=43 (67.06%) of cases were de-escalated and only n=3 (5.58%) cases were escalated and in rest antibiotics were not changed.

De-escalation occurred much more frequently (more than 4 times) among patients in whom a major pathogen was

isolated (26.8%), compared with patients who did not have a major pathogen identified (6.5%). The result of this study is much more different than the result of our study (Kollef, 2001).

Again in another study de-escalation occurred more frequently (almost double) among patients in whom no pathogen was isolated n=64 (45.8%) compared with culture-positive cases n=33 (23.9%) which is similar to the result of our study (Bhakta *et al.*, 2010). Scope of de-escalation was there in n=26 (52%) cases among the patients whose culture report shows growth of bacterial pathogen, among which n=14 (53.85%) cases were de-escalated but (n=4) 15.38% cases were escalated and in n=8 (30.77%) of cases no change to antibiotic therapy was made. In spite of presence of escalation n=4 (15.38%) cases were escalated and in n=8 (30.77%) of cases antibiotic therapy was not changed.

CONCLUSION

De-escalation was thus much higher (more than double) in cases where no bacterial pathogens were isolated than cases where bacterial pathogens were isolated. Mortality rate was lowest in de-escalated cases n=1 (8.43%) compared to no change group n=2 (13.33%) and escalated group n=3 (23.08). Therefore it is clear than de-escalation practice of antibiotic is a better practice of antibiotic use than making no change to antibiotic therapy. The present study concluded that De-escalation was found to be most common practice of antibiotic use. Among the doctors, pharmacist and nurses the doctor were the one who were most aware and the nurses were the once who were least aware of De-escalation strategy. The practice of de-escalation of antibiotic can serve as an effective tool to cut down the unnecessary use of antibiotics and thus preventing antibiotic resistance.

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