An Investigation into Antimicrobial Prescribing and Usage Patterns in the Johannesburg Metro District, Gauteng Province

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Introduction / Background

There was a time when mankind had few, if any, options in the fight against illness. However when Sir Alexander Fleming made a discovery of the powers of Penicillium mould in destroying one of his experimental cultures in 1929,¹ there seemed to be hope on the horizon. At last there was something that could be used in the fight against disease and what was once deemed incurable could now be treated effectively, thus saving numerous lives. Since the early days of penicillin there have been many subsequent innovations in antibacterial chemotherapy, resulting in a large variety of antibiotics becoming available. Over time, though, the basket of weapons against disease has become depleted and weakened because of the development of antibiotic-resistance. This phenomenon occurs when bacteria change in response to the use of these medicines.² This makes it more difficult to treat infections and often leads to extended hospital stays, greater medical costs and increased mortality.² Antibiotic resistance occurs naturally, but the misuse of antibiotics in humans and animals is hastening the process.²

South Africa is not spared from this global scourge that is antibiotics resistance, with 2011-2014 country data showing that 20-39% of Staphylococcus aureus isolates were methicillin resistant (MRSA), 10-19% of Escherichia coli isolates were extended spectrum beta lactamase producing and 2.1-5.9% of Klebsiella pneumonia isolates were carbapenem-resistant.³

The Johannesburg Metro Health District decided to carry out an investigation into antibiotic prescribing patterns within the district, as part of anti-microbial stewardship activities.

Aim

The purpose of the study was to investigate the antibiotic prescribing and usage patterns within the district.

Impact/Significance of the study

By offering an insight into the prescribing patterns within the district, this study could highlight areas of improvement that could be focused on in order to augment the appropriate use of antibiotics.

Literature Review

It is undoubted that the prevalence of antibiotic resistance is on the rise. Consumption data per capita for 2010 showed that in South Africa 60-90 standard units of antibiotics were consumed per person.³ The United Kingdom and the United States of America had a consumption of 45-60 standard units per person.³ The key factors driving antibiotic resistance are increased antibiotic usage in both human and animal medicine, greater movement of people and increased industrialization.⁴

According to Hawkey and Jones,⁴ if the total outpatient antibiotic consumption in different countries is correlated with the rate of penicillin-resistant Streptococcus pneumoniae (PRSP), then a direct correlation is seen. This reinforces the picture of the consequences of increased consumption of antibiotics. Antibiotic resistance is a global challenge affecting both developed and developing nations. The speed at which resistance is now developing is frightening, for example:³

- erythromycin was introduced into the market in 1953 and the first case of resistance was reported in 1967;
- imipenem was introduced into the market in 1985 and the first case of resistance was reported in 1998;
- levofloxacin was introduced into the market in 1996 and the first case of resistance was reported in 1996; but
- linezolid was introduced into the market in 2000 and the first case of resistance was reported in 2001.

According to Phipps,¹ whilst some scientists recognized the potential for misuse of antibiotics very soon after their discovery, this understanding has taken time to filter down to medical practitioners and the general public. This is a potential reason behind the high consumption of antibiotics.

Study Methodology

A quantitative study was carried out between February and May 2017 amongst 6 community health centres (CHCs) across the district. A checklist was developed to assess the following criteria in prescriptions for amoxicillin and co-amoxiclav:

- Correct dosage of medicine
- Correct dose frequency
- Correct duration of treatment
- Route of administration stated on prescription
- Indication/diagnosis stated on prescription

These antibiotics were chosen because they are commonly used in the Primary Health Care (PHC) setting. The criteria were selected as they...
form part of a checklist for optimal antibiotic prescribing, found in the Hospital Level Adult Guidelines in the National Department of Health (NDoH) Essential Medicines List (EML) mobile application. The data was collected retrospectively. The study was carried out in three phases:

Examples of some of the interventions included the following:

- Patient information talks on safe antibiotic use
- Presentations to prescribers on antimicrobial stewardship
- Internal memos stating that all antibiotic scripts had to have an indication/diagnosis
- Reinforcement of the usage of the Standard Treatment Guidelines (STGs) and the Essential Medicine List (EML) during the consultation and prescribing processes

### Results

During the first phase of the study where baseline data was collected, there were 75 prescriptions that did not have an indication/diagnosis written on them. The before-and-after results are shown in Tables 1 and 2 and depicted in Figure 1.

