

STATUS OF EXTENDED SPECTRUM BETA-LACTAMASE PRODUCING  
ENTEROBACTERIACEAE AMONG BACTERIAL UROPATHOGENS

A DISSERTATION SUBMITTED TO THE CENTRAL DEPARTMENT OF  
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(Medical)

BY  
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2013

## RECOMMENDATION

This is to certify that **Mr. Santosh Paudel** has completed this dissertation work entitled "**Status of Extended spectrum beta lactamase producing *Enterobacteriaceae* among bacterial uropathogens**" as a partial fulfillment of the requirements of M. Sc. degree in Microbiology (Medical) under our supervision. To our knowledge this work has not been submitted for any other degree.

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## ABSTRACT

The prevalence of Extended Spectrum Beta Lactamases (ESBL), the main cause of resistance to broad spectrum  $\beta$ -lactams, among uropathogenic bacteria have increased over time raising a global concern in the therapeutic management of infections caused by these organisms. This resistance poses difficulties with the choice of therapeutic options for the treatment of severe infections. The study was carried out in the Alka Hospital, Lalitpur between May to October 2012 with an objective to determine the status of ESBL producing *Enterobacteriaceae* isolated from the urine sample, collected from patients suspected of urinary tract infection. During the study, the *Enterobacteriaceae* isolated were tested for the presence of ESBL by double disc synergy test (DDST) and combination disk method and antibiotic susceptibility testing was done by Kirby Bauer disc diffusion method following Clinical and Laboratory Standard Institute (CLSI) guidelines.

Among the total 1054 mid-stream urine samples, 267 *Enterobacteriaceae* were isolated. By screening test using third generation cephalosporins, 81 of the isolates were suspected of ESBL producers. Among 81 isolates, 72 isolates were positive for ESBL test by combination disk method and only 28 isolates were positive by DDST method. Among the 72 (27%) isolates 67 (30.2%) *Escherichia coli*, 3 (15.8%) of *Klebsiella pneumoniae*, 1 (25%) of *Citrobacter* spp. and 1 (14.3%) of *Morganella morganii* were found to be ESBL producers. Majority of ESBL producer showed resistance to amoxicillin (100%), cotrimoxazole (79.2%) followed by ciprofloxacin (76.4%). Imipenem (100%), tigecycline (98.6%), amikacin (97.2%), piperacillin- tazobactam (98.6%) and nitrofurantoin (91.7%) seemed to be the agent of choice for urinary tract infections when ESBL producers are susceptible to it.

Combination disk method was found to be more sensitive than DDST method for the detection of ESBL producing *Enterobacteriaceae*. The high level of ESBL production found in these *Enterobacteriaceae* with the resultant microbial resistance to the available cephalosporins and other agents may pose difficulties with the choice of therapeutic options for the treatment of severe infections. Efforts to prevent and/or control outbreaks of infections with ESBL producing strains must emphasize on the judicious use of all antibiotics.

**Keywords:** Urinary tract infection, *Enterobacteriaceae*, Extended spectrum beta lactamase (ESBL), Double disk synergy test and combination disk method.

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## ABBREVIATIONS

ATCC	: American Type Culture collection
ATM	: Aztreonam
BA	: Blood Agar
CAZ	: Ceftazidime
CD	: Combination Disk
CDC	: Centre for Disease Control
CFU	: Colony Forming Unit
CLSI	: Clinical and Laboratory Standards Institute
CTR	: Ceftriaxone
DDST	: Double Disk Synergy Test
DNA	: Deoxyribose Nucleic Acid
ESBL	: Extended Spectrum Beta Lactamase
LF	: Lactose fermenting
MA	: Mac Conkey Agar
MDR	: Multi Drug Resistance
MHA	: Muller Hinton Agar
MHB	: Muller Hinton Broth
MIC	: Minimum Inhibitory Concentration
NCCLS	: National Committee for Clinical Laboratory Standards
NLF	: Non-lactose fermenting
NPHL	: National Public Health Laboratory
OMP	: Outer Membrane Protein
PBP	: Penicillin Binding Protein
SIM	: Sulfur, Indole, Motility medium
SPSS	: Statistical Package for Social Science
TSI	: Triple Sugar Iron
TUTH	: Tribhuvan University Teaching Hospital
UTI	: Urinary Tract Infection
WHO	: World Health Organization