KNOWLEDGE, ATTITUDES, AND BEHAVIORS REGARDING ANTIBIOTIC USE FOR UPPER RESPIRATORY TRACT INFECTIONS: A SURVEY OF THAI STUDENTS

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Abstract. The objectives of this study were to determine knowledge, attitudes, and behaviors of antibiotic use in upper respiratory tract infections (URI) among students at different educational levels (Grade 12 students and high vocational students) and to examine factors influencing antibiotic use for URI. A cross sectional questionnaire survey was used with students in one large and one small city in Thailand. Of 712 respondents, more than 75% of all groups had misconceptions on the benefits of antibiotics. Grade 12 students, especially those in the big city, had the highest knowledge scores about antibiotic use in URI, while high vocational students had the lowest. Incomplete taking of a course of antibiotic treatment recommended by health providers was found in more than 45% of respondents in each group. In addition, approximately half of them had taken antibiotics for less than 5 days. Knowledge about antibiotic use in URI, attitudes towards antibiotic use, attitudes towards antibiotic prescribing for treating colds by physicians and by drugstores, belief in the common use of antibiotics for colds, and expectations of receiving antibiotics from physicians significantly influenced intentions and behaviors about antibiotic use. Students had misconceptions on antibiotic use for URI. The Ministry of Education should incorporate information on proper antibiotic use in the formal health education. Reliable sources of information on the correct use of antibiotics should also be more widely available to improve the use of antibiotics.

Keywords: knowledge, attitudes, behaviors, antibiotic use, upper respiratory infection, Thailand

INTRODUCTION

Upper respiratory tract infections (URI) are some of the most common acute illnesses seen in health care services (Monto, 2002). Of 80,000 annual adult outpatient visits to the Social Security Program in Siriraj Hospital, 5% account for URI (Thamlikitkul and Apisitwittaya,

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2004). Although they are predominantly of viral origin, patients frequently receive antibiotics from health providers. In Thailand, physicians or pharmacy personnel prescribe antibiotics to more than half of the adults with an influenza-like illness or for the common cold (Bhavnani *et al*, 2007; Apisarnthanarak *et al*, 2008). Inappropriate use of antibiotics increases the development of resistant strains of pathogens (Costelloe *et al*, 2010). The prevalence of penicillin-resistant *Streptococcus pneumoniae* isolates in Thailand has increased from 63% in 2002-2003 to 69% in 2004-2005 (Srifuengfung *et al*, 2008).

Factors associated with the unnecessary use of antibiotics include: health providers' knowledge, perceived patient demand, and patient expectations (Linder and Singer, 2003; Vinker *et al*, 2003; Moro *et al*, 2009). Specifically, physicians frequently state that patient expectations influence their prescribing decisions (Linder and Singer, 2003; Kotwani *et al*, 2010). Numerous studies have reported that patients often have misconceptions on indications for necessary antibiotic use, and this contributes to a greater expectation for using antibiotics (Vinker *et al*, 2003; Parimi *et al*, 2004). However, these studies have primarily been done in developed countries. A better understanding of patients' knowledge, attitudes, and behaviors about antibiotic use in developing countries should be gained.

The level of patient education may be related to these factors. Knowledge and attitudes towards antibiotic use has been shown to be a good predictor of the correct use of antibiotics by patients (Belongia *et al*, 2002; You *et al*, 2008). Basic knowledge and attitudes towards antibiotic use should be taught and instilled in high school students in order to better prepare them for rational antibiotic use. In Thailand, the appropriate use of antibiotics is part of the curriculum and taught in health education courses for Grade 12 students only. Therefore, students attending vocational schools or leaving before Grade 12 would have no exposure to such knowledge.

This study tried to determine if basic education in Thai schools was adequate to prepare young Thais for rational use of antibiotics. The attitudes about the use of antibiotics were determined using the Theory of Planned Behavior, a theory developed to explain human behavior (Ajzen, 1991). We have attempted to evaluate knowledge, attitudes, and behaviors regarding antibiotic use for URI among students at different levels of education (Grade 12 and high vocational educational students) and to identify factors affecting antibiotic use for URI. This may help to design educational interventions and reduce irrational antibiotic use by students.

