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# Antibiotics for URTI and UTI

## Prescribing in Malaysian primary care settings

### Background

Overprescription of antibiotics is a continuing problem in primary care. This study aims to assess the antibiotic prescribing rates and antibiotic choices for upper respiratory tract infections (URTI) and urinary tract infections (UTI) in Malaysian primary care.

### Method

Antibiotic prescribing data for URTI and UTI was extracted from a morbidity survey of randomly selected primary care clinics in Malaysia.

### Results

Analysis was performed of 1163 URTI and 105 UTI encounters. Antibiotic prescribing rates for URTI and UTI were 33.8% and 57.1% respectively. Antibiotic prescribing rates were higher in private clinics compared to public clinics for URTI, but not for UTI. In URTI encounters, the majority of antibiotics prescribed were penicillins and macrolides, but penicillin V was notably underused. In UTI encounters, the antibiotics prescribed were predominantly penicillins or cotrimoxazole.

### Discussion

Greater effort is needed to bring about evidence based antibiotic prescribing in Malaysian primary care, especially for URTIs in private clinics.

**Keywords:** general practice, prescriptions, drug; upper respiratory tract infection; urinary tract infection; antibiotics, guideline; evidence based medicine

Antibiotic resistance is an emerging global health threat and is likely to have major economic impact.<sup>1</sup> The emergence of antibiotic resistance in bacteria is directly linked to selective pressure exerted by the overuse of antibiotics in healthcare settings.<sup>2</sup> Indiscriminate antibiotic prescribing is defined both by excessive prescribing and by prescribing an inappropriate antibiotic. In Malaysia, antibiotic prescribing for upper respiratory tract infections (URTI) in public and private primary care settings was reported several years ago.<sup>3,4</sup> The present study re-examines the antibiotic prescribing rates for URTI in primary care since the release of sore throat guidelines in 2003.<sup>5</sup> Furthermore, it extends to measuring prescribing rates for urinary tract infections (UTI) and aims to determine if the antibiotics chosen for these conditions are consistent with 2008 national antibiotic guidelines.<sup>6</sup>

### Method

This survey was part of the study: Evaluation of the Quality of Public and Private Primary Care in Malaysia. The primary care clinics included in this study were made up of 100 public and 114 private primary care clinics selected randomly from the Health Facility Registry of the Ministry of Health Malaysia<sup>7</sup> and the Malaysian Medical and Health Directory.<sup>8</sup> The doctors or administrators in charge of the selected public clinics were invited to a meeting for training on data collection, each of the private clinics was visited personally for the same purpose by one of the researchers after an appointment was made by a telephone calls. Consent to participate in this survey was obtained after the meetings. Systematic sampling of the patients was performed – 1:10 at public clinics and 1:5

at private clinics. The demographic and clinical data (ie. reasons for encounter, diagnoses, process of care) were recorded using data encounter forms between April and June 2008.

The information in the data encounter forms was entered into SPSS. The morbidity data (in text) were recoded using International Classification of Primary Care – Version 2 (ICPC-2).<sup>9</sup> Our operational definition of URTI and UTI ICPC-2 codes are shown in *Table 1*.

Ethics approval for this study was granted by the Research and Ethics Committee of the Ministry of Health of Malaysia and the Medical Research Ethics Committee of Universiti Kebangsaan Malaysia.

### Results

The total number of clinics that participated was 108 (response rate: 78% in public and 26.3% in private). The total data encounter forms returned were 4735, of which 3693 (78%) were from public clinics and 1042 (22%) were from private clinics. The number of doctors submitting data encounter forms were 213 from public clinics and 43 from private clinics.

### Demographic data of patients

A total of 1262 encounters were analysed, representing 1157 patients with URTI only (790 from public clinics, 367 from private clinics), 99 patients with UTI only (82 from public clinics, 17 from private clinics) and six patients with both URTI and UTI (five from public clinics, one from a private clinic). The demographic characteristics of patients are shown in *Table 2*. The proportion of children (age <12 years) with a URTI or a UTI was 35.5% and 7.8% respectively. The gender proportions were similar in URTI but females constituted about three-quarters in UTI. In both URTI and UTI there was a preponderance of patients with Chinese ethnicity in the private clinics.

