Self-medication with antibiotics in four Guatemala City pharmacies: characteristics, sources of information, perceived effects, and motives.

Automedicación con antibióticos en cuatro farmacias de ciudad de Guatemala: características, fuentes de información, efectos percibidos, y motivos.

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Resumen

Existen pocas regulaciones que guíen el uso racional de antibióticos en países de rentas bajas o medias, lo cual facilita la automedicación con antibióticos (AMA). Describir las fuentes de información usadas durante la práctica de AMA, los efectos percibidos, y los motivos que rodean la práctica de AMA en Guatemala. Una encuesta descriptiva transversal se administró entre quienes compraron antibióticos sin receta en cuatro farmacias de ciudad de Guatemala. Las preguntas identificaron las características demográficas de los participantes, el origen de la solicitud de antibiótico, y los efectos percibidos de la AMA. En total, 230 participantes respondieron al cuestionario en cuatro farmacias. Dos farmacias correspondieron a un contexto socioeconómico bajo (FSEB) y dos correspondieron a un contexto socioeconómico alto (FSEA). La mayoría de participantes de las FSEB (93%) y de FSEA (60%) reportaron haberse automedicado con antibióticos previamente ($p < .001$). Cuarenta y cuatro por ciento de participantes de FSEB y 27% de FSEA usaron viejas recetas como fuentes de información cuando practicaron AMA ($p = .010$); 27% de participantes de FSEA hablaron por teléfono con médicos para seleccionar el antibiótico. Setenta y tres por ciento de FSEB y 68% de FSEA percibieron mejoras en su salud ($p < .001$) como resultado de AMA. Veinticinco por ciento de FSEB y 35% de FSEA reportaron efectos secundarios de AMA. Los motivos para automedicarse con antibióticos incluyeron ahorro de tiempo y dinero en consultar a un médico. Los resultados contribuyen a las evidencias crecientes sobre el uso de antibióticos y tienen el potencial de servir para desarrollar prácticas y políticas sobre dispensación de antibióticos en farmacias.

Palabras clave: evidencias, políticas, dispensación, efectos secundarios, contexto socioeconómico.

Abstract

Few regulations guide the rational use of antibiotics in Low to Middle Income Countries (LMIC) facilitating self-medication with antibiotics (SMA). To describe the sources of information used when practicing SMA, perceived effects of SMA, and motives surrounding SMA practice in Guatemala. A descriptive, cross sectional questionnaire was administered to those purchasing antibiotics without a prescription in four Guatemala City pharmacies. Questions identified respondent demographics, origin of antibiotic request, and the perceived effects of SMA. A total of 230 participants responded to the questionnaire in four pharmacies. Two pharmacies represented Low Socio-Economic Setting Pharmacies (LSEP) and two represented High Socio-Economic Setting Pharmacies (HSEP). The majority of LSEP pharmacy respondents (93%), and HSEP respondents (60%) reported previously carrying out SMA ($p < .001$). Forty-four percent of LSEP and 27% of HSEP respondents used old-prescriptions as a source of information when practicing SMA ($p = .01$); 27% of HSEP respondents spoke over the phone with physicians in order to make antibiotic selection. Seventy-three percent of LSEP and 68% of HSEP perceived improvements in health ($p < .001$) as a result of SMA. Twenty five percent of LSEP and 35% of HSEP reported side effects from SMA. Motives for self-medicating with antibiotics included saving time and money on visiting a physician. Results contribute to the growing body of evidence regarding antibiotic use and serve to develop antibiotic dispensing practice and policies in pharmacies.

Keywords: Evidence, policies, dispensation, side effects, socioeconomic context.

