Determinants of Appropriate Antibiotic Dosing in Patients with Chronic Kidney Disease in a Kenyan Referral Hospital

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Table 4: Bivariable analysis of determinants of appropriate antibiotic dose administration in patients with chronic kidney disease

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dose not appropriate</th>
<th>Dose appropriate</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>122 (69.3%)</td>
<td>54 (30.7%)</td>
<td>0.23</td>
</tr>
<tr>
<td>Male</td>
<td>152 (74.9%)</td>
<td>51 (25.1%)</td>
<td></td>
</tr>
<tr>
<td><strong>Age group (years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 45</td>
<td>142 (68.9%)</td>
<td>64 (31.1%)</td>
<td>0.11</td>
</tr>
<tr>
<td>&lt; 45</td>
<td>132 (76.3%)</td>
<td>41 (27.7%)</td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>217 (71.2%)</td>
<td>88 (28.9%)</td>
<td>0.37</td>
</tr>
<tr>
<td>Single</td>
<td>55 (76.4%)</td>
<td>17 (23.6%)</td>
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</tr>
<tr>
<td><strong>Highest level of education</strong></td>
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<td></td>
</tr>
<tr>
<td>None</td>
<td>32 (68.1%)</td>
<td>15 (31.9%)</td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>100 (71.4%)</td>
<td>40 (28.6%)</td>
<td>0.80</td>
</tr>
<tr>
<td>Secondary</td>
<td>90 (75.0%)</td>
<td>30 (25.0%)</td>
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<tr>
<td>Tertiary</td>
<td>35 (74.5%)</td>
<td>12 (25.5%)</td>
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<tr>
<td><strong>Employment status</strong></td>
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<tr>
<td>Unemployed</td>
<td>171 (71.6%)</td>
<td>68 (28.5%)</td>
<td>0.83</td>
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<tr>
<td>Employed</td>
<td>45 (71.4%)</td>
<td>18 (28.6%)</td>
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<tr>
<td>Self</td>
<td>57 (75.0%)</td>
<td>19 (25.0%)</td>
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<tr>
<td><strong>Clinical setting</strong></td>
<td></td>
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</tr>
<tr>
<td>Medical Ward</td>
<td>233 (72.1%)</td>
<td>90 (27.9%)</td>
<td>0.89</td>
</tr>
<tr>
<td>Renal Unit</td>
<td>41 (73.2%)</td>
<td>15 (26.8%)</td>
<td></td>
</tr>
<tr>
<td><strong>Stage of Chronic Kidney Disease</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0 (0%)</td>
<td>1 (100%)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0 (0%)</td>
<td>1 (100%)</td>
<td>&lt;0.01</td>
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<tr>
<td>3</td>
<td>3 (17.7%)</td>
<td>14 (82.4%)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>24 (55.8%)</td>
<td>19 (44.2%)</td>
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<tr>
<td>5</td>
<td>247 (79.4%)</td>
<td>64 (20.6%)</td>
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<td><strong>On Dialysis</strong></td>
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<td>123 (65.8%)</td>
<td>64 (34.2%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Yes</td>
<td>151 (78.7%)</td>
<td>41 (21.4%)</td>
<td></td>
</tr>
<tr>
<td><strong>Type of antibiotic</strong></td>
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<tr>
<td><strong>Route of administration</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Intravenous</td>
<td>189 (70.5%)</td>
<td>79 (29.5%)</td>
<td>0.23</td>
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<tr>
<td>Oral</td>
<td>85 (76.6%)</td>
<td>26 (23.4%)</td>
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<tr>
<td><strong>Duration of administration</strong></td>
<td></td>
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<tr>
<td>5</td>
<td>86 (78.9%)</td>
<td>23 (21.1%)</td>
<td>0.01</td>
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<tr>
<td>7</td>
<td>78 (82.1%)</td>
<td>17 (17.9%)</td>
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<tr>
<td>14</td>
<td>6 (54.6%)</td>
<td>5 (45.5%)</td>
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<tr>
<td><strong>eGFR</strong></td>
<td>844</td>
<td>477</td>
<td>&lt;0.01</td>
