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Title page

General practitioners' knowledge, attitude and prescribing of antibiotics for upper respiratory tract infections in Selangor, Malaysia: findings and implications

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Abstract

Background: Antibiotics are widely prescribed especially for URTIs. Their irrational use can increase costs and resistance. **Aim:** Assess knowledge, attitude and prescribing of antibiotics for URTIs in, Selangor, Malaysia using a cross-sectional survey among GPs working in private clinics in 2011. **Results:** 139 physicians completed the questionnaire (response rate = 34.8%). 49.6% (n=69) agreed antibiotics are helpful in treating URTIs, with most GPs agreeing antibiotics may reduce URTI duration and complications. The majority of GPs reported they felt patients expected antibiotics, with 36.7% (n=51) agreeing patients would change doctors if they did not prescribe antibiotics and 21.6% (n=30) agreeing when requested they prescribe antibiotics even if they believe them unnecessary. When assessed against six criteria, most GPs had a moderate level of knowledge of prescribing for URTIs. However, antibiotic prescriptions could be appreciably reduced. **Conclusion:** Further programmes are needed to educate GPs and patients about antibiotics building on current initiatives.

Keywords: Antibiotics, irrational use of medicines; respiratory tract infections; physicians; patients; education programmes, Malaysia

Introduction

Antibiotics are perceived as safe medicines that can alleviate the symptoms of infection, and are commonly prescribed to patients in ambulatory care (1-6), augmented by their low cost and easy accessibility despite concerns (7-10). However inappropriate use can lead to resistance development as well as additional costs, with a clear link between antimicrobial resistance and the consumption of antibiotics (7, 11-15). Increasing antibiotic resistance is a growing concern decreasing physicians' abilities to treat infections due to the lack of therapeutic options. In Asia including Malaysia, the extent of antibiotic resistance is already high (16-18). E.g. in Malaysia, the National Surveillance on Antibiotic Resistance in 2010 reported an increase in antibiotic resistance among common strains of bacteria such as *Staphylococcus aureus*, *Acinebacter* and *Haemophilus influenza* (19). This needs to be urgently addressed,

We are aware in ambulatory care that the inappropriate use of antibiotics is common, especially for upper respiratory tract infections (URTIs), as most antibiotic prescriptions in this setting are for URTIs (7, 20). URTIs are defined as 'a diagnosis of an acute infection that is typically viral in origin and in which sinus, pharyngeal and lower airway symptoms, although frequently present, are not prominent' (21). However, URTIs can result from bacterial infection, albeit less frequently. Antibiotic prescribing for URTIs is common in Malaysia, e.g. physicians prescribe antibiotics for more than 60% of URTIs (22, 23) and up to 90% in some clinics (24). The Malaysian Statistics on Medicine for 2008 reported that antibiotics were the most commonly prescribed anti-infectives, with a defined daily dose (DDD) of 9.72 per 1000 population per day (DID) including both public and private sectors (25). There was greater prescribing of antibiotics in the private sector at nearly twice the rate seen in the public sector when adjusted for population sizes (25). In Malaysia, healthcare is provided via a dual system - public and private - in which the public sector is predominant: about 80% of inpatient care is provided by the public sector along with 35% of ambulatory care (26-28). The private sector provides the remainder of inpatient care and over 60% of ambulatory care, principally in urban areas (29, 30). Consequently, the private sector plays an

important role in Malaysian healthcare system especially in ambulatory care to improve the rational use of antibiotics (26). Community pharmacists also play a role since antibiotics are sometimes dispensed by them without a prescription despite antibiotics being prescription only medicines.

It is crucial to address the irrational prescribing of antibiotics as this can enhance resistance development. Inadequate knowledge regarding resistance patterns in local settings might also contribute to this (31). Consequently, understanding physicians' views and their knowledge regarding antibiotic resistance is essential to plan measures to address prescribing concerns (31). To date, few studies have been performed in Malaysia on antibiotic prescription patterns in ambulatory care. In addition, private GPs' knowledge, attitudes and antibiotic prescribing practices for patients with URTIs has yet to be explored. This is imperative given the extent of private GPs in ambulatory care in Malaysia, concerns with rising antibiotic resistance patterns as well as the appreciably greater prescribing of antibiotics in private versus public sectors. Consequently the objectives of the study are firstly to assess the knowledge of private general practitioners regarding antibiotic prescribing for URTIs and to evaluate their attitudes and prescribing practices for patients URTIs. Subsequently, use the findings to provide guidance to the authorities and others in Malaysia regarding potential future activities that could be undertaken to enhance the rational use of antibiotics.