Introduction

Irrational use of antibiotics leads to antimicrobial resistance worldwide. Incorrect antibiotic indication, antibiotic purchase without a prescription, recurrent disease despite antibiotic use, and substandard manufacturing processes of generic antibiotics all contribute to inappropriate uses of antimicrobial drugs (Roca et al., 2015). Combating antibiotic resistance is multifaceted; health professionals play a vital role in guiding the rational use of antibiotics in humans just as farmers and the food industry have an important position in combating resistance in animals in the food chain. Additionally, the role of the pharmaceutical industry is fundamental in providing new technologies to combat antimicrobial resistance and actors guiding policy are important in controlling the informal use of antimicrobial medications (World Health Organization [WHO], 2015). Furthermore, the international health community is a big proponent of antibiotic control and has recently focused their attention toward supporting health systems through surveillance methods in animals and humans (WHO, 2014), promoting prescription based on diagnosis and medical need, and strengthening policies surrounding the rational use of antibiotics (Chioro et al., 2015). These antimicrobial monitoring systems require robust infrastructure, and represent major challenges in countries with limited resources. Antimicrobial abuse is a complex problem, especially in some Low to Middle Income Countries (LMICs) where antibiotics are sold over-the-counter representing a major barrier in guiding the rational use of antibiotics,

facilitating Self Medication with Antibiotics (SMA).

Prevalence of SMA is higher in LMICs than reported rates in high-income countries (Bojalil & Calva, 1994; Ramay, Lambour, & Cerón, 2015; WHO, 1996). In one review, non prescription antimicrobial use was as high as 19% in Central America, compared to only 3% in Nordic countries (Morgan, Okeke, Laxminarayan, Perencevich, & Weisenberg, 2011). This is consistent with the results of another review where prevalence of SMA was higher in South America (44.1%) compared to the middle east (34.1%) (Ocan et al., 2015). SMA occurs when consumers take medication based on self-diagnosed symptoms and is a practice that exemplifies the irrational use of antibiotics, driving antimicrobial resistance worldwide (Bloom et al., 2015). SMA saves consumers' time and money on doctors visits (Bennish & Khan, 2010), and improves issues regarding access to medications in LMICs (Ocan et al., 2015). But inappropriate antibiotic selection, and inadequate duration of therapy resulting from SMA creates unwanted side effects, worsening of infectious disease symptoms, and fuels antibiotic resistance (Ocan et al., 2014). Regulations guiding the rational use, supporting rational prescribing and dispensing practices, may curb antibiotic resistance in settings where SMA occurs (Ilić, Jakovljević, & Škodrić-Trifunović, 2012). Developing antimicrobial regulations guiding distribution and sale of antibiotics associated with improving the knowledge base of providers and consumers may aid in controlling antibiotic resistance (Bennish & Khan, 2010). But a comprehensive strategy is required, managing regulations and awareness of SMA at various levels of the health system, so that appropriate use of antibiotics may be achieved.

Some characteristics regarding SMA are easily identified and generalizable across socio-economic sectors. For example, consumers report self-medicating for themselves, for their children and their parents (Fuentes Albarrán & Villa Zapata, 2008; WHO, 1996) and practice self-medication when they report minor symptoms, and or when the practice saves time (or is convenient) (Fuentes Albarrán & Villa Zapata, 2008). In a recent study in Argentina, respondents self medicated when they felt capable of self-diagnosing, and had previously experienced similar symptoms (Hartman, Dos Santos, Horna, & Morales, 2015). Oftentimes respondents self-medicate asking pharmacy personnel for advice, in other cases respondents ask for specific antibiotics by referring to old-prescriptions (Eticha & Mesfin, 2014; Ocan et al., 2014). These data have been previously presented as they pertain to socio-economic status although the relationship between socio-economic status and SMA generalized across LMIC countries has been inconclusive (Ocan et al., 2015). SMA is convenient in cases when access to medication is limited but presents significant public health risks, promoting resistance, and contributing to unwanted side effects or allergies (Bennadi, 2014; Ocan et al., 2015). Evaluation of SMA, as it relates to socio-economic, status may shed light on strategies toward developing regulatory interventions.

