ANTIBIOTICS AND UPPER RESPIRATORY INFECTIONS: THE IMPACT OF ASIAN AND PACIFIC ISLAND ETHNICITY ON KNOWLEDGE, PERCEIVED NEED, AND USE

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The threat of microbial resistance to antibiotics grows increasingly serious each year. Despite the severity of the problem, little is known about ways that ethnicity and culture influence antibiotic knowledge, attitudes, and use. Based on a random sample of residents from a multicultural metropolitan county in the western United States, this study finds that Filipinos have lower levels of antibiotic knowledge, express higher perceived need, and report more frequent use. Whites in this sample are at the opposite end on all of these measures; other Asian Americans and Hawaiians/Pacific Islanders are in between. The results also suggest that preference for a ''paternalistic'' interaction/decision-making style between Filipino patients and their physicians may increase the challenge of designing an effective intervention promoting appropriate antibiotic use; a social marketing approach may be one possible alternative. Implications and future research directions are discussed for other multicultural urban environments that experience inappropriate use of antibiotics. (*Ethn Dis*. 2006;16:268–274)

Key Words: Antibiotics, Attitudes, Ethnicity, Knowledge, Upper Respiratory Infection, Use

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INTRODUCTION

The relationship between excessive antibiotic use and increasing microbial resistance is well documented.[1,2] To date, however, research on relationships between patient ethnicity and antibiotic use is limited. This is the case even though issues surrounding antibiotic attitudes and use vary significantly by ethnicity and culture.[3–5]

For example, although improving two-way communication between physician and patient appears to increase appropriate antibiotic use and enhance patient satisfaction,[6] certain ethnic groups may view efforts to increase the patient's role in information exchange and decision-making[7] as disrespectful of the physician's position.[8] Such views may, in turn, limit the effectiveness of antibiotic interventions that assume all ethnic groups are equally comfortable with increased patient-physician interaction and joint decision-making.

Given the importance of increasing appropriate antibiotic use, more research on ethnic attitudes toward these drugs and ethnic preferences for patient-physician communication style is needed. Research along these lines will play a role in designing segment-specific interventions that improve interactions between ethnic minority patients and their physicians to increase appropriate antibiotic use. With these objectives in mind, this study of Asian Americans, Hawaiian/Pacific Islanders and Whites in a major US metropolitan area (Honolulu City and County, Hawaii) has two goals. First, it examines whether antibiotic knowledge, perceived need, and use in the context of upper respiratory infection (URI, ie, cough, cold, or influenza) vary across these ethnic groups. Second, the study seeks to understand cultural factors related to patient preference for certain interaction and decision-making styles with their physician. By investigating these two topics simultaneously, our goal is to provide preliminary information on issues that should be considered in future development of effective interventions aimed at increasing appropriate antibiotic use among certain ethnic groups.

This study examines whether antibiotic knowledge, perceived need, and use in the context of upper respiratory infection (URI, ie, cough, cold, or influenza) vary across these ethnic groups.

Appropriate Antibiotic Use

Studies indicate that physicians feel considerable pressure to prescribe antibiotics to patients with acute respiratory tract infections.[9,10] Physicians are more likely to prescribe antibiotics and diagnose a bacterial illness when they perceive that patients expect an antibiotic than when they perceive no expectations on the patient's part.[11,12] Although physicians are more likely to prescribe antibiotics when they believe it is expected, the prescription alone may not influence patient satisfaction.[13] In fact, satisfaction in these cases may be linked more strongly to effective physician-patient communication than to receiving a prescription.[14,15] Hamm et

al reported that patients with upper respiratory infections tended to be more satisfied when the physician spent adequate time listening and explaining the rationale behind the diagnosis and treatment.[16] Similarly, after an extensive literature review, researchers concluded that satisfaction is enhanced when the physician provides information, spends time interacting with and reassuring the patient, and expresses an interest in the patient's problems.[6] Hence, poor communication may affect patient satisfaction more than whether or not an antibiotic is prescribed.