Methodology

Study Design

This is a cross-sectional postal survey using a self-administered questionnaire mailed to GPs practising in private clinics in the state of Selangor. In Malaysia, the GPs are visited by patients from all socio-economic classes and ages with different medical conditions. The study was conducted in March 2011.

Development of Questionnaire

The questionnaire was based on the work of Cho et al. (2004) (32). The original questionnaire focused on knowledge and beliefs about antibiotic resistance, antibiotic prescriptions for the paediatric common colds, and the reasons for antibiotic prescriptions, targeting both healthcare professionals (physicians and pharmacists) and parents regarding the use of antibiotics. Other items were added and the questionnaire was modified to the Malaysian setting. The first draft of the questionnaire was reviewed by a panel of four professionals and academics, all of whom had considerable expertise in survey research and quantitative studies. The questionnaire was also reviewed by three practising GPs from the target population. The questionnaire was subsequently revised and modified following the feedback. After this, a pilot study was carried out to ensure the questionnaire was workable in practice settings and acceptable to the participants. In addition, the questionnaire could gather reliable and valid data effectively and efficiently (33). The pilot study was conducted with 21 GPs in 21 different clinics located outside the designated study area.

The final questionnaire consisted of three sections. The first section contained the demographic data and characteristics of the physician participants. The second section contained 12 statements designed to assess the knowledge, beliefs and attitudes of the GPs regarding antibiotic resistance and antibiotic prescribing for the treatment of URTIs. This section used a four-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = agree and 4 = strongly agree). The scale had an even number of intervals and no middle point, and was

chosen to avoid non-committal responses. This type of scale requires the respondents to give either a positive or a negative view, as described by Smith (33). The third section of the questionnaire aimed to assess antibiotic prescribing practices of the general practitioners. This section evaluated the frequency of prescribing antibiotics for five URTI conditions (bronchitis, runny nose with yellow or green mucus, sore throat, a cold and otitis media). This section required the GPs to rate the frequency of their antibiotic prescribing for these conditions from a list comprising 'never', 'almost never', 'sometimes', 'always' or 'almost always'.

Study Population, Setting and Sampling Technique

The total number of all general practitioner clinics located in Selangor, Malaysia and listed by the Private Medical Practice Control Department, Medical Practice Division, Ministry of Health Malaysia (2009) was 1430. The sample size was calculated with Raosoft web (34), which is a web-based calculator. A confidence interval of 95% and error margin of 5% were chosen, and a prevalence of 50% was also chosen to provide a more conservative sample. The required sample size was subsequently calculated at 303. The sample size was increased by 30% to account for the non-response rate. Hence, the total sample included in the study was 400 GPs working in private clinics. The clinics were chosen from the Ministry of Health list by simple random sampling on a computerized system.

Data Collection Procedure

A set of questionnaires together with an invitation letter and a pre-paid return envelope were sent by post to the randomly selected clinics. Three weeks after the first mailing, a second mailing was sent. The second mailing was intended for the clinics that had not replied to the survey and had been identified by the ID given in the first mailing. In this second mailing, a reminder letter was given, in addition to the same set of questionnaires, invitation letter and a pre-paid return envelope. The GPs who returned complete questionnaires were included in the study. The study ethical approval was granted by the Discipline of Social and Administrative Pharmacy academics during their departmental meeting in December 2010 (approval number 004/3).