SMA and over-the-counter sales of antibiotics are just some of the informal practices contributing to antibiotic resistance in the LMIC setting and should be clearly understood so that effective steps may be taken to guide antibiotic dispensing practice (Santa-Ana-Tellez, Mantel-Teeuwisse, Dreser, Leufkens, & Wirtz, 2013). Unmonitored antibiotic dispensing practices are of concern in Latin America where within a 10-year period there has been a notable, continual rise in

antimicrobial sales. In eight Latin American countries the net, average rate of antimicrobial sales increased by 1.07 from 1997 to 2007, ranging from -4.23 in Chile and +5.58 in Peru. Cross cutting themes of antibiotic purchase include patients demanding antibiotics from physicians and lack of political and economic resources to enforce rules regarding antibiotic dispensing practices (Wirtz, Dreser, & Gonzales, 2010). Understanding the country-specific characteristics of those who practice SMA, their motives, and results of SMA represent one fundamental step towards addressing the local, informal uses of antibiotics.

With this study we aim to understand the practice of SMA in four Guatemalan private pharmacies by comparing the characteristics of SMA in Guatemala, sources of information used, perceived effects of SMA, and motives of those who purchased antibiotics without a prescription in pharmacies located in less affluent and more affluent neighborhoods.

Materials and methods

We carried out a cross sectional descriptive study in four private, independent pharmacies in Guatemala City. Two establishments served clients of lower purchasing power (zone 1 and 7) or Low Socio-Economic Setting Pharmacies (LSEP), and two served higher purchasing power regions (zone 10 and 15) or High Socio-Economic Setting Pharmacies (HSEP). Within each region, we selected two pharmacies based on pharmacy owner authorization to participate; selection was not random. A finite population was calculated to estimate the sample size for one-month periods in each of the four pharmacies. The sample size was calculated with Epidat 4.0 based on pharmacy staff estimations of monthly populations of 550 people visiting the LSEP, and 250 people visiting the HSEP pharmacies in one month, with an estimated 50% population proportion carrying out SMA, an 80% confidence interval and 5% of margin of error. The estimated sample size for LSEP pharmacies was 127 (65 respondents in each LSEP pharmacy) and in the HSEP pharmacies 100 (50 respondents in each HSEP pharmacy). We recruited every person who came to each pharmacy to purchase antibiotics without a prescription, until we reached the sample size.

Only customers arriving to pharmacies to purchase antibiotics without a prescription were invited to participate in the study. Respondents were excluded from the study if they were younger than 15 years old, older than 80 years old or if they were not fluent in the Spanish language. Of the total recruited population, one potential participant from LSEP was excluded for age greater than 80 years old. Four additional participants from LSEP and five participants from the HSEP were unwilling to participate in the study.

Those participating in the study were given a brief definition of self-medication: “When patients obtain and use medications without a written prescription from the physician and make a personal decision to seek treatment for their illness”. Antibiotics were defined as medications used to treat bacterial infections found on the World Health Organization’s Model list of Essential medicines and on the Guatemalan national “basic list” of medication. Respondents were given the opportunity to ask any questions regarding SMA and antibiotics and were then given the option to carry out the questionnaire by writing out the response or verbally responding.

We collected information using a previously validated questionnaire (Fuentes Albarrán 2006; Fuentes Albarrán, & Villa Zapata, 2008; Ramay et al., 2015; Tobon Marulanda, 2002)

adding supplementary questions regarding SMA consumer practice. Questionnaires were administered from June to September 2014 from Monday to Friday from 8 am - 4 pm in four pharmacy establishments in four separate regions of the city until the target number of questionnaires was obtained. The SMA instrument consisted of 25 questions. To the original survey study in 2013, we added questions that identified for whom the respondent was purchasing medication, origin of antibiotic request (old prescription, phone call to physician etc.), and the perception of clinical outcomes following SMA. Data analysis was carried out using descriptive statistics, and a comparison of proportions between characteristics of SMA by pharmacy location using a two-sample Z-test, at 5% level of significance

The Universidad del Valle de Guatemala ethics committee in the Faculty of Humanities and Science (CE-FCCH) approved this study under protocol number: QFARMA-007-Abril-2014. All study participants ranging from 15-80 years old carried out written informed consent. Local research ethics committee (CE-FCCHH) regarded unaccompanied minors as sufficiently responsible and competent for completing the informed consent processes given that they were practicing SMA on their own accord, and that the study was of minimal risk.