In addition to communication-related influences, evidence suggests that culture and ethnicity affect antibiotic knowledge and perceptions. For example, one study found that non-Hispanic Whites had higher antibiotic knowledge scores than other groups.[5] Another study reported that France, Spain, and Portugal had more than twice the rate of antibiotic use than Scandinavian countries and Germany.[17] A third study noted that ethnicity was among the three strongest demographic predictors of antibiotic prescription provision in the United States (Blacks received antibiotics less often).[4] Finally, research presented at the 42nd Meeting of the Infectious Disease Society indicates that antibiotics are widely sold over-the-counter in predominantly Hispanic neighborhoods in New York City, but not in predominantly Black or White non-Hispanic neighborhoods.[3]

All of these studies point to the need to consider ethnicity in developing interventions aimed at improving appropriate antibiotic use. However, to date, research on antibiotic attitudes and use for Americans of Asian and Hawaiian/Pacific Islander descent are lacking in the literature. Furthermore, as noted earlier, improved communication between patient and physician appears to increase appropriate antibiotic use. Yet, as the following review indicates, little is known about ways that ethnicity affects patients' preferred interaction and decision-making styles.

Patient-Physician Interaction Style

Increased treatment options, more variable benefits and risks, higher financial costs, and the growth of consumerism appear to be central contributors to a growing role for patients in the decision-making process.[7] Supporting this conclusion is a study in the United Kingdom[18] that found that increasing numbers of patients expect physicians to employ a shared decision-making approach (as opposed to a "paternalistic" approach),[19] which implies enhanced two-way interaction between doctor and patient.

Other studies report that greater sharing of information between physicians and patients produces more positive outcomes. For example, an in-depth review concludes that providing information on treatment options has positive effects on outcomes.[19] Even so, evidence is mixed on whether treatment choice by patients enhances psychological and/or physical outcomes. Satisfaction and method continuation in Egyptian reproductive health clinics were positively related to an emphasis on two-way interaction,[20] and, in another study, patients were more satisfied when their doctors held a similar view of the physician role or were patient-centered.[21] Only one study appears not to have found a relationship between increased information exchange and outcome.[22]

Study Focus and Hypotheses

Overall, the literature review supports the conclusion that enhanced two-way communication and shared decision-making improved understanding of appropriate antibiotic use while increasing patient satisfaction.[6] In addition, improved two-way communication should produce more accurate physician understanding of patient expectations. Furthermore, if doctors believe that effective (and efficient) communication regarding appropriate antibiotic use produces equal or greater patient satisfaction, they may be more likely to recommend alternative treatments (eg, delayed prescriptions and/or over-the-counter decongestants) when uncertain about whether an infection's cause is bacterial.

Unfortunately, formative research critical to designing subsequent interventions that will improve communications between physicians and ethnic minority patients about appropriate antibiotic use is limited. To initiate study of Asian/Pacific Islander antibiotic knowledge and perceptions, as well as variations in preferred styles of physician-patient interactions among these same ethnic groups, a random sample survey was conducted in Honolulu City and County, a multicultural, urban area in the western United States.

Some of the major Asian ethnic groups in the Honolulu area have been residents for several generations (ie, Japanese and Chinese). However, Filipinos constitute a relatively large percentage of recent immigrants; these persons are from a country in which antibiotic availability and inappropriate use are substantially higher than in the United States.[23] Hawaiian and Pacific Islanders tend to possess lower educational and economic resources. For these reasons, we expect that antibiotic knowledge will be lowest, perceived antibiotic need highest, and reported antibiotic use highest among Filipino and Hawaiian/Pacific Islander ethnic groups. Given generally higher socioeconomic status, Whites are likely to have higher antibiotic knowledge and lower perceived antibiotic need and reported levels of use.[24] Other Asian ethnic groups will probably fall in between.