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<tr>
<td>(ml/min/1.73 m2)</td>
<td>(519, 1162)</td>
<td>(240, 926)</td>
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**Weight recorded**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dose not appropriate</th>
<th>Dose appropriate</th>
<th>P</th>
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<tr>
<td>Weight recorded</td>
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<td>Yes</td>
<td>229 (74.1%)</td>
<td>80 (25.9%)</td>
<td>0.10</td>
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<tr>
<td>No</td>
<td>45 (64.3%)</td>
<td>25 (35.7%)</td>
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<tr>
<td><strong>Cause of CKD</strong></td>
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</tr>
<tr>
<td>Diabetes</td>
<td>24 (61.5%)</td>
<td>15 (38.5%)</td>
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<tr>
<td>Diabetes,^BP</td>
<td>36 (69.2%)</td>
<td>16 (30.8%)</td>
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<tr>
<td>BP</td>
<td>29 (67.4%)</td>
<td>14 (32.6%)</td>
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<tr>
<td>^PGD</td>
<td>64 (82.1%)</td>
<td>14 (18.0%)</td>
<td>0.27</td>
</tr>
<tr>
<td>^HIVAN</td>
<td>27 (73.0%)</td>
<td>10 (27.0%)</td>
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</tr>
<tr>
<td>^OU</td>
<td>43 (75.4%)</td>
<td>14 (24.6%)</td>
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<tr>
<td>Drug induced</td>
<td>1 (50.0%)</td>
<td>1 (50.0%)</td>
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<tr>
<td>Other</td>
<td>3 (100%)</td>
<td>0 (0.0%)</td>
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<tr>
<td>Unknown</td>
<td>85 (76.6%)</td>
<td>26 (23.4%)</td>
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<tr>
<td><strong>Frequency of drug administration</strong> (times daily)</td>
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<tr>
<td>Once</td>
<td>12 (60%)</td>
<td>8 (40%)</td>
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</tr>
<tr>
<td>Twice</td>
<td>120 (75%)</td>
<td>40 (25%)</td>
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</tr>
<tr>
<td>Thrice</td>
<td>117 (88%)</td>
<td>16 (12.0%)</td>
<td>&lt;0.01</td>
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<td>&gt; 4 times</td>
<td>19 (52.8%)</td>
<td>17 (47.2%)</td>
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<td><strong>Indication for antibiotic/Infection</strong></td>
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<tr>
<td>^RTI</td>
<td>53 (79.1%)</td>
<td>14 (20.9%)</td>
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<tr>
<td>Catheter site</td>
<td>5 (62.5%)</td>
<td>3 (37.5%)</td>
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<tr>
<td>Sepsis</td>
<td>31 (64.6%)</td>
<td>17 (35.4%)</td>
<td></td>
</tr>
<tr>
<td>^UTI</td>
<td>24 (70.6%)</td>
<td>10 (29.4%)</td>
<td></td>
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<tr>
<td>Gastroenteritis</td>
<td>19 (67.9%)</td>
<td>9 (32.1%)</td>
<td>0.63</td>
</tr>
<tr>
<td>Prophylaxis</td>
<td>4 (100%)</td>
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<tr>
<td>Bone, soft tissue</td>
<td>2 (66.7%)</td>
<td>1 (33.3%)</td>
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</tr>
<tr>
<td><strong>Co-morbidity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>91 (74.6%)</td>
<td>31 (25.4%)</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>50 (70.4%)</td>
<td>21 (29.6%)</td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td>86 (73.5%)</td>
<td>31 (26.5%)</td>
<td></td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>20 (69.0%)</td>
<td>9 (31.0%)</td>
<td></td>
</tr>
<tr>
<td>Heart disease</td>
<td>3 (37.5%)</td>
<td>5 (62.5%)</td>
<td>0.20</td>
</tr>
<tr>
<td>^BP</td>
<td>15 (83.3%)</td>
<td>3 (16.7%)</td>
<td></td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>1 (33.3%)</td>
<td>2 (66.7%)</td>
<td></td>
</tr>
<tr>
<td>Cervical cancer</td>
<td>1 (33.3%)</td>
<td>2 (66.7%)</td>
<td></td>
</tr>
<tr>
<td>Breast cancer</td>
<td>1 (100%)</td>
<td>0 (0%)</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>6 (85.7%)</td>
<td>1 (27.7%)</td>
<td></td>
</tr>
</tbody>
</table>