Results

Two hundred and thirty people arrived to the four pharmacies included in this study to self-medicate with antibiotics during the study period. Of the 230 participants completing the questionnaire, 130 were from (LSEP) and 100 were from (HSEP). Eighteen patients in the LSEP (14%) and 13 patients in the HSEP (13%) responded to the questionnaire in written format, the remainder answered by verbal response. Women accounted for 63% of respondents in the LSEP, and 47% of respondents in the HSEP (p = .010). The mean age of the LSEP population was younger than HSEP respondents. Table 1 for the demographic results.

Table 1. Respondent demographics

Age (in years)	LSEP[a] (n=130)	%	HSEP[b] (n=100)	%	*p* value[c]
15-30	40	31	24	24	.254
31-40	27	21	18	18	.603
41-50	33	25	27	27	.779
50 and above	30	23	31	31	.177
Sex					
Female	82	63	47	47	.007*
Male	48	37	53	53	.007*
Marital Status					
Married	73	56	44	44	.034*
Single	46	35	36	36	.460
Other	11	8	20	20	.060
Education					
Less than Elementary	18	14	1	1	< .001*
Elementary	14	11	4	4	.058
Middle School	13	10	5	5	.161
High school	66	51	42	42	.186
College Education	19	15	48	48	< .001*
Monthly Income					
$0 - $133.33 5	2	40	19	19	< .001*
$134 -$666 6	3	48	26	26	< .001*
$667 -$1,333 1	4	11	25	25	< .001*
$1,333 - $2,666 1		1	29	29	< .001*
Occupation					
Salaried-Employee	79	61	54	54	.152
House Wife 3	7	28	13	13	.002*
Independent-Worker	7	5	28	28	< .001*
Student	7	5	5	5	.440

[a] LSEP- Low Socio-Economic Setting Pharmacies

[b] HSEP- High Socio-Economic Setting Pharmacies

[c] (*) Significant at .05 level

The two sets of pharmacy respondents differed in educational levels and monthly income. Although large proportions of the LSEP respondents and HSEP respondents had completed high school (51%, 42% respectively), only 15% of the LSEP versus 48% of the HSEP reported completion of a university level education ($p < .001$). There was a marked difference between the ranges of incomes of respondents. In the LSEP pharmacy, the majority of respondents earned a monthly income ranging from $0-133 (40%) and $134-666 (48%). In contrast, the majority of respondents in the HSEP setting had incomes higher than $667 (54%). Differences in income and higher education were significant. These and other demographic data can be seen in Table 1.

The majority of respondents reported self-medicating with antibiotics on previous occasions (LSEP 93%, HSEP 60%; $p < .001$), while the remainder indicated it was the first time they were carrying out SMA. The majority of respondents in both pharmacies purchased antibiotics for themselves (LSEP 77%, HSEP 89% $p = .010$) and in smaller proportions for their children (17% LSEP and 4% HSEP, $p = .001$). Differences in whom respondents purchased medications were significant between pharmacies. Sore throat was the most reported symptom resulting in self-medication with antibiotics (LSEP 43%, HSEP 41%) and Amoxicillin was the most-commonly purchased antibiotic in both pharmacies (53% LSEP, 42% HSEP). SMA purchase of Amoxicillin was followed by Tetracycline and Ciprofloxacin in LSEP (10% and 9%, respectively). In HSEP, Amoxicillin was followed by Azithromycin and Penicillin (11% each). These characteristics of self-medication with antibiotics can be found in Table 2.