Furthermore, stronger beliefs in the value of social hierarchy may produce greater comfort among Asian Americans with more paternalistic physician-patient interactions.[7,8] The Asian ethnic

group with larger percentages of recent arrivals to Hawaii (ie, Filipinos) are likely to more strongly embrace the paternalistic alternative.

METHODS

Survey of Sample Selection

A survey was mailed to a random sample of 2000 households in Honolulu City and County, an urban area with a population of approximately one million.[23] Instructions asked the individual responsible for most of the healthcare decisions in the living unit to respond to the questionnaire. The survey packet included a cover letter from the major state university medical school whose main campus is located in the same county. A stamped, self-addressed business reply envelope was also included.

Patient Sample

Following the initial mailing, two postcard reminders were sent. Five hundred and four responses were obtained, a 25.2% response rate. The mean/median age was 51 years, with a range from 17 to 87 years. Thirty-two percent were male, and 59% were female (9% missing). Thirty-one percent were single, and 66% were married (3% missing). The median income of the sample was similar to that of the state as a whole (≈$50,000),[24] but the sample was somewhat better educated and had a higher percentage of professionals and managers (45.6% vs 32.2% for the state overall).[24] Major ethnic groups in the county were represented as follows: 11.3% Chinese, 9.3% Filipino, 9.9% Hawaiian/Pacific Islander, 29.6% Japanese, 30% White, 7.2% other, and 2.8% missing. Although Filipinos are somewhat underrepresented in the sample relative to the population as a whole, sufficient numbers of each ethnic group allow comparison on all key variables.

Table 1. Knowledge of appropriate antibiotic use

	Scale 1		Scale 2	
Number of Correct Answers	Number of Respondents	% of Respondents	Number of Respondents	% of Respondents
0	40	7.9	31	6.2
1	70	13.9	63	13.9
2	60	11.9	115	22.8
3	73	14.5	90	17.9
4	83	16.5	50	9.9
5	108	21.5	155	30.8
6	51	10.2		
7	17	3.4		
8	0	0.0		
	Total 502*		Total 504	

* Two respondents were missing on this variable and were excluded from subsequent analyses involving the combined knowledge sum scale created from these two measures.

Differences by ethnicity were observed on the following variables: 1) age: Hawaiian/Pacific Islanders (46.6) and Filipinos (46.5) were somewhat younger than the overall average (51.1), while the Japanese were somewhat older (55.1); 2) education: Whites reported slightly higher levels of education while Hawaiian/Pacific Islanders reported slightly lower and other groups were in between; and 3) perceived health: Hawaiian/Pacific Islanders described their health as somewhat lower (3.92 on six-point scale with 1="Very Poor Health" and 6="Excellent Health") versus other groups (4.2–4.45, $P \leq .03$).

RESULTS

Overall Antibiotic Knowledge, Perceived Need, and Use

Knowledge regarding appropriate antibiotic use in treating URI was measured with an eight-item scale that asked when antibiotics were an appropriate treatment, eg, treating head colds, runny nose with green or yellow mucus, etc. A second knowledge scale consisted of five agree/disagree statements. Data from both scales are presented in Table 1. As Table 1 indicates, respondents' knowledge regarding antibiotics for URI is limited; <35% answered five or more out of eight questions correctly on the first scale, and 40% answered four or more out of five correctly on the second scale. The correlation between individuals' scores on the two scales was significantly positive (.267, $P<.001$), which increases confidence in their convergent validity. Given these results, a sum scale composed of individuals' correct number of answers on both scales was used in subsequent analyses as the measure of antibiotic knowledge. Two respondents with incomplete knowledge data were excluded in subsequent analyses that used this measure.

Respondents were also asked to indicate their general beliefs about the need for antibiotics in treating URI by using a 10-item scale. Higher scores indicated a greater sense of perceived need and, therefore, more positive attitudes toward antibiotic use. Inter-item reliability of the scale was strong (Chronbach=.87). A sum scale indicating an individual's overall attitude toward antibiotic use was created (1, negative to 7, positive). The mean of the scale was 3.16, which indicates that on average, respondents' attitudes toward antibiotic use were significantly negative ($t[500]=-14.3$, $P<.001$).