Data Analysis

Data were analysed with the Statistical Package for the Social Sciences (SPSS) version 16.0 for Windows. The data were analyzed by means of descriptive and inferential statistics. For continuous data, the mean with confidence interval (CI) was used. For categorical data, frequency and percentages were reported. The Chi-square test was used to identify the association between the demographic data and the responses of knowledge and belief statements. The Chi-square test was also chosen to analyse the association because the observations were nominal and ordinal data (35). For items expected to have small frequencies, defined as fewer than two, or if more than 20% of the expected frequencies were fewer than five, the alternative procedure, Fisher's exact test, was used. This prevents the false inflation of Chi square value when there is a small expected frequency in the denominator (35).

Results

a) Response Rates

The response rate after the first mailing was 10% (n=40). After the second mailing (i.e. the reminder), 102 responses were received. Out of the total 142 responses received, 139 were valid and completed questionnaires. Hence, the effective response rate was 34.8%.

b) Demographic Characteristics of Respondents

The majority of the respondents (n=82, 59%) were male. Almost half of the respondents (n=68, 48.9 %) were Malay, and the majority of the respondents had graduated in Malaysia (n=69, 49.6%) or India (n=51, 26.6%) (Table 1). A high proportion of the respondents (n=115, 82.7%) did not have any specialization or postgraduate degree. The demographic characteristics of all participant physicians are summarized in Table 1.

Table 1: Demographic characteristics of the GP respondents (n=139)

Characteristics	(Frequency)	Percentage (%)
Gender		
Male	82	59
Female	57	41
Race		
Malay	68	48.9
Indian	37	26.6
Chinese	25	18.0
Others	9	6.5
Country of graduation		
Malaysia	69	49.6
India	51	36.7
Indonesia	3	2.2
United Kingdom	3	2.2
Australia	2	1.4
Others	11	7.9
Specialty		
Yes	24	17.3
No	115	82.7
Years of Practice		
<10 years	13	9.4
10-20 years	62	44.6
21-30 years	38	27.3
>30 years	26	18.7
Number of GPs in the clinic		
One	81	58.3
Two	37	26.2
Three	10	7.2
> Four	11	7.9
Average number of patients visiting the clinic/ day		
<30 patients	43	30.9
30-60 patients	72	51.8
>60 patients	24	17.3

Average number of URTI patients visiting the clinic every day		
<15 patients	56	40.3
15-30 patients	64	46.0
>30 patients	19	13.7

c) Knowledge of the General Practitioners

As mentioned, there were six statements assessing GPs' knowledge regarding antibiotic resistance and the prescribing of antibiotics for treating URTIs, with the respondents who answered 'strongly agree' and 'agree' grouped as having 'agreed'. The responses 'disagree' and 'strongly disagree' were collapsed into one group called 'disagree'. The majority of the respondents (n=124, 89.2%) agreed that antibiotic resistance was problematic in Malaysia (Table 2). A similar number of GPs agreed that antibiotic prescribing in ambulatory care can contribute to antibiotic resistance. The results are summarized in Table 2.

Table 2: Responses to the knowledge statements of the prescribing of antibiotics for the management of URTIs

Statement	Agreement level		P value (χ^2 test/ Fisher's exact test)		
	Agree n (%)	Disagree n (%)	Gender	Country of graduation	Years of practice
Antibiotic resistance is problematic in this country.	124 (89.2%)	15 (10.8%)	0.232	0.787 ^a	0.688 ^a
Prescription of antibiotics in primary care can contribute to antibiotic resistance.	123 (88.5%)	16 (11.5%)	0.166	0.970 ^a	0.899 ^a
Most URTIs are caused by viruses.	117 (84.2%)	22 (15.8%)	0.992	0.118 ^a	0.042 ^{*a}
Antibiotics are helpful in treating URTIs.	69 (49.6%)	70 (50.4%)	0.808	0.392 ^a	0.182
Antibiotics reduce the duration of URTIs.	78 (56.1%)	61 (43.9%)	0.484	0.693 ^a	0.306
Antibiotics can reduce the occurrence of complications of URTIs.	108 (77.7%)	31 (22.3%)	0.261	0.705 ^a	0.562

^aFisher's exact test *Statistically significant

The level of knowledge of the GPs was also analysed. The total knowledge score ranged from zero to a maximum of six. For each statement, the correct answer was given a score of one and the wrong answer was given zero. Depending on their responses, participants were categorized into three groups: poor (total score: 0-2), moderate (total score: 3-4) or good (total score: 5-6). Of the respondents, 45.3% (n=63) had a moderate level of knowledge. Thirty-six per cent (n=50) respondents were considered to have good knowledge and 18.7% (n=26) were categorized as having poor knowledge.

