

Letter to Editor

Biofilm production in relation to extended spectrum beta-lactamase production and antibiotic resistance among uropathogenic *Escherichia coli*

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Dear editor,

Biofilm formation is a common phenomenon occurring in the nature and is associated with establishment of many bacterial infections in humans [1]. It is produced by microorganisms to survive in harsh environment [2]. Bacterial biofilm consists of bacteria enclosed in polymeric matrix [2] and it protects bacteria from antibiotics and host defenses, making the infection difficult to treat and leading to recurrent symptoms [3]. The bacteria enclosed in biofilm may show high level of drug resistance (upto 1000 folds) to many antibiotics, intrinsically [2]. The main reason for this may be the low amount of antibiotics reaching to the bacteria in biofilm along with the metabolic inactiveness of these organisms and degradation of the antibiotics by them [2]. Biofilms may also be the means for horizontal transfer of drug resistance markers and genes

associated with other virulence factors, through inter-bacterial interactions [4]. *Escherichia coli* is the most common cause of urinary tract infection and one of the most common biofilm producing bacteria [5].

Rate of infections caused by extended spectrum beta-lactamase (ESBL) producing bacteria is increasing, worldwide and ESBL producing bacteria are known to show resistance to many different classes of commonly used antibiotics. In Nepal, limited data are available regarding the relationship between biofilm production and ESBL production among the clinical isolates. Only a few studies have been conducted to investigate the rate of biofilm production among ESBL producing bacteria in Nepal [2]. So, in this study, we studied the association between the biofilm formation and rate of ESBL production along with the antibiotic

susceptibility patterns of uropathogenic *E. coli* isolated from the patients attending Korea-Nepal Friendship Hospital, Bhaktapur, Nepal from April 2014 to December 2014. Antimicrobial susceptibility testing was performed by Kirby Bauer disk diffusion method following Clinical and Laboratory Standards Institute guidelines (2014). ESBL detection was done by combined disc diffusion method and biofilm production was detected by Congo Red Agar method [2].

Altogether, 96 (15.5%) *E. coli* isolates were obtained from total 620 urine samples, which was similar to the finding of another study from Nepal (14.1 %) [2]. Out of 96 *E. coli* isolates, 31 (32.3%) were ESBL positive. This result is in support of the rate of ESBL producing bacteria reported by Neupane et al. (33.2 %) [2]. Of total 96 *E. coli* isolates, 45 (46.9%) were biofilm producers. Similar, results were also reported by Neupane et al. (51.9%) [2].

Out of 31 ESBL producing *E. coli*, 18(58.1%) showed biofilm formation, while out of 65 ESBL negative *E. coli*, 27(41.5%) showed biofilm formation. As in a study by Neupane et al. [2], we reported higher rate of biofilm production among ESBL producing bacteria than in ESBL negative bacteria.

In our study, the rate of antibiotic resistance among biofilm producing *E. coli* was found significantly higher than that of biofilm non-producing *E. coli*, which was in accordance with the findings by Neupane et al. [2]. In our study, the highest rate of antibiotic resistance among biofilm producing bacteria was seen toward ciprofloxacin followed by ampicillin, while highest rate of susceptibility was seen toward amikacin followed by nitrofurantoin (table 1). Similarly, Neupane et al. also reported the highest rate of susceptibility of

biofilm producing bacteria toward amikacin followed by nitrofurantoin [2]. However, Neupane et al. found the highest rate of resistance toward cephalexin followed by amoxicillin [2].

Table 1: Antibiotic resistance patterns of biofilm producer and biofilm non-producer uropathogenic *E. coli*

Antibiotics	Resistance patterns of bacteria		Total N=96
	Biofilm producer (n=45)	Biofilm non-producer (n=51)	
Ampicillin	44 (97.8%)	41 (80.4%)	85 (88.5%)
Cefixime	39 (86.7%)	34 (66.7%)	73 (76%)
Amikacin	18 (40%)	8 (15.7%)	26 (27.1%)
Cotrimoxazole	31 (68.9%)	21 (41.2%)	52 (54.2%)
Ciprofloxacin	45 (100%)	17 (33.3%)	62 (64.6%)
Nalidixic acid	37 (82.2%)	34 (66.7%)	71 (74%)
Nitrofurantoin	21 (46.7%)	8 (15.7%)	29 (30.2%)

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NDP- conceived and designed the study, performed the laboratory work, analyzed the data and prepared the manuscript; **SK, SN-** conceived and designed the study, performed the laboratory work and analyzed the data; **SB-** analyzed the data. **MRB-** monitored the study. All the authors read and approved the final manuscript.

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