Finally, reported use of antibiotics in this sample did not appear to be excessive. Fifty-one percent stated that they never use antibiotics to treat upper respiratory infections (ie, cough, cold,

Table 2. Impact of ethnicity on reported antibiotic use for URI (n=454)

	Self-Reported Ethnicity					
	Chinese	**Filipino**	**Haw/Pac Isle**	**Japanese**	**White**	**Total**
Never take for URI	26	13	24	82	92	237
	45.6%	27.7%	48.0%	55.0%	60.9%	52.2%
Take for URI once or more/year	31	34	26	67	59	217
	54.4%	72.3%	52.0%	45.0%	39.1%	47.8%
Total	57	47	50	149	151	454

$\chi^2(4)=17.8$, $P<.001$; $\lambda=.13$, $P<.02$.

or flu), and 39.5% reported using them once or twice per year. This compares favorably with national survey data from Canada in which 53% of the sample respondents stated that they had received an oral antibiotic prescription in the past three years.[25]

Ethnicity and Antibiotic Knowledge/Perceived Need

Regarding associations between ethnicity and antibiotic knowledge and perceived need, the major contrast occurred between Filipinos, Hawaiian/Pacific Islanders, and Whites. Respondents who indicated another ethnic group (<4% of the total sample) were not included in these and subsequent analyses. Filipinos and Hawaiian/Pacific Islanders had lower antibiotic knowledge (5.7 and 5.5 respectively on a 13-point scale) than Whites (7.5), and other ethnic groups were in between ($F[4,447]=8.1$, $P\leq.001$). Filipinos and Hawiian/Pacific Islanders also reported stronger perceived need for antibiotics (3.47 and 3.41 on a seven-point scale respectively) than Whites (2.84), and other Asian ethnic groups were in between ($F[4,446]=3.69$, $P\leq.006$). However, perceived need was still significantly below the neutral point ($P<.002$).

The effect of ethnicity was next tested controlling for education and age. Two regression models were run with antibiotic knowledge and perceived need as dependent variables and ethnicity, age, and education as predictors. For antibiotic knowledge, the regression was significant ($F[5,495]=4.02$, $P<.001$, $R^2=.04$). White ethnicity (beta=.287, $P<.001$) and education (beta=.326, $P<.001$) were significantly related to the dependent measure. Thus, White ethnicity predicted higher antibiotic knowledge as did more formal education. A regression on perceived need for antibiotics was also significant ($F[7,463]=5.136$, $P<.001$; $R^2=.07$). Once again, White ethnicity (beta=−.221, $P<.007$) and education (beta=−.198, $P<.001$) were significant. Thus, White ethnicity predicted lower levels of perceived antibiotic need, as did years of formal education. The lack of other significant relationships suggests that the difference between Whites and all other ethnic groups coupled with differences in formal education are the most powerful predictors of antibiotic knowledge and attitude.

The correlation between antibiotic knowledge and perceived need for antibiotics is significantly negative ($r=-.492$, $P<.001$). This correlation is strong and shows that as one's knowledge about antibiotics increases, perceived need for them decreases. In a traditional ''hierarchy of effects'' model,[26] antibiotic knowledge would be included as a predictor of attitude. Running regression again with knowledge as an antecedent to attitude along with ethnicity, education, and age revealed just how important increasing knowledge is to reducing perceived need. In that regression ($F[8,461]=20.68$, $P<.001$, $R^2=.27$), only antibiotic knowledge was significant (beta=−.479, $P<.001$). Thus, increasing patients' knowledge appears critical to forming appropriate attitudes toward antibiotic use, irrespective of ethnicity, age, or formal education.