**Table 1. ICPC codes included as URTI and UTI**

ICPC codes	Number
<b>URTI in this study</b>	
R05 (cough)	1341
R07 (sneezing)	
R21 (throat symptoms)	
R74 (acute URTI)	941
R76 (acute tonsillitis)	56
R77 (laryngitis, tracheitis)	3
R80 (influenza/flu)	83
<b>UTI in this study</b>	
U01 (dysuria)	51
U02 (urinary frequency/urgency)	49
U70 (upper UTI)	0
U71 (lower UTI)	69

### URTI antibiotic prescribing

Antibiotic prescribing rates for URTI was 33.8%; significantly higher at the private clinics compared to the public clinics (46.7% vs. 27.8%,  $\chi^2=40.3$ ;  $p<0.001$ ) (Figure 1). However, antibiotic prescribing rates were similar for children (age <12 years) and adults with URTI (32.0% vs. 34.6%,  $\chi^2=0.81$ ;  $p=0.37$ ). In the 394 URTI encounters where antibiotics were prescribed, the main antibiotics chosen were penicillins (47.7%) and macrolides (37.6%).

Antibiotic choices were numerous in both settings, but more so in the private clinics (10 different antibiotics were used in public clinics compared with 20 in private clinics). Penicillin V was prescribed in four patients only (Table 3), all from public clinics. Ten patients were given quinolones, all from private clinics.

### UTI antibiotic prescribing

Antibiotic prescribing rates for UTI was 57.1%; rates were not significantly different between the private and the public clinics (55.6% vs. 57.5%,  $\chi^2=0.02$ ;  $p=0.88$ ) (Figure 1). Antibiotic prescribing rates were similar for males and females with UTI (53.6% vs. 58.1%,  $\chi^2=0.17$ ;  $p=0.68$ ).

In the 60 UTI encounters where antibiotics were prescribed, the main antibiotics chosen were penicillins (40%) – mainly amoxicillin and bacampicillin in the public clinics – or cotrimoxazole (38.3%) (Table 4). The classes of antibiotic chosen in both settings was similar (seven types in public clinics, six in private clinics).

## Discussion

### Study limitations

The low response rate from private primary care clinics means the study findings may not be generalisable to clinics in this setting. The operational definitions of URTI and UTI that we used in this study were intentionally broad, because diagnoses were not necessarily accurately recorded in the data encounter form. The definition of URTI would have captured almost all ‘true’ URTI but may have included some patients presenting with undifferentiated cough or runny nose that may have turned out not to be a URTI. Similarly, the definition of UTI would include all ‘true’ UTI but may have inadvertently included some patients with other diagnoses, such as benign prostatic hypertrophy (thus explaining the relatively high proportion of patients aged  $\geq 51$  years in the public clinics). We are unable to verify the

**Table 2. Demographic characteristics of patients with URTI and UTI**

Age group (years)	URTI (%)			UTI (%)		
	Public	Private	Both	Public	Private	Both
$\leq 10$	274 (35.2)	101 (27.7)	375 (32.4)	5 (6)	2 (11.1)	7 (6.9)
11–20	117 (15.0)	36 (9.9)	153 (13.4)	9 (10.7)	4 (22.2)	13 (12.7)
21–30	114 (14.7)	66 (18.1)	180 (15.8)	16 (19)	9 (50)	25 (24.5)
31–40	88 (11.3)	81 (22.3)	169 (14.8)	14 (16.7)	1 (5.6)	15 (14.7)
41–50	66 (8.5)	36 (9.9)	102 (8.9)	15 (17.9)	1 (5.6)	16 (15.7)
$\geq 51$	119 (15.3)	44 (12.1)	163 (14.3)	25 (29.8)	1 (5.6)	26 (25.5)
Subtotal	778 (100)	364 (100)	1142 (100)	84 (100)	18 (100)	102 (100)
	$\chi^2=33.4$ $p<0.001$			$\chi^2=13.4$ $p=0.016$		
<b>Gender</b>						
Male	390 (50.2)	207 (57.0)	597 (52.4)	21 (25.0)	7 (38.9)	28 (27.5)
Female	387 (49.8)	156 (43.0)	543 (47.6)	63 (75.0)	11 (61.1)	74 (72.5)
Subtotal	777 (100)	363 (100)	1140 (100)	84 (100)	18 (100)	102 (100)
	$\chi^2=4.63$ $p=0.03$			$\chi^2=1.44$ $p=0.23$		
<b>Ethnicity</b>						
Malay	476 (62.6)	172 (47.8)	658 (57.9)	53 (63.9)	9 (50.0)	62 (61.4)
Chinese	100 (13.2)	133 (36.9)	233 (20.8)	13 (15.7)	8 (44.4)	21 (20.8)
Indian	157 (20.7)	32 (8.9)	189 (16.9)	12 (14.5)	1 (5.6)	13 (12.9)
Others	27 (3.6)	23 (6.4)	50 (4.5)	5 (6.0)	0	5 (5.0)
Subtotal	760 (100)	360 (100)	1120 (100)	83 (100)	18 (100)	101 (100)
	$\chi^2=100.2$ $p<0.001$			$\chi^2=8.35$ $p=0.04$		