MATERIALS AND METHODS

Study setting

The study was carried out in one large and one small city located in the south of Thailand. The large city includes an area of 853 km^2 with a population of 370,919 in 2009. There are 7 hospitals and 169 Type I drugstores (having a pharmacist on duty and being able to dispense antibiotics without prescription by law). There are 12 high schools, 4 vocational schools, and 2 universities. Average income per head per year was THB 103,785 (THB 30≈USD 1). Conversely, the small city is in another province and includes 258 km^2 with a population of 160,000 in 2009, 3 hospitals, and 33 Type I drugstores. Educational institutions consist of 8 high schools, 3 vocational schools, and 1 university. Average income per head per year was THB 58,915.

Study design and ethical considerations

This was a cross sectional study using a self-reported questionnaire. The current study was conducted in high schools and vocational schools in two cities, one large and one small, from May to September 2010. The Ethics Committee of the Faculty of Pharmaceutical Sciences, Prince of Songkla University approved this study (Ref Nº PSU598/147) on February 12, 2010.

Education in Thailand

Thailand requires 12 years of basic education: from grades 1-12 in high school, or from grades 1-9 with another 3 years for a vocational certificate from a vocational school. Vocational students could study for a further 2 years to obtain a high vocational certificate. A student who passes Grade 12 can continue to study at a university or college as an undergraduate student.

Subjects

Students were recruited as follows: four high schools and three vocational schools in the large city and four high schools and two vocational schools in the small city were randomly selected from the lists of institutions in each area. Classes within the selected high schools and vocational schools were also randomly selected. All the students in the selected classes were asked to participate in the study. Participants in the large city were 228 Grade 12 students and 207 high vocational students. In the small city, 153 Grade 12 students and 124 high vocational students were recruited in the study.

Data collection

The study instrument was a self-administered questionnaire. The research proposal was sent and approved by the heads of high schools and vocational schools. Also, the questionnaires were distributed to Grade 12 and high vocational students through the heads of the schools.

Questionnaire

The questionnaire consisted of 29 items on knowledge, attitudes, and behaviors about antibiotic use for URI. The instrument also collected demographic information, such as education, gender, age, occupation, income, and underlying diseases. Three senior lecturers in the Department of Clinical Pharmacy, Faculty of Pharmaceutical Sciences, Prince of Songkla University validated the questionnaire. The questionnaire was pre-tested by 25 students. The test-retest reliability was 0.63.

Questions that evaluated knowledge on URI and antibiotic use for such conditions (nine items) included questions on the causes of colds, benefits and risks related to antibiotic therapy, and appropriate use of antibiotics with true or false responses. The knowledge score was calculated by adding the number of correct answers. The maximum knowledge score was nine.

Eight variables on relevant intention and attitudes were derived from the Theory of Planned Behavior (Ajzen, 1991). Regarding the Theory of Planned Behavior, an individual's intention is suspected to predict the actual behavior. Intention indicates how much of an effort is used to perform the behavior. Attitudes towards performance are determinants of behavioral intention and represent the favorable or unfavorable evaluation of a behavior by a person. Behavioral belief is associated with attitudes towards behaviors. These items consisted of intention to use antibiotics for colds, attitudes towards the use of antibiotics for colds, attitudes towards the use of antibiotics for symptoms of URI, attitudes towards antibiotic prescribing for colds by physicians and

by drugstores, belief in the common use of antibiotics for treating colds by public, and one's expectation of receiving antibiotics for colds from physicians and from drugstores. Questions on these items were rated on a 5-point Likert scale (1=strongly disagree to 5=strongly agree).

Questions that assessed behavior on antibiotic use (six items) included the sources of health care sought when having colds and reasons for attendance at such health care service, sources of antibiotics received, when to cease taking antibiotics, the period of antibiotic use, and the number of times of antibiotics had been used for colds in the previous six months.

Statistical analysis

Knowledge and attitudes toward antibiotic use for URI in the three groups of participants (Grade 12 students in the large city, Grade 12 students in the small city, and high vocational students), were compared with one-way ANOVA. Factors related to intention and behaviors on the use of antibiotics were examined using multiple logistic regression analysis. A *p*-value of <0.05 was considered statistically significant.

RESULTS

Of the 712 respondents, the majority were female (73.7%), age 18-20 years (67.3%), and having no chronic disease (93.5%) (Table 1).