Before the interventions 68.6% of prescriptions had the correct dose indicated. Overdosing can lead to severe side effects. Lower doses are associated with increased risk of resistance. Only 69.8% of the prescriptions had the correct dose frequency. In the case of antibiotics this parameter is vital as sub-optimal doses can lead to the development of resistance. Only 65.2% of prescriptions had the correct duration of therapy. Longer duration of therapy is associated with an increased risk of antibiotic resistance. However, 72.0% of prescriptions showed the route of administration. Just over half (55.6%) of the prescriptions evaluated had the correct indication for use, where it was stated, but 75 (23.1% of the sample) did not show an indication/diagnosis.

After the interventions, 78.9% of the prescriptions had correct dose indicated, 81.5% had the correct dose frequency, 71.9% had the correct duration of therapy, 71.9% had the route of administration indicated, whilst 55.3% had the correct indication for use. This is disconcerting.

### Table 1. Summary of prescriptions collected before the interventions

<table>
<thead>
<tr>
<th></th>
<th>Correct dose indicated</th>
<th>Correct frequency</th>
<th>Duration of therapy correct</th>
<th>Route of admin. Indicated</th>
<th>Correct indication for use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes n (%)</td>
<td>223 (68.6)</td>
<td>227 (69.8)</td>
<td>212 (65.2)</td>
<td>234 (72.0)</td>
<td>139 (55.6)</td>
</tr>
<tr>
<td>No n (%)</td>
<td>102 (31.4)</td>
<td>98 (30.2)</td>
<td>113 (34.8)</td>
<td>91 (28.0)</td>
<td>111 (44.4)</td>
</tr>
<tr>
<td>Total</td>
<td>325 (100)</td>
<td>325 (100)</td>
<td>325 (100)</td>
<td>325 (100)</td>
<td>250 (100)</td>
</tr>
</tbody>
</table>

### Table 2. Summary of prescriptions collected after interventions

<table>
<thead>
<tr>
<th></th>
<th>Correct dose indicated</th>
<th>Correct frequency</th>
<th>Duration of therapy correct</th>
<th>Route of admin. Indicated</th>
<th>Correct indication for use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes n (%)</td>
<td>250 (78.9)</td>
<td>255 (81.5)</td>
<td>224 (71.6)</td>
<td>225 (71.9)</td>
<td>173 (55.3)</td>
</tr>
<tr>
<td>No n (%)</td>
<td>63 (16.1)</td>
<td>58 (18.5)</td>
<td>89 (28.4)</td>
<td>88 (28.1)</td>
<td>140 (44.7)</td>
</tr>
<tr>
<td>Total</td>
<td>313 (100)</td>
<td>313 (100)</td>
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</table>
because the decision to initiate antibiotics should be based on a proper evaluation of the patient to assess what type of infection they are suffering from and also what medication would be best suited to treat it. One of the more troubling cases was a patient being given an antibiotic for flatulence and a sore throat. The Standard Treatment Guidelines (STGs) are the guidance documents on which prescribers should rely to determine which medications should be prescribed, given a diagnosis.

Some of the challenges raised by prescribers were:

- Lack of availability of testing facilities to determine if the infection is bacterial or viral.
- The presence of comorbid conditions (e.g. patients with HIV and TB). They felt that on examination of the patient and the presence of the above conditions, there were cases where it was necessary for them to change dosages and duration of treatment in order for the patient to benefit.
- Patients pressuring them to prescribe antibiotics.

**Conclusion and Way Forward**

The interventions applied had some positive influence on the prescribing patterns, however continuing education needs to be pursued for both patients and prescribers. It is important to remember that the patient is a vital stakeholder in the fight against antimicrobial resistance. The establishment of Antimicrobial Stewardship Programs (ASP) would go a long way to improving rational use of antimicrobials. Antimicrobial Stewardship Committees at sub-district level and even facility level could offer a platform where various professionals could engage with each other to find a lasting solution. This is a multi-faceted problem that requires a multi-disciplinary approach.

**References**


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