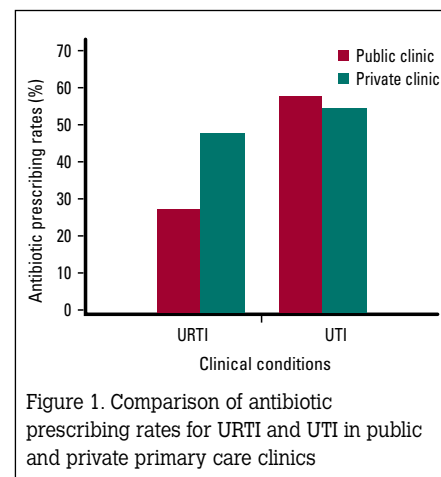


Figure 1. Comparison of antibiotic prescribing rates for URTI and UTI in public and private primary care clinics

**Table 3. Antibiotic choices for URTI in public and private primary care clinics**

Antibiotics	Antibiotic choices for URTI		
	Public n=222	Private n=173*	Both n=395* (%)
• Cotrimoxazole	1	2	3 (0.8)
• Cephalosporins	11	30	41 (10.4)
– cefaclor	0	1	1
– cephadroxil	0	1	1
– cephalexin	11	19	30
– cephalosporin (unspecified)	0	9	9
• Macrolides	102	45	148 (37.6)
– azithromycin	0	3	3
– clarithromycin	0	15	15
– erythromycin	102	21	123
– roxithromycin	0	6	6
• Penicillins	105	78	183 (46.4)
– amoxicillin	62	60	122
– ampicillin	20	0	20
– ampicillin-sulbactam	0	2	2
– co-amoxiclav	1	15	16
– bacampicillin	7	0	7
– cloxacillin	11	1	12
– penicillin V	4	0	4
• Quinolones	0	10	10 (2.5)
– ciprofloxacin	0	5	5
– norfloxacin	0	1	1
– ofloxacin	0	4	4
• Tetracyclines	3	7	10 (2.5)
– doxycycline	3	5	8
– tetracycline	0	2	2
• Others	0	1	1 (0.3)
– metronidazole	0	1	1

\* Two patients were prescribed two antibiotics (one patient was given clarithromycin and cephalosporin, another was given erythromycin and cloxacillin)

**Table 4. Antibiotic choices for UTI in public and private primary care clinics**

Antibiotics	Antibiotic choices for UTI*		
	Public n=50	Private n=10	Both n=60 (%)
• Cotrimoxazole	19	4	23 (38.3)
• Cephalosporins	6	2	8 (13.3)
– cefuroxime	2	1	3
– cephalexin	4	1	5
• Macrolides	2	0	2 (3.3)
– erythromycin	2	0	2
• Penicillins	22	2	24 (40)
– amoxicillin	11	2	13
– bacampicillin	11	0	11
• Quinolones	0	1	1 (1.7)
– ciprofloxacin	0	1	1
• Tetracyclines	1	1	2 (3.3)
– doxycycline	1	1	2

\* There were no prescriptions for trimethoprim

diagnoses of URTI and UTI in this study due to the method of data collection and the infrequent use of microbiological culture in the primary care clinics. This limits the interpretation of the appropriateness or otherwise of the antibiotic prescribing practices that have been observed.

### URT antibiotic prescribing

The antibiotic prescribing rates for URTI in this study were 46.7% and 27.8% in private and public primary care clinics respectively. As URTI are primarily viral (bacterial aetiology in unselected URTI cases was 2.4%;<sup>10</sup> pharyngitis was 14%<sup>11</sup>), these antibiotic prescribing rates are far too high. The antibiotic prescribing rate for URTI in the public clinics in this study was similar to a smaller survey of seven public primary care clinics in Seremban (28.7%),<sup>3</sup> conducted in May to June 2000, before the release of sore throat guidelines<sup>5</sup> in 2003. The URTI antibiotic prescribing rates from the public primary care clinics suggest the sore throat guideline may have failed to reduce antibiotic prescribing in this setting. In the present study, the antibiotic prescribing rate for URTI in private clinics was found to be somewhat lower than a large survey of adult attendees from 150 private general practice clinics in three urban areas in Malaysia (68.4%).<sup>4</sup> It is possible that the antibiotic prescribing rate for URTI in the private clinics in the present study is underestimated, possibly due to the low response rate. In line with a previous study,<sup>3</sup> the doctors in the present study tended to rely on broad spectrum antibiotics, instead of penicillin V, a narrow spectrum antibiotic recommended in the Malaysian National Antibiotic Guideline<sup>6</sup> and other authoritative guidelines.<sup>12</sup>