Ethnicity and Antibiotic Use

As was the case for antibiotic knowledge and perceived need, antibiotic use varied significantly by ethnicity ($\chi^2(4)=17.8$, $P<.001$; $\lambda=.13$, $P<.02$) Filipinos reported the highest use (see Table 2); 72% said that they took antibiotics for URI one or more times per year. Whites reported the lowest use; 39% took antibiotics one or more times per year. Japanese, Chinese, and Hawaiian/Pacific Islander ethnic groups fell between Filipinos and Whites.

Logistic regression analysis was undertaken to examine the extent to which ethnicity predicted using antibiotics one or more times per year versus never using antibiotics to treat URI, with two other predictors (antibiotic perceived need and antibiotic knowledge) and covariates (age and education) included in the model. The model was significant ($P<.001$) and meaningful as it correctly classified 70.4% of the cases. Significant predictors included perceived need (beta=.599; $P<.001$), knowledge (beta=−.142; $P<.001$), and Filipino ethnicity (beta=1.048, $P<.043$). Thus, stronger perceived need for antibiotics, lower knowledge, and Filipino ethnicity were associated with increased antibiotic use.

Ethnicity and Patient Attitudes Toward Physician Interaction Style

Finally, to investigate potential ethnic differences that may affect interven-

tion designs in multicultural communities such as Honolulu, items were drawn from prior research to measure patient attitudes toward alternative physician-patient interaction.[18,21,27–28] Three strong factors, with only item 6 cross-loading, accounted for 52.7% of the variance in principal components analysis following varimax rotation. Based on items under each latent dimension, factor 1 was labeled "doctor dominates" (22.7% variance), factor 2 was labeled "shared decision-making" (17.6%), and factor 3 was labeled "patient dominates" (12.4%). Mean scores on the scales created from each factor indicate that patients agree most strongly with the shared decision-making approach ($\bar{X}$=6.05 on a seven-point agree/disagree scale), agree somewhat with the patient-dominates model ($\bar{X}$=4.83), and disagree mildly with the doctor-dominates approach ($\bar{X}$=3.78).

Factor score analysis by ethnic group was undertaken to determine how much ethnicity influenced attitudes toward the three alternative interaction/decision-making styles. This analysis revealed that Filipino (.45) and Japanese (.24) respondents had more positive attitudes toward the doctor-dominates alternative, while Whites held more negative attitudes (−.33) and other groups were neutral ($F[5,451]=7.3$, $P<.001$). Filipinos (−.35) held more negative attitudes toward shared decision-making, while Whites (.15) were more positive and other groups were generally neutral ($F[5,451]=2.2$, $P\leq.05$). Ethnic differences on the patient-dominates factor were not significant.

Discussion

This study of randomly sampled patients from an urban county in the western United States demonstrates the importance of considering ethnicity when developing interventions aimed at promoting appropriate antibiotic use. Analysis of the overall sample indicated that knowledge levels about appropriate use were moderate and perceived need for antibiotics mildly negative. In addition, antibiotic use for URIs did not appear excessive; approximately half of the sample reported that they never take and the other half reported that they take antibiotics for URIs one or more times per year. Finally, antibiotic knowledge appeared to play a central role reducing both perceived need for and use of antibiotics for URI. While information at the aggregate level is helpful, significant differences between ethnic groups were identified.

Analysis of the overall sample indicated that knowledge levels about appropriate use were moderate and perceived need for antibiotics mildly negative.

As hypothesized, antibiotic knowledge was lowest and perceived need highest within the Filipino ethnic group. These results were predicted because larger percentages of Filipinos are recent immigrants who come from a country in which inappropriate antibiotic use is more common.[23]

Also as predicted, antibiotic knowledge was significantly lower and perceived need for antibiotics relatively higher among Pacific Islanders (including Hawaiians), the most resource-challenged of the groups studied. However, in line with an earlier study that reported that a relatively resource-poor ethnic group had significantly lower antibiotic use,[4] Hawaiian/Pacific Islanders did not report extremely high usage rates. Finally, consistent with limited past research,[4] Whites had the highest levels of knowledge, least positive attitudes, and lowest levels of perceived need for antibiotics.

