

**MULTIDRUG RESISTANCE AND EXTENDED SPECTRUM BETA-  
LACTAMASE PRODUCING STRAINS AMONG CLINICAL ISOLATES  
OF PATIENTS FROM SHREE BIRENDRA HOSPITAL, CHHAUNI**

**A**

**Dissertation**

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Tribhuvan University**

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of  
Science in Microbiology  
(Environment and Public Health)**

**Submitted by  
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This is to certify that **Ms. Sushila Maharjan** has completed this dissertation work entitled “**MULTIDRUG RESISTANCE AND EXTENDED SPECTRUM BETA-LACTAMASE PRODUCING STRAINS AMONG CLINICAL ISOLATES OF PATIENTS FROM SHREE BIRENDRA HOSPITAL, CHHAUNI** ” as a partial fulfillment of Master of Science Degree in Microbiology under our supervision. To our knowledge this thesis work has not been submitted for any other degree.

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## ABSTRACT

The microbial resistance to various classes of drugs has increased a multitude of bacterial species which has complicated the therapeutic management of infections. For this reason, a six month study was conducted in order to analyze the prevalence of the Multidrug Resistant strains(MDR) and the Extended Spectrum of  $\beta$ -lactamase(ESBL) producing strains among the organisms, isolated from clinical specimens (urine, sputum and pus samples) received in the laboratory. Microorganisms from 388 clinical specimens were identified by conventional microbiological method and antimicrobial susceptibility of bacterial isolates was determined by CLSI (Clinical and Laboratory Standard Institute) recommended by Kirby-Bauer method. Among 388 clinical samples processed in the study, 207 were urine samples, 79 were sputum samples and 102 were pus samples. Out of 207 urine samples, 95 (45.89%) showed significant growth and among the 95 isolates, 62 (65.26%) were multi-drug resistant. In urine sample, *Escherichia coli* was the most predominant Gram-negative isolate. Out of 68 *E. coli* isolates, 47 (69.12%) were found to be MDR and 11 (16.18%) were ESBL-producers. Out of 79 sputum samples received, 77 (97.47%) met the American Society for Microbiology (ASM) criteria and thus were considered for further processing, whereas 2 (2.53%) of the samples didn't meet the criteria and were not included in this study. Out of 77 processed sputum samples, 20 (25.97%) samples showed significant growth, out of which, 9 (45%) were MDR and 3 isolates of *Klebsiella pneumoniae* among 20 different isolates from the sputum samples were ESBL-producers. Likewise, out of 102 pus samples, 75 (73.53%) showed significant growth with 82 isolates (some samples showed more than one type of significant bacterial growth) and among 82 isolates, 40 (39.22%) were multi-drug resistant, additionally, 5 isolates (3 out of 23 isolates of *Escherichia coli* and 2 out of 8 isolates of *Klebsiella pneumoniae*) were found to be ESBL-producers. In all the urine and pus specimens, the most predominant Gram-negative isolate was *Escherichia coli* while in case of sputum, it was *Pseudomonas aeruginosa*. The most predominant Gram-positive isolates were *Staphylococcus aureus* in all the studied specimens. Erythromycin and cloxacillin were highly effective towards Gram-positive isolates, nitrofurantion towards Gram-negative urinary pathogens while gentamicin followed by ciprofloxacin and amikacin for sputum and pus isolates. Thus total of 386 samples were processed, out of which 190 (49.22%) samples showed positive growth with 197 (51.03%) of total isolates and among those bacterial isolates, 111 (57.21%) were found to be MDR-strains whereas 19 of them were found to be ESBL-producers. Significant association was found between multidrug resistance and hospitalization of patients in different wards ( $P<0.05$ ), whereas no association was seen between multidrug resistance and gender ( $P>0.05$ ).

**Key words:** Urine, Pus, Sputum, ASM, MDR, ESBL, DDST

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## LIST OF ABBREVIATIONS

|       |   |
|-------|---|
| ASM   | American Society for Microbiology             |
| ATCC  | American Type Culture Collection              |
| ATP   | Adenosine Triphosphate                        |
| BA    | Blood Agar                                    |
| BLNAR | Beta-lactamase Negative, Ampicillin Resistant |
| CA    | Chocolate Agar                                |
| CAT   | Chloramphenicol Acetyltransferase             |
| CFU   | Colony Forming Unit                           |
| CLED  | Cystine Lactose Electrolyte-deficient         |
| CLSI  | Clinical and Laboratory Standard Institute    |
| CONS  | Coagulase Negative Staphylococci              |
| CRF   | Coagulase Reacting Factor                     |
| DDST  | Double Disk Synergy Test                      |
| DHFR  | Dihydrofolate Reductase                       |
| DNA   | Deoxyribonucleic Acid                         |
| EDTA  | Ethylene Diamine Tetra-acetic Acid            |
| ESBL  | Extended Spectrum Beta Lactamase              |
| ICU   | Intensive Care Unit                           |
| IS    | Insertion Sequence                            |
| LPS   | Lipopolysaccharide                            |
| LRTI  | Lower Respiratory Tract Infection             |
| MA    | MacConkey Agar                                |
| MBC   | Minimum Bactericidal Concentration            |
| MDR   | Multi-drug Resistant                          |
| MHA   | Mueller Hinton Agar                           |
| MIC   | Minimum Inhibitory Concentration              |

|      |   |
|------|---|
| MLS  | Macrolide-Lincosamide-Streptogramin                     |
| MRSA | Methicillin Resistant <i>Staphylococcus aureus</i>      |
| MRVP | Methyl Red Voges Proskauer                              |
| NA   | Nutrient Agar   |
| NAD  | Nicotinamide Adenine Dinucleotide                       |
| NADP | Nicotinamide Adenine Dinucleotide Phosphate             |
| NB   | Nutrient Broth  |
| NCTC | National Collection Type Cultures                       |
| NFW  | New Female Ward   |
| ONPG | <i>o</i> -nitrophenyl- $\beta$ -D-galactopyranoside     |
| PBP  | Penicillin Binding Protein                              |
| PDA  | Phenylalanine Deaminase                                 |
| QRDR | Quinolone Resistance-determining regions                |
| QREC | Quinolone Resistant <i>Escherichia coli</i>             |
| RNA  | Ribonucleic Acid  |
| SIM  | Sulfide Indole Motility                                 |
| TPD  | Tetramethyl <i>p</i> -phenylene diamine dihydrochloride |
| TSIA | Triple Sugar Iron Agar                                  |
| TUTH | Tribhuvan University Teaching Hospital                  |
| UTI  | Urinary Tract Infection                                 |
| VRE  | Vancomycin Resistant Enterococci                        |
| VRSA | Vancomycin Resistant <i>Staphylococcus aureus</i>       |

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