Table 2. Characteristics of self-medication

History of SMA practice	LSEP[a] (n=130)	%	HSEP[b] (n=100)	%	*p* value[c]
Respondents practicing SMA previously	121	93	60	60	< .001*
First time practicing SMA	9	7	40	40	< .001*
For whom respondent self-medicates [d]					
Myself	101	77	89	89	.010*
Someone other than respondent (total)	31	23	11	11	< .001*
Child 2	2	17	4	4	.001*
Another family member	5	4	2	2	.209
Spouse	4	3	2	2	.305
A parent, friend or sibling	0	0	3	3	.050
Symptoms resulting in self-medication [d]					
Sore throat	93	43	69	41	.330
Fever	38	18	41	24	.030*
Cough	32	15	13	8	.010*
Cold	24	11	12	7	.090
Upset stomach	13	6	8	5	.300
Other	10	5	4	2	.120
Generally unwell	3	1	10	6	< .001*
Allergy	2	1	7	4	.010*
Diarrhea	2	1	4	2	.120
Antibiotic purchased, according to respondent					
Amoxicillin	67	53	42	42	.075
Tetracycline	13	10	2	2	< .001*
Ciprofloxacin	11	9	10	10	.340
Sulfamethoxazole/Trimethoprim	10	8	4	4	.120
Amoxicillin+ Clavulanic acid	9	7	7	7	.490
Azithromycin	7	6	11	11	.050
Penicillin	4	3	11	11	< .001*
Levofloxacin	3	2	4	4	.220
Cefadroxil	1	1	5	5	.420
Ampicillin	1	1	2	2	.020*
Erythromycin	1	1	1	1	.200
Frequency of SMA					
Two times a year or more	17	13	4	4	.980
Less than two times per year	113	87	96	96	.010*

[a]LSEP- Low Socio-Economic Setting Pharmacies
[b]HSEP- High Socio-Economic Setting Pharmacies
[c] (*) Significant at .05 level
[d] Multiple responses allowed

Respondents in LSEP reported self-medicating as frequently as those in HSEP. LSEP respondents reported self-medicating less than two times per year (87%), and two times per year or more (13%). In HSEP pharmacies, respondents reported self-medicating less than twice a year (96%), and two times per year or more (4%), Table 2.

Sources of medication-information utilized when choosing an antibiotic differed between LSEP and HSEP pharmacies. Forty four percent of LSEP and 28% of HSEP respondents used old-prescriptions as a source of information when choosing self-medicating antibiotics (p = .010) whereas 28% of HSEP respondents received recommendations over the phone from physicians when choosing self-medicating antibiotics, see Table 3 for detailed information. The majority of respondents in both pharmacy settings obtained antibiotics in pharmacies when self-medicating, however 8% and 2% of LSEP respondents purchase antibiotics at corner stores and left over from previous prescriptions respectively (p = .010). We found both similarities and differences in whom respondents went to for advice to familiarize themselves with antibiotic use after purchasing antibiotics without a prescription. When self-medicating, 51% of LSEP respondents and 54% of HSEP respondents reported not asking anyone for advice. Forty five percent of LSEP and 31% of HSEP respondents asked the pharmacy technician for advice (p < .001), Table 3 includes detailed results.

Table 3. Sources of information when practicing SMA.