^Median (IQR), n, ^BP-Hypertension, ^PGD-Primary Glomerular Disease, ^HIVAN-HIV Associated Nephropathy, ^OU-Obstructive Uropathy, ^RTI-Respiratory Tract Infection, ^UTI-Urinary Tract Infection, ^BP-Benign Prostate Hypertrophy, ^GFR-estimated glomerular filtration rate

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Table 5: Multivariable analysis of determinants of appropriate antibiotic dose administration in patients with chronic kidney disease

<table>
<thead>
<tr>
<th>Variable</th>
<th>Crude OR [95% CI]</th>
<th>P value</th>
<th>Adjusted OR [95% CI]</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age below 45 years</td>
<td>0.689 [0.436, 1.090]</td>
<td>0.11</td>
<td>0.422 [0.198, 0.898]</td>
<td>0.03</td>
</tr>
<tr>
<td>Stage of CKD</td>
<td>0.255 [0.166, 0.392]</td>
<td>&lt;0.001</td>
<td>0.159 [0.082, 0.309]</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Patient on dialysis</td>
<td>0.522 [0.330, 0.826]</td>
<td>0.01</td>
<td>0.458 [0.192, 1.090]</td>
<td>0.08</td>
</tr>
<tr>
<td>Route of administration</td>
<td>0.732 [0.439, 1.221]</td>
<td>0.23</td>
<td>1.685 [0.489, 5.811]</td>
<td>0.41</td>
</tr>
<tr>
<td>Frequency of drug administration</td>
<td>1.519 [1.308, 1.765]</td>
<td>&lt;0.001</td>
<td>1.724 [1.185, 2.508]</td>
<td>0.004</td>
</tr>
<tr>
<td>Duration of administration (days)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not written in the prescription</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>1 to 4</td>
<td>0.806 [0.260, 2.498]</td>
<td>0.71</td>
<td>0.563 [0.104, 3.046]</td>
<td>0.51</td>
</tr>
<tr>
<td>5</td>
<td>0.431 [0.241, 0.772]</td>
<td>0.01</td>
<td>0.377 [0.104, 3.046]</td>
<td>0.03</td>
</tr>
<tr>
<td>7</td>
<td>0.351 [0.186, 0.663]</td>
<td>0.001</td>
<td>0.262 [0.099, 0.692]</td>
<td>0.01</td>
</tr>
<tr>
<td>9 to 12</td>
<td>0.230 [0.050, 1.057]</td>
<td>0.06</td>
<td>0.153 [0.027, 0.861]</td>
<td>0.03</td>
</tr>
<tr>
<td>14</td>
<td>1.343 [0.389, 4.639]</td>
<td>0.64</td>
<td>1.927 [0.313, 11.755]</td>
<td>0.48</td>
</tr>
<tr>
<td>≥ 15 days</td>
<td>6.449 [0.700, 59.377]</td>
<td>0.10</td>
<td>1.030 [0.81, 13.167]</td>
<td>0.98</td>
</tr>
<tr>
<td>Type of Antibiotic</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Benzylpenicillin</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Vancomycin</td>
<td>2.423 [0.908, 6.490]</td>
<td>0.08</td>
<td>1.589 [0.245, 10.294]</td>
<td>0.63</td>
</tr>
<tr>
<td>Norfloxacin</td>
<td>0.452 [0.101, 2.024]</td>
<td>0.30</td>
<td>0.876 [0.066, 11.700]</td>
<td>0.92</td>
</tr>
<tr>
<td>Amoxycillin/clavulanic acid</td>
<td>0.098 [0.040, 0.240]</td>
<td>&lt;0.001</td>
<td>0.101 [0.024, 0.420]</td>
<td>0.002</td>
</tr>
<tr>
<td>Amoxycillin</td>
<td>0.528 [0.086, 3.283]</td>
<td>0.49</td>
<td>0.284 [0.008, 10.485]</td>
<td>0.49</td>
</tr>
<tr>
<td>Ceftazidime</td>
<td>0.576 [0.176, 1.883]</td>
<td>0.36</td>
<td>4.850 [0.859, 27.386]</td>
<td>0.07</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>0.274 [0.096, 0.784]</td>
<td>0.02</td>
<td>0.504 [0.123, 2.063]</td>
<td>0.34</td>
</tr>
<tr>
<td>Gentamycin</td>
<td>0.633 [0.132, 3.044]</td>
<td>0.57</td>
<td>3.157 [0.382, 26.100]</td>
<td>0.29</td>
</tr>
<tr>
<td>Amikacin</td>
<td>0.352 [0.033, 3.701]</td>
<td>0.38</td>
<td>0.198 [0.010, 3.850]</td>
<td>0.29</td>
</tr>
<tr>
<td>Metronidazole</td>
<td>0.640 [0.273, 1.498]</td>
<td>0.30</td>
<td>3.005 [0.600, 15.035]</td>
<td>0.18</td>
</tr>
<tr>
<td>Clarithromycin</td>
<td>0.440 [0.129, 1.499]</td>
<td>0.19</td>
<td>0.979 [0.124, 7.764]</td>
<td>0.98</td>
</tr>
<tr>
<td>Meropenem</td>
<td>0.352 [0.082, 1.512]</td>
<td>0.16</td>
<td>2.200 [0.338, 14.302]</td>
<td>0.41</td>
</tr>
<tr>
<td>Imipenem/cilastatin</td>
<td>0.704 [0.105, 4.713]</td>
<td>0.72</td>
<td>5.567 [0.438, 70.760]</td>
<td>0.19</td>
</tr>
<tr>
<td>Co-morbidities</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>No co-morbidity</td>
<td>-</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.233 [0.642, 2.368]</td>
<td>0.53</td>
<td>0.868 [0.311, 2.421a]</td>
<td>0.79</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.058 [0.593, 1.887]</td>
<td>0.85</td>
<td>1.026 [0.430, 2.445]</td>
<td>0.95</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>1.321 [0.545, 3.204]</td>
<td>0.54</td>
<td>0.961 [0.248, 3.723]</td>
<td>0.95</td>
</tr>
<tr>
<td>Heart disease</td>
<td>4.892 [1.105, 21.671]</td>
<td>0.04</td>
<td>12.718 [1.867, 86.629]</td>
<td>0.01</td>
</tr>
<tr>
<td>BPH</td>
<td>0.587 [0.159, 2.165]</td>
<td>0.42</td>
<td>0.073 [0.009, 0.609]</td>
<td>0.02</td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>5.871 [0.514, 67.01]</td>
<td>0.15</td>
<td>1.486 [0.076, 29.17]</td>
<td>0.79</td>
</tr>
<tr>
<td>Cervical cancer</td>
<td>5.871 [0.514, 67.01]</td>
<td>0.15</td>
<td>12.151 [0.313, 471.0]</td>
<td>0.18</td>
</tr>
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</table>