

ABSTRACT

Present research work was planned; to investigate the concentration of ciprofloxacin (CIP), norfloxacin (NOR) and ofloxacin (OFL) in hospitals wastewaters, municipal wastewater drains (MWWD) which receive the hospital waste, and in river receiving the untreated wastewater, and also to study antibiotic resistance level of *Escherichia coli* (*E. coli*), *Salmonella typhimurium* (*S. typhi*) and *Vibrio cholerae* (*V. cholerae*) isolated from the raw hospital wastewaters, municipal wastewater drains and from the river.

Composite wastewater samples were collected from drains of three teaching hospitals viz., Mayo, Services and Jinnah hospitals and from MWWDs and water samples were taken from the River Ravi to investigate the impact of wastewater discharge on the pollution level of the river. Samples were prepared by solid phase extraction and analyzed by using HPLC. The antibiotics were detected in wastewater of all the three hospitals but concentration was not same. In wastewater of Mayo hospital, concentration of CIP and NOR ranged from 79.3 $\mu\text{g L}^{-1}$ to 126.9 $\mu\text{g L}^{-1}$, and 30.8 $\mu\text{g L}^{-1}$ to 50.2 $\mu\text{g L}^{-1}$, respectively. In wastewater of Services and Jinnah hospital, concentration of CIP and NOR ranged between 48.2 $\mu\text{g L}^{-1}$ to 113.0 $\mu\text{g L}^{-1}$, and 7.7 $\mu\text{g L}^{-1}$ to 41.5 $\mu\text{g L}^{-1}$, respectively. Higher concentration of OFL was detected from the samples collected from Services hospital and it was ranged between 20.3 $\mu\text{g L}^{-1}$ to 39.1 $\mu\text{g L}^{-1}$. OFL ranged between 7.3 $\mu\text{g L}^{-1}$ to 25.6 $\mu\text{g L}^{-1}$ in wastewater of Mayo and Jinnah hospitals. Before mixing of the hospital wastewaters, concentration of CIP (1.3 $\mu\text{g L}^{-1}$ to 2.2 $\mu\text{g L}^{-1}$), NOR (0.25 $\mu\text{g L}^{-1}$ to 1.17 $\mu\text{g L}^{-1}$) and OFL (0.26 $\mu\text{g L}^{-1}$ to 0.43 $\mu\text{g L}^{-1}$) were also detected from the MWWDs receiving the wastewater from the three hospitals. After mixing of untreated hospital wastewater, an increase in concentration of the antibiotics was observed. From the river water samples collected from the River Ravi upstream to the city before mixing of first MWWD, no antibiotic was detected. After mixing of the first MWWD drain all the three antibiotics CIP (0.032 $\mu\text{g L}^{-1}$), NOR (0.026 $\mu\text{g L}^{-1}$) and OFL (0.019 $\mu\text{g L}^{-1}$) were detected from the river water. In the river, downstream to the MWWD carrying wastewater of Mayo and Services hospitals along with wastewater from different areas of Lahore, an increase in concentration of CIP (0.111 $\mu\text{g L}^{-1}$ to 0.116 $\mu\text{g L}^{-1}$), NOR (0.083 $\mu\text{g L}^{-1}$ to 0.085 $\mu\text{g L}^{-1}$) and OFL

(0.052 $\mu\text{g L}^{-1}$ to 0.053 $\mu\text{g L}^{-1}$) was noted. Hudiara drain carrying wastewater of Jinnah hospital and other areas of the city. Increase in concentration of CIP (0.121 $\mu\text{g L}^{-1}$ to 0.125 $\mu\text{g L}^{-1}$), NOR (0.091 $\mu\text{g L}^{-1}$ to 0.093 $\mu\text{g L}^{-1}$) and OFL (0.066 $\mu\text{g L}^{-1}$ to 0.067 $\mu\text{g L}^{-1}$) was observed.

All the wastewater samples collected from the hospitals and MWWDs were contaminated with *E. coli*, *S. typhi* and *V. cholerae*. In case of hospital isolates of the bacteria, 66.7% to 83.3 % were found resistant to CIP, NOR and OFL. In case of the isolates of *E. coli*, *S. typhi* and *V. cholerae* which were isolated from the wastewater drains before mixing of the hospital wastewater were 33.3% to 66.7% resistant to CIP, NOR and OFL. All the river water samples collected from downstream to the first MWWD to final drain entering into the river from the city were contaminated with the three pathogens. Antibiotic sensitivity tests of the river isolates of *E. coli*, *S. typhi* and *V. cholerae* revealed that 16.7% to 100% isolates were resistant to CIP, NOR and OFL. When co-culture of resistant *S. typhi* and *V. cholerae* was separately prepared with antibiotic sensitive *E. coli* to study the transfer of antibiotic resistance, it was observed that 20% to 33.3% isolates of *E. coli* were resistant to CIP, NOR and OFL. The result of the present study showed that untreated hospital and municipal wastewaters are contaminating natural water bodies with different antibiotics and antibiotic resistant bacteria, and the resistant bacteria may distribute antibiotic resistance to non-resistance microbial community.