Table 1
Demographic data of respondents (*N*=712).

	n (%)
Education	
Grade 12 students	381 (53.5)
High vocational students	331 (46.5)
Gender	
Male	187 (26.3)
Female	525 (73.7)
Age	
< 18 years	180 (25.3)
18-20 years	479 (67.3)
> 20 years	53 (7.4)
Income/month	
≤ THB 5,000[a]	665 (93.4)
THB 5,001-10,000	39 (5.5)
THB 10,001-15,000	5 (0.7)
> THB 15,000	3 (0.4)
Chronic disease	
None	666 (93.5)
Having chronic diseases	46 (6.5)

[a] USD 1 ≃ THB 30.

Table 2 shows that significantly more Grade 12 students in the big city had more correct antibiotic knowledge compared to those in the small city ($p<0.01$) regardless of knowledge on the benefits of antibiotics. Grade 12 students had higher scores in knowledge on URI, risks and use of antibiotics than other groups had ($p< 0.001$). High vocational students had less than half of the full scores in all four topics of knowledge (disease, benefits of antibiotics, risks of antibiotics, and use of antibiotics). On average, 66.0% of all respondents had correct knowledge on the inappropriate use of antibiotics that could lead to drug resistance. However, a minority of respondents had adequate knowledge on the benefits of using antibiotics, such as antibiotics could not reduce the duration of colds (24.7% in all groups) and could not prevent complications (21.9%). For the total score of knowledge about antibiotic use in URI, the lowest knowledge score was found in the high vocational students (3.46±1.94).

A majority of respondents accurately perceived that antibiotics were helpful for bacterial pharyngitis (71.9%) and sinusitis

Table 2
Knowledge about antibiotic use for URI by educational level.

Question	Grade 12 students		High vocational students	*p*-value
	Large city (*n*=228) %	Small city (*n*=153) %	(*n*=331) %	
Disease				
Colds are caused by viruses.	88.2	45.8[a]	42.9	
Colds resolve by themselves.	70.2	41.2[a]	22.4	
Benefits of antibiotics				
Antibiotics reduce the duration of colds.	18.9	26.8	28.4	
Antibiotics prevent the complications of colds.	16.7	27.5[a]	21.5	
Risks of antibiotics				
Unnecessary use of antibiotics causes drug resistance.	79.4	64.1[a]	54.4	
Antibiotics may cause drug allergy.	63.6	44.4[a]	38.4	
Use of antibiotics				
You can stop taking antibiotics when the symptoms improve.	78.1	49.0[a]	42.3	
Incomplete the treatment course of antibiotics reduce the effectiveness of the drugs.	74.1	61.4[a]	51.1	
Frequent incomplete the treatment course of antibiotics contributes to the drug resistance.	79.8	56.2[a]	44.7	
Disease (2 scores)(mean±SD)	1.58±0.57[c]	0.87±0.71[d]	0.65±0.64[e]	< 0.001
Benefits of antibiotics (2 scores)	0.36±0.59[c]	0.54±0.66[d]	0.50±0.68[d]	0.008
Risks of antibiotics (2 scores)	1.43±0.68[c]	1.08±0.79[d]	0.93±0.78[d]	< 0.001
Use of antibiotics (3 scores)	2.32±0.92[c]	1.67±1.08[d]	1.38±1.12[e]	< 0.001
Total score (9 scores)	5.69±1.61[c]	4.16±1.84[d]	3.46±1.94[e]	< 0.001
	5.08±1.86[b]			

[a] $p < 0.01$ when compared Grade 12 students in the big city with those in the small city.
[b] Mean±SD of Grade 12 students in the large city and the small city.
[c, d, e] The same letter means no significant difference, using one-way ANOVA with $p < 0.05$.

Table 3
Intention and attitudes towards the use of antibiotics by educational level (mean ± SD)[a].

Variable	Grade 12 students		High vocational students (n=331)	p-value
	Large city (n=228)	Small city (n=153)		
Intention to use antibiotics for colds	2.78 ± 0.99^{b}	2.99 ± 1.01^{b}	2.97 ± 1.01^{b}	0.047
Attitude towards the use of antibiotics for colds	3.14 ± 0.44	3.16 ± 0.51	3.11 ± 0.44	0.549
Attitude towards practice behavior of health providers:				
Attitude towards antibiotic prescribing for colds by physicians	3.11 ± 1.02^{b}	3.37 ± 0.95^{b}	3.19 ± 0.99^{b}	0.042
Attitude towards antibiotic dispensing for colds by drugstores	3.10 ± 0.95	3.31 ± 0.93	3.13 ± 0.93	0.081
Belief in the common use of antibiotics for colds by the public	3.44 ± 0.74^{b}	3.27 ± 0.80^{b}	3.18 ± 0.86^{c}	0.001
Expectation of receiving antibiotics for colds from health providers:				
Expectation of receiving antibiotics for colds from physicians	2.40 ± 0.72^{b}	2.75 ± 0.86^{c}	2.92 ± 0.76^{c}	<0.001
Expectation of receiving antibiotics for colds from drugstores	2.38 ± 0.78^{b}	2.74 ± 0.84^{c}	2.97 ± 0.84^{d}	<0.001

