Antimicrobial Use and Sensitivity of Mastitis Pathogens Among Smallholder Dairy Cows in Peri-Urban Areas of Nakuru City, Kenya

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Abstract

Antimicrobial use (AMU) in lactating dairy cows for treatment or prevention of mastitis if not responsible and prudent can advance into antimicrobial resistance (AMR). This study is determining use frequency and dosage of antimicrobial drugs and antimicrobial sensitivity of common mastitis pathogens. The study was cross-sectional survey of smallholder dairy farms around peri-urban area of Nakuru city, Kenya. A sample of 210 lactating cows testing positive for mastitis were examined for antimicrobial drug use within past 12 months. Their milk samples were collected and processed for bacteriological culturing and Antimicrobial Susceptibility Testing (AST). The differences in means of drug use frequency and the Defined Daily Dose (DDD) were tested with general linear models. Prevalence of isolated mastitis pathogens and their sensitivity to different antimicrobial drugs were evaluated with Chi-square test statistics. Of the cows sampled, more than half (119/210; 56.7 percent) had been treated within past 12 months, mostly for mastitis (47.1) than ($p<0.05$) for East Coast Fever (14.3), parasitic infections (11.8) and other diseases (26.8) percent. The average drug use frequency was 2.2 per year with an average dose of 20mg/kg and 8.4 DDD mg/cow/year. The disease incidences decreased with increasing intensification from free-grazing (42.9) to semi-grazing (29.4) and to zero-grazing (25.8) percent. Though seven in ten (66.4 percent) farmers did not know the specific drugs used, some drugs were identified: gentamycin (13.4), tetracycline (11.8), penicillin G (5.0), and sulphamethoxazole (3.4) percent. The DDD varied with disease condition ($p<0.05$) and decreased with increasing intensification from free- grazing (10.9) to semi-grazing and zero-grazing (6.5 - 6.6) mg/cow/year. Of the pathogens isolated from milk samples (n=191), *Staphylococcus aureus* (100 percent) predominated over ($p<0.05$) Clostridium (16.2), E. coli (14.7), *Corynebacterium* (14.0) and *Enterococcus species* (4.4) percent, while *Streptococcus agalactia* and *Salmonella typhi* were negative. Both *Staphylococcus aureus* and *Escherichia coli* exhibited a significant level ($p<0.05$) of resistance (97 to 100 percent) against Ampicillin and Penicillin G. In conclusion, Milk from peri-urban dairy poses a risk for multidrug-resistant bacteria due to inappropriate antimicrobial use. Urgent antimicrobial stewardship and surveillance are needed in peri-urban smallholder dairy herds to prevent antimicrobial resistance.

Keywords: Antimicrobial Use, Antimicrobial Resistance, Antimicrobial Sensitivity test, Public Health, Kenya