Statistically significant associations between level of knowledge and gender (p=0.030) and race (p=0.019) were noted but there was no significant association with other variables,

namely country of graduation ($p=0.280$), specialization ($p=0.814$) and years of practice ($p=0.107$) (Table 3). In this study, a higher percentage ($n=33$, 40.2%) of the male respondents had a good level of knowledge compared with female participants, with a higher percentage of the female respondents in the moderate category (Table 3). The Chinese followed by the Indians had higher percentages in the good knowledge category. Detailed results are summarized in Table 3.

Table 3: Association between demographic characteristics and level of knowledge of the management of URTIs among GPs

Statement	Level of knowledge			P value (χ^2 test/ Fisher's exact test)
	Poor	Moderate	Good	
Gender				
Male	21(25.6%)	28(34.1%)	33 (40.2%)	0.030
Female	2 (3.5%)	38(66.7%)	17 (29.8%)	
Race				
Malay	10(14.7%)	39(54.7%)	19 (24.5%)	0.019 ^{*a}
Chinese	3 (12.0%)	7 (28.0%)	15 (60.0%)	
Indian	12(32.4%)	12(32.4%)	13 (35.1%)	
Others	1 (11.1%)	5 (55.6%)	3 (33.3%)	
Country of graduation				
Malaysia	10(12.9%)	34(49.3%)	25 (36.2%)	0.280 ^a
Indonesia	0 (0%)	3 (100%)	0 (0%)	
Australia	0 (0%)	2 (100%)	0 (0%)	
India	15(29.4%)	17(33.3%)	19 (37.3%)	
United Kingdom	0 (0%)	2 (66.7%)	1 (33.3%)	
Other	1 (9.1%)	5 (45.5%)	5 (45.5%)	
Specialization				
Yes	4 (16.7%)	10(41.7%)	10 (41.7%)	0.814
No	22(19.1%)	53(52.1%)	40 (34.8%)	
Years of Practice				
<10 years	2 (15.4%)	10(76.9%)	1 (7.7%)	0.107 ^a
10-20 years	10(16.1%)	31 (50%)	21 (33.9%)	
21-30 years	8 (21.1%)	12(31.6%)	18 (47.4%)	
>30 years	6 (23.1%)	10(38.5%)	10 (38.5%)	

^a *p* values from Fisher's exact test *Statistically significant

d) Belief and Attitude of the GPs towards Antibiotic Prescription for URTIs

The majority (n=125, 90%) of GPs agreed that they felt that patients expected antibiotics from them (Table 4), with 21.6% agreeing that when requested by patients, they prescribe antibiotics even if they think they are unnecessary (Table 4). 84.9% of respondents agreed they could reduce antibiotic prescribing by more than 25% without jeopardizing the outcome of URTIs, with no significant statistical difference found between the statements and the three characteristics gender, country of graduation and years of practice (Table 4). Detailed results are included in Table 4.

Table 4: Responses towards the belief and attitude statements

Statement	Agreement level		P value (χ^2 test/ Fisher's exact test)		
	Agree n (%)	Disagree n (%)	Gender	Country of graduation	Years of practice
I feel the patients expect antibiotics from GPs.	125 (90%)	14 (10%)	0.062	1.00 ^a	0.177 ^a
I think that patients will change doctors if I do not prescribe antibiotics.	51 (36.7%)	88 (63.3%)	0.297	0.587 ^a	0.080
I could reduce antibiotic prescription by more than 25% without jeopardizing the outcome of the URTIs.	118 (84.9%)	21 (15.1%)	0.438	0.201 ^a	0.793 ^a
When requested to do so by patients, I prescribe antibiotics even if I think them unnecessary.	30 (21.6%)	109 (78.4%)	0.585	0.659 ^a	0.22
I prescribe antibiotics for financial benefit.	5 (3.6%)	134 (96.4%)	0.331	0.314 ^a	0.755 ^a
Prescribing medicine is easier than providing explanations to the patients about their condition.	29 (20.9%)	110 (79.1%)	0.371	0.398 ^a	0.471