One might be tempted to attribute these findings to differing levels of formal education. However, Filipino culture places a high premium on education.[29] The Filipino sample in this study reflects that value; almost 50% had college degrees, similar to Japanese and White respondents. Furthermore, in a logistic regression analysis that included ethnicity, age, education, and antibiotic knowledge and perceived need, Filipino ethnicity still emerged as a significant predictor of reported use. This result, coupled with lower levels of knowledge and stronger perceived need, argues for targeting this and other ethnic groups with large proportions of recent immigrants from countries in which inappropriate antibiotic use is more widespread, eg, Mexico and other Latin American countries.[30,31]

Analysis of preferred physician-patient interaction/decision-making styles revealed that Filipino and Japanese Americans were more favorably disposed to the paternalistic decision-making (physician dominates) model than were other ethnic groups. Filipinos were least favorably disposed toward the shared decision-making approach, while Whites were most favorably disposed to this approach. Our findings pose a particular problem for interventions that target more recent immigrants whose original cultures value traditional, paternalistic relationships between doctors and patients. Such relationships appear likely to be particularly strong in cultures with stronger and more hierarchic distinctions between social classes such as Mexico, Panama, Peru, Guatemala, and Malaysia, among others.[8] Many immigrants from these cultures could be uncomfortable with increased two-way interaction. However, as noted earlier, increased communication between physician and patient about appropriate antibiotic use appears to be an important element in addressing the problem due to misconceptions on both sides of the dyad. Hence,

including other intervention elements to foster patient-physician communication in addition to antibiotic education may increase the level of information exchange between doctor and patient.

In particular, an additional conversation stimulant, such as a ''cold pack'' (a free symptom-treatment pack with aspirin, decongestants, throat lozenges, and other products for patients who do not exhibit bacterial infection symptoms), may provide a mechanism for increased information sharing between physician and patient about appropriate antibiotic use. Feedback from patients and physicians would be necessary to culturally adapt the cold pack, eg, including packets of chicken ramen (the Asian variant of chicken soup). Furthermore, this approach would present real, added cost issues to physicians and/or public health departments. Hence, to be effective, creative cost-sharing and sponsorship arrangements between providers, government, and the private sector will be necessary. Such partnerships and coalitions are common in social marketing campaigns.[32]

This study has limitations that suggest the need for future research. Data are based on self-report and may not reflect actual antibiotic use in this population. The sample was drawn from an urban area of Hawaii, and results may not be generalizable to persons who live in rural Hawaii or Asian/Pacific Islander immigrants in other areas of the country.

Additionally, data are cross-sectional. Tracking changes in antibiotic knowledge, perceived need, and use by ethnic group will provide much insight into the effect of intervention efforts and other external influences. The relative numbers of respondents from certain ethnic groups in this study prevented extensive analysis of factors that could shed additional light on the reasons for observed results. For example, larger numbers would enable analysis of possible cross-generational effects, which was not possible in this study given relatively small samples of individual ethnic groups. Japanese respondents had relatively high antibiotic knowledge, low perceived antibiotic need, and low antibiotic use even though they preferred the paternalistic model of physician-patient interaction/decision-making more than some other groups. This finding suggests that enhancing appropriate antibiotic use may be possible without first addressing physician-patient interaction/decision-making style. Future research with larger numbers of ethnic respondents could prove helpful in addressing these and other issues.

This study only looked at individuals who live in the United States. Home cultures of immigrant groups that report higher antibiotic use should be examined. This effort would involve understanding reasons for such widespread antibiotic use in their home countries, eg, in the Philippines or Mexico. Studies cited earlier provide some insight, but additional research is needed, particularly on foreign national groups who tend to immigrate to developed countries like the United States.

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