[a] Scores range from 1 (strongly disagree/very unlikely) to 5 (strongly agree/very likely).
[b, c, d] The same letter means no significant difference, using one-way ANOVA with $p < 0.05$.

(59.3%). Conversely, a high percentage of respondents held misconceptions regarding antibiotic use for cough with sputum (55.2%), sore throat with a clear runny nose (53.9%), mild sore throat (43.8%), clear runny nose and nasal congestion (41.0%), dry cough (36.6%), and fever (34.4%).

In each group of respondents, the intention to use antibiotics for colds was rather weak (average intention < 3 on a scale 1 to 5), but attitudes towards the use of antibiotics and towards the practice of health providers were at a moderate level, with a mean of 3.10-3.37 on a scale of 1 to 5 (Table 3). Comparisons among the groups indicated that high vocational students had the lowest beliefs in the common use of antibiotics and the highest expectations of receiving antibiotics from physicians or drugstores.

Approximately one-third of students selected drugstores or medical clinics as sources for treatment of colds. A smaller percentage of students (29.1%) visited hospitals. A majority of respondents chose drugstores for the treatment of colds because of a short waiting time for service (66.7%) and accessibility or located near their homes (58.1%). Big city Grade 12 students (35.5%) were more likely to visit there compared to the other groups. Respondents reported visiting clinics due to rapid service (54.7%) and providing physical examinations (32.5%), whereas visiting hospitals was due to the possibility of having physical examination (43.5%) and location near to homes (34.8%). High vocational students (67.3%)

Table 4
Behavior on the use of antibiotics by educational level.

Behavior	Grade 12 students		High vocational students, % (*N*=331)
	Large city, % (*N*=228)	Small city, %, (*N*=153)	
Stop taking antibiotics when:			
The symptoms improved.	20.7	23.6	27.2
The symptoms disappeared.	25.4	43.1	39.6
The treatment course was completed.	53.9	33.3	33.2
The period of taking antibiotics			
≤ 4 days	34.7	52.7	60.2
5-9 days	55.2	42.7	33.5
≥10 days	10.1	4.6	6.3
Number of antibiotics used in the last 6 months			
None	30.7	32.9	34.5
1-3 times	52.2	46.1	38.4
4-6 times	11.4	16.4	20.5
> 6 times	5.7	4.6	6.6

were more associated with increased visits to physicians (clinics or hospitals), compared to other groups.

Respondents acquired antibiotics for colds primarily from physicians in clinics or in hospitals (60-70%) or from drugstores (23-31%). The remaining sources of antibiotics were from medicines kept in the house, family members, and friends (6-9%). Less than 55% of respondents in each group, or 40% of all respondents, completed the antibiotic treatment course (Table 4). At least 90% of subjects in all groups stated that the period of antibiotics administration was less than 10 days. Approximately one-half had taken antibiotics for less than 5 days. In the previous six months, most students used antibiotics 1-3 times (38.4-52.2%).

Factors influencing intentions and behaviors about the use of antibiotics for URI are shown in Table 5. After adjusting for gender, age, income, and underlying diseases, educational background did not significantly affect the intentions and behaviors about the use of antibiotics. The significant predictors of intention were attitudes towards the use of antibiotics (OR 2.51; 95% CI 1.63-3.88), attitudes towards antibiotic prescribing by physicians (OR 1.48; 95% CI 1.15-1.90), belief in the common use of antibiotics (OR 1.54; 95% CI 1.17-2.04), and expectations of receiving antibiotics from physicians (OR 2.32; 95% CI 1.52-3.56). Knowledge about the antibiotic use (OR 1.23; 95%

Table 5
Factors associated with intention and behavior regarding the use of antibiotics (N=712).