^a *p* values from Fisher's exact test

e) Frequency of Prescribing Antibiotics for URTI Conditions

Five conditions were described to GPs and they were asked to rate their frequency of antibiotic prescribing for the specified conditions. For simplicity, the responses were summarized into three groups as follows: 'never' and 'almost never' were grouped together as 'never'; 'sometimes' responses remained a group by itself and 'always' and 'almost always' were grouped as 'always'. Slightly more than half of the GPs (n=72, 51.8%) stated that they always prescribed antibiotic for bronchitis whereas 40.3% (n=56) sometimes prescribed them and 7.9% (n=11) never prescribed antibiotics for this condition. For runny nose with yellow or green mucus condition, most of the GPs (n=62, 44.6%) prescribed antibiotics sometimes and 51 (36.7%) always prescribed antibiotics whereas 18.7% (n=26) did not prescribe antibiotics for this condition. For sore throat patients, 90 (64.7%) reported that they sometimes prescribed antibiotics whereas 26.6% (37) always

prescribed them and 8.7% (n=12) of the respondents never prescribed antibiotics for sore throat. Most of the GPs (n=93, 66.9%) never prescribed antibiotics for cold conditions whereas 42 (30.2%) sometimes prescribed antibiotics for cold. For otitis media, the majority of the GPs (n=115, 82.7%) stated that they always prescribed antibiotics.

Discussion

The overall response rate obtained in this survey was 34.8%. This is below our expectations; however, it is accepted it is challenging to achieve higher response rates from physicians in general (36) and physicians from private sector in particular (37). The response rate in this study can, however, be considered relatively high compared with other local surveys of medical practitioners in Malaysia which achieved response rates of less than 30% (38, 39). It has also been reported that, although changing, physicians remained a relatively homogenous population with regard to their knowledge, training, attitudes and behavior (37, 40). Thus, the rate of non-response bias may be lower than anticipated (38).

The study showed that many GPs had a moderate level of knowledge regarding the management of URTIs, with a smaller proportion having a poor knowledge of infections and pertinent antibiotic prescribing behavior (Table 3). In this study, 89.2% of GPs thought that antibiotic resistance was problematic (Table 2), which is consistent with the findings reported by Cho et al. that 79.3% of GPs thought antibiotic resistance was problematic (32). Only 10.8% GPs did not consider antibiotic resistance a problem, which is encouraging as a lack of awareness regarding antibiotic resistance can lead to over-prescribing of antibiotics (31). Furthermore, although the majority of the GPs viewed resistance as a very significant national problem, other studies have shown that they may have inadequate knowledge of the prevalence of antimicrobial resistance in their own settings, e.g. Wester et al (31). However, a study performed in six general hospitals in Malaysia found doctors' knowledge of local antibiotic resistance patterns was poor when assessed against their knowledge of resistance patterns and rates in their local hospital (41).

Against this, it was encouraging to see that an appreciable proportion of GPs (88.5%) agreed that prescribing of antibiotics in ambulatory care contributes to antibiotic resistance (Table 2). This finding is similar to 89.4% of physicians in Korea (32). In the USA, physicians were relatively more aware of the impact of their antibiotic prescribing on the development of antibiotic resistance with 97% agreeing with the statement (42). Similarly encouraging was that 84.2% of surveyed GPs agreed that most URTIs are caused by viruses (Table 2). This concurs with the findings reported in Korea where 89.0% of participants agreed with this statement (32). However, a statistically significant difference ($p=0.042$) was found between the responses to the statement "most URTIs are caused by viruses" and GPs years of practice (Table 2). GPs who correctly answered this statement had typically been practicing for 10 to 20 years, with most respondents who gave incorrect answers had been practicing for more than 30 years. Other studies also support this finding (43, 44), with more than half (52%) of the published evaluations in a systematic review reporting evidence of decreasing physician performance with increasing years in practice (44).