Sources of medication-information utilized when choosing antibiotic	LSEP[a] (n=130)	%	HSEP[b] (n=100)	%	*p* value[c]
A previous prescription	53	44	27	28	.010*
Family member	30	25	18	19	.170
Pharmacy dependent	18	15	12	12	.090
Friend	16	13	7	7	.340
Over the phone with MD	2	2	27	28	< .001*
Publicity	1	1	0	0	.050
Other	0	0	3	3	.020*
Licensed pharmacist	0	0	2	2	.180
Internet	0	0	1	1	.120
Locations for obtaining antibiotics used for SMA[d]					
Pharmacy	129	91	100	96	.180
Corner store	12	8	2	2	.010*
Left over from previous illness	1	1	0	0	.180
Supermarket	0	0	2	2	.050
Who respondents go to upon familiarizing themselves with antibiotics when purchasing medications?					
No one	66	51	46	54	.230
Pharmacy technician	59	45	26	31	< .001*
Friend	5	4	4	5	.470
Family member	0	0	8	9	< .001*
Pharmacist	0	0	1	1	.120

[a]LSEP- Low Socio-Economic Setting Pharmacies

[b]HSEP- High Socio-Economic Setting Pharmacies

[c] (*) Significant at .05 level

[d] Multiple responses allowed

The majority of respondents in both pharmacies self-reported positive health outcomes as a result of SMA, nevertheless most respondents perceived SMA to have overall negative effects. Seventy-three percent of LSEP and 68% of HSEP experienced a reported improvement in their health upon self-medicating ($p < .001$), and a small portion of respondents from both pharmacies had to call or visit a doctor after self-medicating (14% LSEP, 10 % HSEP, $p = .010$). Most respondents in the LSEP and HSEP perceived self-medication as having a negative effect on their health (51%, 43% respectively) or a neutral effect on their health (24%, 29% respectively) (Table 4). Upon self-medicating 25% of LSEP and 35% of HSEP reported experiencing side effects, Table 4 for specific side effects.

Table 4. Perceived health outcomes and effect on one's health

Patient reported health outcome after self-medicating [d]	LSEP[a] (n=130)	%	HSEP[b] (n=75)	%	*p* value[c]
Improvement of illness	119	73	53	68	< .001*
Have to call or visit physician	23	14	8	10	.010*
Faster cure rates	9	5	10	13	.200
Slower cure rates	5	3	5	6	.330
Side effects of drugs	4	2	2	3	.300
Illness worsens	4	2	0	0	.030*
How it SMA effects one's health, 1 negative effect 10 positive effect					
1-4	66	51	43	43	.240
5	31	24	29	29	.180
6-9	22	17	20	20	.270
10 (positive effect)	10	8	7	7	.420
Side effects of antibiotics used in SMA					
No side effects reported	98	75	49	65	
Number of respondents reporting side effects	32	25	26	35	
Side effects from SMA					
Allergic reaction	12	9	1	1	< .001*
Upset stomach	9	7	9	12	.280
Diarrhea	4	3	3	4	.480
Headache	2	2	4	5	.120
Rash	2	2	0	0	.100
Heartburn	1	1	4	5	.040*
Vomiting	1	1	0	0	.180
Sun sensitivity	1	1	0	0	.180
Nausea	0	0	3	4	.020*
Bad taste in the mouth	0	0	1	1	.127
Insomnia	0	0	1	1	.120

[a]LSEP- Low Socio-Economic Setting Pharmacies

[b]HSEP- High Socio-Economic Setting Pharmacies

[c] (*) Significant at .05 level

[d] Multiple responses allowed

There was little variation in the motives for carrying out SMA between LSEP and HSEP pharmacies. Twenty three percent of LSEP respondents self-medicated with antibiotics to save money spent on doctors visits, and because medications are easily obtained from pharmacies (23%). HSEP respondents self-medicated to save time spent on doctors' visits,

because antibiotics are easily obtained in the pharmacy, and because it was convenient to self-medicate (26%, 25%, 24% respectively). In short, respondents carried out SMA to save money (LSEP) and time (HSEP) on doctors' visits, and because SMA was convenient and easy to carry out (LSEP and HSEP), differences between pharmacies were not significant (Table 5).