Factors	Odds ratio (95% CI)		
	Intention to use antibiotics for colds	Completion of antibiotic course	The use of antibiotics for ≥ 10 days
Graduate 12 level	0.86 (0.43-1.69)	1.50 (0.83-2.71)	1.95 (0.61-6.21)
High vocational level	1.00 (reference)	1.00 (reference)	1.00 (reference)
Knowledge about antibiotic use in URI	0.96 (0.87-1.07)	1.23 (1.12-1.35)	1.11 (0.93-1.34)
Attitude towards the use of antibiotics for colds	2.51 (1.63-3.88)	1.26 (0.88-1.81)	1.66 (0.85-3.24)
Attitude towards antibiotic prescribing for colds by physicians	1.48 (1.15-1.90)	0.94 (0.75-1.17)	1.30 (0.87-1.95)
Attitude towards antibiotic dispensing for colds by drugstores	1.18 (0.91-1.51)	1.06 (0.85-1.33)	0.56 (0.38-0.84)
Belief in the common use of antibiotics for colds by the public	1.54 (1.17-2.04)	1.06 (0.84-1.33)	1.19 (0.78-1.81)
Expectation of receiving antibiotics for colds from physicians	2.32 (1.52-3.56)	0.85 (0.59-1.23)	0.59 (0.30-1.17)
Expectation of receiving antibiotics for colds from drugstores	0.67 (0.46-1.00)	0.96 (0.69-1.35)	1.30 (0.71-2.38)

CI 1.12-1.35) was the potential predictor for completion of the treatment course. The significant determinant of using antibiotics for at least 10 days was attitudes towards antibiotics received from drugstores (OR 0.56; 95% CI 0.38-0.84).

DISCUSSION

This study suggested that a majority of students in the study area had inappropriate knowledge, attitudes, and behaviors concerning antibiotic use for URI. Misconceptions regarding a faster cold recovery with antibiotics were found in 75.3% of all students, which is higher than those reported in previous studies in the US (39.0%)(Belongia *et al*, 2002) and Singapore (61.7%)(Tan *et al*, 2006). Sixty-six percent of respondents knew that inappropriate use of antibiotics caused drug resistance; however, their knowledge on the cause of antibiotic resistance was poorer than that reported in Hong Kong (79.0%)(You *et al*, 2008). Possible reasons for the differences in knowledge among respondents in various countries may include variations in accessibility of knowledge about the rational use of antibiotics, differences in health education courses during compulsory education, and over-reliance on antibiotics or medications by individuals.

Grade 12 students had high knowledge scores about antibiotic use in URI, followed by high vocational students. The higher knowledge scores found for Grade 12 students could possibly be because they would have recently learned about the use of antibiotics in a health education course at their schools. Those in the large city had higher knowledge scores than those in the small city. This result reflects the divergence in quality of education and educational outcomes between the large

city and the small city. High vocational students had the lowest knowledge scores because of their education. They had passed Grade 9 and studied in vocational education for another 5 years to graduate. Courses in high vocational curriculum included no formal content in antibiotic use.

More respondents (>35%) believed that antibiotics were needed for cough (with or without phlegm), mild sore throat and colds, which is strongly against the treatment guidelines from health professionals and other organization (Bisno *et al*, 2002; Tietze, 2004). An international survey of Europe, Africa, and Asia also indicated similar results (Pechere, 2001). A large number of patients worldwide misunderstand symptoms of infection, whether by virus or bacteria. Patients' inadequate knowledge on antibiotic use influenced expectations or demands for antibiotics (Parimi *et al*, 2004). Similarly, our study explored whether high vocational students with the lowest knowledge scores were more likely to expect antibiotics than did other groups. Patient expectation to receive antibiotics was a substantial factor associated with physician's overprescribing (Kotwani *et al*, 2010).

Goel *et al* (1996) describe how drugstores in developing countries are important sources of health care service. This study suggested that drugstores were a major source of health care because of their quick service and location near customers' homes. Medical clinics were also mentioned as an important place for care seeking, and respondents gave quick service and offering physical examinations as the main reasons for choosing clinics. Accordingly, fast service was the most likely reason for choosing a place for health service. High vocational students who had the lowest knowledge scores were more likely to visit physicians to treat the colds than other groups were. Big city Grade 12 students, who had the highest knowledge scores, were more likely to visit drugstores when having colds. Higher knowledge scores on URI are related to an increase in self-treatment with antibiotics (Buke *et al*, 2003). Drugstores should include as part of their service, to inform clients on the judicious use of medications. Only 40% of respondents in this study finished the antibiotic course, compared to those in a study in France and United Kingdom (82-90%)(Pechere, 2001). This poorer compliance in completing a course in antibiotic use in our study may be due to patients' inadequate knowledge and/or not being properly advised by health providers relative to those in developed countries.