Less encouraging was the fact that a high percentage of GPs had inaccurate knowledge regarding the outcome of antibiotic treatment for URTIs (Table 2). These findings are interesting as it is known that most URTIs are caused by viruses, so antibiotics are not effective in reducing the complications or duration or even helping to treat URTIs. Similar

misconceptions have also been found by others. In Korea, 58.9% of GPs thought that antibiotics were helpful in treating common URTIs (32). Lim et al. found that 45% of Malaysian physicians would use antibiotics to prevent secondary bacterial infection in URTIs despite evidence showing that antibiotics were not beneficial (41). Furthermore, 55% of physicians in the USA (42) and 47% in Korea thought that antibiotics reduce the complications of URTIs (32).

As seen in Table 4, the majority of the respondents (90%) felt that patients expected antibiotics from them. Encouragingly though most GPs (78.4%) reported they did not prescribe antibiotics on request unless medically necessary. Many studies have shown a strong association between patient expectations and demands with the excess prescribing of antibiotics (45-47), e.g. Hamm et al. found approximately 65% of patients who visited physicians expected antibiotics to be prescribed (45). General public misconceptions regarding antibiotics and indications have also been reported in the literature including Malaysia and may well lead to inappropriate prescribing (19, 48-50). Consequently, although the prescribing power rests with GPs, patients' education on appropriate antibiotic use is important to reduce unnecessary demand and pressure on GPs to prescribe antibiotics. This has resulted in activities across countries to reduce antibiotic prescribing including educating patients (12, 51-58).

More than half of the respondents in this study did not think patients would change their doctor if they did not prescribe antibiotics (Table 4). This belief is consistent with other publications showing only a small proportion of patients would seek a different GP because of the prescribing pattern of their own practitioner (59).

It was also encouraging to see a large number of GPs (85.5%) thought they could reduce antibiotic prescriptions by more than 25% without jeopardizing the outcome of the URTIs (Table 4), showing room for improvement. This is important as 82.7% of the GPs in this study stated they always prescribe antibiotics for otitis media, which is contrary to the findings in a Dutch study where only 29% of the respondents would prescribe antibiotics for otitis media and most would only prescribe symptomatic medication (60). In addition half of the GPs stated they prescribe antibiotics routinely for bronchitis, which contradicts the recommendations on treatment by the Center for Disease Control (CDC) that antibiotics should not be routinely prescribed for bronchitis (61). In this study, most GPs also stated that they would prescribe antibiotics 'sometimes' for sore throat despite sore throats or pharyngitis caused by *Group A β-hemolytic streptococcus* (GABHS) in only 10% of adult cases. GPs should be able to accurately identify and diagnose patients with GABHS by following appropriate guidelines in order to appropriately prescribe antibiotics (62). Failure to do this could lead to antibiotics being over-prescribed. Encouragingly, the majority of surveyed GPs stated that they never prescribe antibiotics for the common cold, which is better than the United States where 42% of GPs prescribed antibiotics for the common cold regardless of the regulation on judicious antibiotic use (42).

The findings from this survey suggest it is important that the authorities and heads of the medical profession in Malaysia take steps to reduce inappropriate antibiotic prescribing building on examples in the literature (12,51,54-56, 63). For example, in France, the government launched a nationwide campaign in 2002 to reduce the antibiotic use in the community. This programme successfully reduced the unnecessary use of antibiotics by 26.5% over 5 years from 2002-2007 (12). In Italy, a community-based educational

intervention to improve antibiotic prescribing in the outpatient setting including posters, brochures, and advertisements in the local media targeting the community, and a newsletter on antibiotic resistance targeting pharmacists and physicians, significantly improved antibiotic prescribing (63). A recent study from India suggested several interventions for improving antibiotic prescribing. These included training physicians through continuing medical education programmes regarding the rational use of antibiotics, educating patients and the public about antibiotics through several means including advertisements and pamphlets, and issuing clinical guidelines for appropriate use of antibiotics based on local microbiological data (64). The review by Huttner et al. showed that several interventions have been successfully used to educate physicians regarding antibiotic prescription such as academic detailing, audit and feedback, and distribution of guidelines to physicians (51).