Table 5. Patient reported motives for self-medicating with antibiotics

Patient reported reasons associated to self - medicating[d]	LSEP[a] (n=130)	%	HSEP[b] (n=75)	%	*p* value[c]
Easy to obtain medication in the pharmacy	42	23	33	25	.450
Save money from doctors visit	41	23	16	12	< .001*
Save time on doctors' visit	34	19	34	26	.090
Convenient (ease of curing perceived symptoms)	25	14	31	24	.010*
Symptoms of illness are not severe	15	8	6	5	.070
Previous knowledge regarding antibiotic use	10	6	7	5	.420
Don`t like going to the doctor	10	6	3	2	.060
Distance to the clinic	4	2	1	1	.140
Other	0	0	0	0	< .001*

[a]LSEP- Low Socio-Economic Setting Pharmacies

[b]HSEP- High Socio-Economic Setting Pharmacies

[c] (*) Significant at .05 level

[d] Multiple responses allowed

Discussion

The majority of the respondents reported practicing SMA recurrently, but this proportion was greater in LSEP pharmacies as compared to HSEP pharmacies. One previous study in Guatemala found that disparate socio-economic groups self-medicate in similar proportions (Ramay et al., 2015) and is not the case with the four pharmacies in this study. Differences in socio-economic characteristics have been cited as a determinant for self-medication practices (Ocan et al., 2015) although there is mixed data regarding its effect. In addition to socio-economic status, gender has also been cited as a determinant for self-medication in previous studies (Ocan et al., 2015), wherein more women markedly carried out self-medication with antibiotics (Eticha & Mesfin, 2014; Ramay et al., 2015). In our study gender was significantly different between LSEP and HSEP pharmacies. More women than men completed the SMA survey in LSEPs, and more men than women in the HSEPs.

Socio-economic status and gender of self-medicating respondents may be influenced by pharmacy-questionnaire location and hours

during which questionnaire is administered. Pharmacies participating in the current study were centrally located, near urban centers frequented by working class citizens and questionnaire was administered during normal work hours (8 am–4 pm). These characteristics emphasize the nature by which socio-economic and demographics related to gender may vary according to pharmacy location and pharmacy hours even within the same country. Differences in socio-economic status and gender in SMA practice need to be taken into account when designing interventions aimed at influencing the dispensing practice of antibiotics.

Sources of medication-information sought by respondents differed between pharmacy respondents according to socio-demographic characteristics. In the LSEP setting, a significantly higher proportion of patients reported using old-prescriptions in order to self-medicate with antibiotics, an uncommon resource used in comparison to other similar studies (Eticha & Mesfin, 2014; Gupta, Bobhate, & Shrivastava, 2011; Ocan et al., 2014; Pan, Cui, Zhang, Farrar, Law, & Ba-Thein, 2012), but similar to previous reports in Chile (Fuentes Albarrán & Villa Zapata, 2008). Using old prescriptions to self-medicate in this setting is understandable given that respondents report not have time or money to visit a physician.

A significantly higher proportion of LSEP respondents seek advice from pharmacy staff upon self-medicating with antibiotics a characteristic of self-medication that presents an opportunity for guiding the rational use of antibiotics in the pharmacy setting. In uncomplicated infectious disease situations, licensed pharmacists have been shown to facilitate antibiotic dispensing in collaboration with physicians, reducing prescribing and dispensing of antibiotic products (Roque, Soares, Breitenfeld, Figueiras, & Herdeiro, 2015), a system that models improvements in access to medication while preserving antibiotic potency (Daulaire, Bang, Tomson, Kalyango, & Cars, 2015). Nevertheless, pharmacists are not required to be present when dispensing medications in the pharmacy in Guatemala, presenting a barrier to this type of service in this LMIC context. According to our results, respondents seek advice from pharmacy personnel who may facilitate access to antibiotics, nevertheless several important steps must to be taken in order to improve policy regarding the role of the pharmacist in the retail pharmacy setting. If pharmacy personnel are to steward antibiotic use in private pharmacies, necessary advances in regulations must be made for antibiotic purchase and dispensing.