A great proportion of participants (≥ 90%) at various educational levels had taken antibiotics for less than 10 days, while half of them took antibiotics for less than 5 days. This situation may increase pathogen resistance (Rubinstein, 2007). Perez-Gorricho and Ripoll (2003) report that better compliance and patient satisfaction are achieved with short-course antibiotic therapy compared to courses of longer treatment. Short-course drug therapy is also another important factor that influences good clinical outcomes and reduces antibiotic resistance. Most of the respondents in our study (60-70%) received antibiotics from physicians in either clinics or hospitals for the treatment of colds, while drugstores were the major source for treating such illnesses. Prescribing antibiotics by physicians was correlated with the use of antibiotics among the respondents. The reasons that affect physician's prescribing behavior for URI include perception of patient demand (Coenen *et al*, 2006). A wide discrepancy between perceptions and real patients'

wishes exist. Several studies find that patient satisfaction is not associated with the receipt of antibiotics, but is influenced by a clear explanation of the illness and the rationale for treatment (Ong *et al*, 2007; Filipetto *et al*, 2008). Ninety-five percent of patients indicate satisfaction when their physicians explain that antibiotics were not helpful, notwithstanding that they initially thought they had wanted antibiotics (Filipetto *et al*, 2008). Better patient education on the illness and its management could reduce the improper prescription of antibiotics. However, the results regarding perceived patient demand and actual patient expectations have been obtained from developed countries, *ie*, Belgium and the US. Further studies are needed to confirm these findings in developing countries including Thailand.

One of the significant predictors of intention to use antibiotic for colds was the attitude to use them. This agrees with the findings of Walker *et al* (2001). Attitudes towards the use of antibiotics for colds would be expected to have a meaningful effect on actual behavior, as predicated by the Theory of Planned Behavior. Attitudes towards the antibiotic use may be modifiable by providing more accurate knowledge (Taylor *et al*, 2003).

More accurate knowledge should lead to reduce actual use of antibiotics for colds with a higher likelihood that the course of treatment would be completed, as was shown in this study. An expectation to receive antibiotic treatment from physicians was significantly predictive of intention to use antibiotics for colds. This encouraged misuse of the drug by patients. Correction of misconceptions among patients could reduce unnecessary antibiotic use (McFarlane *et al*, 2002).

Attitudes about antibiotic dispensing by drugstores negatively influenced the antibiotic use for at least 10 days. The practice pattern of drugstores was directly related to the behavior on the duration of medicine administration. Physicians were more likely to prescribe a full course of antibiotics than pharmacy personnel did. A study that investigated the practice of drugstores in Thailand presented that the median duration of antibiotic therapy was 7 days (range, 6-9 days) for acute viral pharyngitis (Apisarnthanarak *et al*, 2008). An educational program, therefore, is advocated to improve dispensing practice in drugstores.

The current study has several limitations. First, the subjects were recruited from academic institutions in 2 urban areas. Accordingly, results from the subjects in other settings may differ. Second, using a self-administered questionnaire may lead to inaccurate reporting or recall bias. Finally, this survey confined the investigation to URI only, thus this findings may not be generalized to antibiotic use in other diseases.

In conclusion, knowledge, attitudes, and behaviors regarding antibiotic use for URI are found to be inappropriate among Thai students. The Ministry of Education should inspect knowledge of students, especially those who study in a small city. Furthermore, the content of antibiotic use should be taken into account in health education, particularly for high vocational curricula. Health education, including information on the issue of antibiotic resistance, is important among consumers. Targeted strategies in the community could include written information using newsletters and brochures and media via radio, television, billboards, and magazines. These programs proved to be effective in changing consumer awareness, attitudes, and behaviors concerning the rational use of antibiotics for URI in Australia (Wutzke

et al, 2006). Improvement of knowledge on the benefits of antibiotic use is needed for consumers at every educational level. Interventions directed at physicians and drugstore personnel could be helpful to optimize the prescribing of antibiotics. Education that provides good clinical practice guideline to health providers may not be enough, as communications with their patients requires more attention to providing proper advice about the illness and treatments.

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