Activities in Malaysia could build on current and planned initiatives by the authorities. Campaigns targeted at patients could include their education by physicians and pharmacists as well as distribution of pamphlets and posters in public places such as shopping malls, bus stations, hospitals and medical centers and clinics. This could also include activities to reduce antibiotics being requested and dispensed by pharmacists without a prescription. The coordination of activities by the Ministry of Health (MOH) in Malaysia to reduce antimicrobial resistance began with the establishment of Infection Control and National Antibiotic committee in 2000. Monitoring of antibiotic utilization patterns has been ongoing in Malaysia since 2005 to compare prescribing trends across therapeutic classes using daily defined doses (65). This is conducted under the annual National Medicines Use Survey to help plan future activities. The annual antibiotic surveillance, which is a part of the Antibiotic Stewardship Program (ASP), is an on-going activity that comprises both MOH and non-MOH hospitals. In 2013, there were 64 contributing hospitals including 41 hospitals from the MOH, 3 university hospitals, 3 armed forces hospitals and 17 private hospitals. The protocol to improve antibiotic prescribing is still being finalized. However, it will state the role of the antibiotic stewardship teams in hospitals, which comprise infectious disease physicians, clinical microbiologists and pharmacist from primary and tertiary referral centers. It is hoped such activities will improve antibiotic prescribing in ambulatory care. Future activities will also include point prevalence data where information on patient level data will be collected and analysed to determine the number of days of antibiotic use against the number of patients treated with antibiotics for a particular day. This will be an extension of the ASP activities where feedback will be supplied to physicians, hoping to subsequently improve future antibiotic prescribing.

These programmes will be the subject of future research activities to improve antibiotic prescribing across sectors in Malaysia especially private GPs in ambulatory care.

Limitations of the Study

We are aware of a number of limitations with the study. These include the low response rate. However we are aware it is difficult obtaining higher response rates (38,39, 66). There may also be potential differences between the respondents and non-respondents. As with most other surveys, it is also possible that respondents gave socially desirable answers. However to reduce this, we administered the survey in a neutral manner and guaranteed the confidentiality of the responses.

We also acknowledge that we were not able to correlate GPs' responses with their actual practice. In addition, the survey was conducted in only one state in Malaysia (i.e. Selangor).

However, this State has the highest number of GPs compared to other states – approximately 25% of the total number of GPs in the country (66). We acknowledge though there is no national data of demographic and characteristics of GPs to compare our sample with. However, we believe that in view of the chosen State, the relatively good response rate when compared to other surveys and the anonymity of the responders, the findings are robust and provide guidance to the authorities in Malaysia.

Conclusion

The study finding showed that most GPs in Malaysia had a moderate knowledge of antibiotic prescribing for URTIs. Furthermore, most GPs had positive attitudes towards antibiotic prescription. However there were concerns with actual prescribing behavior as well as the influence of patients on subsequent antibiotic prescribing. Consequently, educational interventions are needed among both physicians and patients to improve antibiotic prescribing among private GPs in Malaysia. This can build on current initiatives.

Conflicts of interest

Dr Faridah is employed by the Ministry of Health in Malaysia. Otherwise the authors have no other relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript apart from those already mentioned

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Key points

- The majority of private GPs in the survey, who are the highest t prescribers of antibiotics compared to public sector GPs, agreed that antibiotic resistance was problematic in Malaysia, and that antibiotic prescribing can contribute to the development of resistance
- However whilst 84% agreed that most URTIs were caused by viruses, 50% agreed that antibiotics were helpful in treating URTIs, 56% agreed that antibiotics reduce the duration of URTIs and 78% the occurrence of complications from URTIs. The majority of GPs who disagreed with the statement ‘Most URTIs are caused by viruses’ had been practicing for > 30 years
- The majority of GPs felt that patient expectations enhanced their prescribing of antibiotics even if they believed them unnecessary as this was sometimes easier than providing explanations to patients. Overall GPs believed antibiotic prescribing could be reduced by more than 25% without affecting patient outcomes.
- Consequently, there is a need for educational activities among both GPs and patients in Malaysia to improve the rational use of antibiotics, building on current and planned activities by the Ministry of Health.

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