### UTI antibiotic prescribing

In this study, the antibiotic prescribing rate for UTI was 57.1%, with no significant difference between public and private clinics. This lower than expected rate may be due to the definition of UTI in this study, which includes patients coded with UTI symptoms such as dysuria but not UTI diagnosis. Antibiotic prescribing for patients with the diagnosis UTI recorded by the doctors was 70.3%, while antibiotic prescribing for the remainder of the patients with UTI-like symptoms was 25.8%. Over one-third of the antibiotics

**Table 5. Antibiotic recommendation in the Malaysian Antibiotic Guideline 2008**

Clinical problem	Preferred choice	Alternative choice
Upper respiratory tract infection (acute tonsillitis and acute pharyngitis)	Penicillin V or erythromycin (in penicillin-allergic patients)	
Acute uncomplicated urinary tract infection	Trimethoprim	Cefuroxime or nitrofurantoin or cotrimoxazole

prescribed were cotrimoxazole, however, no prescribing of trimethoprim was observed, despite the latter antibiotic being recommended as the first antibiotic of choice for UTI in Malaysian antibiotic guidelines<sup>6</sup> (Table 5). A further 40% of the antibiotics prescribed were amoxicillin and bacampicillin (a prodrug of ampicillin which has better oral availability than ampicillin and is fairly close to amoxicillin in its pharmacological action). Amoxicillin and bacampicillin have been removed from the Malaysian antibiotic guidelines due to the high prevalence of antibiotic resistance reported in two surveys from general practice.<sup>13,14</sup> There may be important differences between the public and private clinics in terms of their antibiotic choices for UTI, however, this study has too few patients to allow an accurate comparison.

### Changing antibiotic prescribing behaviour

This study was conducted just before the introduction of the Malaysian antibiotic guidelines,<sup>6</sup> and has demonstrated excessive antibiotic prescribing practices for URTI, and antibiotic choices for both URTI and UTI that are not consistent with the guidelines (though only the 2003 sore throat guidelines<sup>5</sup> had been released at that time, the UTI and URTI guidelines<sup>6</sup> were yet to be released). The problem demonstrated in this study is not unique to Malaysia. Studies from European countries have shown the same problem,<sup>15</sup> with Dutch general practitioners being a notable exception (showing that judicious prescribing and guideline adherence is possible).<sup>16</sup> The excessive use of newer second line antibiotics (eg. quinolones) for UTI in Hong Kong has been shown to promote the emergence of resistant strains of *Escherichia coli* to this antibiotic.<sup>17</sup> Studies from Europe have shown that reducing antibiotic prescribing at the clinic level can lead to a significant reduction in the prevalence of antibiotic resistance in the community.<sup>18,19</sup>

It is unlikely that passive dissemination of antibiotic guidelines, as is the practice in Malaysia, will lead to positive changes in the prescribing behaviour of primary care doctors. Policy makers, healthcare managers and researchers need to gain a better understanding of the pseudomedical and nonmedical reasons that influence primary care doctors to prescribe antibiotics.<sup>20–22</sup> Among these reasons are antibiotics being viewed as a ‘magic bullet’ for all infections irrespective of aetiology; the belief that antibiotics can prevent secondary bacterial infection in URTI; the misconception that broad spectrum antibiotics are more efficacious than narrow spectrum antibiotics (eg. penicillin V); and a lack of confidence of primary care doctors in explaining that URTI is self limiting.

Judicious antibiotic prescribing needs to be emphasised as an issue in continuing education, with specific focus on better communication skills to deal with patient expectations for antibiotics, and on improving the ability of doctors to provide appropriate advice to patients given the time constraints of primary care, particularly in private clinics. A systematic review<sup>23</sup> has recommended the use of multifaceted interventions to improve antibiotic prescribing that include strategies such as:

- interactive educational meetings
- educational outreach visits
- physician reminders
- use of delayed prescriptions by physicians
- financial and healthcare system changes
- (in combination with) more efficient but less effective intervention such as printed educational materials and clinical audits.

### Conclusion

This study confirmed high antibiotic prescribing rates for URTI and inappropriate antibiotic choices for both URTI and UTI in the Malaysian primary care settings.

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Conflict of interest: none declared.

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