Respondents in LSEP pharmacies used old prescriptions to guide SMA whereas in HSEP pharmacies, respondents' contacted physicians by phone guiding SMA practice. Although it has not been systematically documented, telephone advice in the private health care sector in Guatemala seems to be common for patients in the private sector. In these cases, doctors in Guatemala make over-the-phone recommendations indicating which antibiotic should be taken without examining the patient and without writing a formal prescription. Phone prescriptions for antibiotics have been cited in other countries, for example in Scotland, where patients presenting self-diagnosed symptoms and treatments were more likely to be prescribed medications they requested over the phone than during face-to-face consultations (Hewitt, Gafaranga, & McKinstry, 2010). In one Danish study, one of every five telephone consultations resulted in prescribing medication, antibiotics being the most frequent medication recommended

by physicians (Moth, Huibers, Christensen, & Vedsted, 2014).

Telephone consultations facilitate overcoming barriers to seeking medical treatment, but represent an informal practice that may result in increased antibiotic prescribing, use, and resistance. In addition to overuse and resistance of antibiotics, the dangers of informal prescribing may lead to the wrong medication, dose or duration of therapy. Nevertheless, absence of pharmacy regulations facilitates telephone-prescription SMA and is opportune given difficulties in access to health care. Antibiotic dispensing practices are multifaceted, and the result of various interworking health professionals who are often unaware of their actions contributing to the resistance and the ineffectiveness of antimicrobial medications in Guatemala.

Respondents perceived a negative or neutral effect of SMA on their health, a characteristic generalizable across all pharmacies involved in this study. Additionally, a large proportion of respondents, in all pharmacies, suffered side effects as a result of self-medication in this study, a concern posed in previous studies (Bennadi, 2014) but not consistently demonstrated in all countries. Two studies carried out in Latin American populations reported similar risks including side effects due to SMA, inadequate dose or antimicrobial drugs (Bojalil & Calva, 1994), and allergic reactions (Horton & Stewart, 2012). In China, 55.2% of all adverse reactions reported from medications were due to antibiotics (Pan et al., 2012). Nevertheless, in one review of LMICs where SMA was highly prevalent in all countries, adverse effects were rarely reported as a result of its practice (Ocan et al., 2015). In a separate study regarding side effects and Emergency Room admissions in France, only 1% of admissions were due to adverse reactions from self-medication (Asseray et al., 2013). Our results show a relatively high proportion of side effects resulting from SMA. However, the health care system implications regarding severity and cost of these adverse effects are unclear.

Our results show that some respondents needed to seek medical advice (via telephone or medical visit) after SMA implying increased costs and time in medical visits as well as over-use of antimicrobial agents. But these results do not prove causality or indicate cost in the risks associated to SMA.

Motives for SMA differed between LSEP and HSEP pharmacies but were centered on the cost of medical visits. In LSEP respondents self-medicated to save money spent on doctors visits and in HSEP respondents self-medicated to save time on doctors visits. Additionally, improved access to antibiotics was similarly noted as a driver of SMA across pharmacies. Similar characteristics have been reported in other LMICs, including Guatemala (Ahmad, Patel, Mohanta, & Balkrishnan, 2014; Eticha, & Mesfin, 2014; Ramay et al., 2015) and resulted in inadequate antibiotic consumption (Ocan et al., 2014; Skliros et al., 2010). SMA also predicts an increase in antibiotic resistance in LMICs including countries within Latin America (Alsan, Schoemaker, Eggleston, Kammili, Kolli, & Bhattacharya, 2015). SMA is a strategy used by patients in order to easily obtain medications, but its practice results in financial gain of private pharmacies in Guatemala, and poses a threat toward antibiotic resistance. Our results emphasize the importance of antimicrobial stewardship programs in the pharmacy setting in Guatemala. Pharmacy personnel are the gatekeepers of antimicrobial agents, but pharmacies currently

lack infrastructure and support from qualified personnel to take on the responsibility to oversee medication dispensing practices in Guatemala. Additionally, current guidelines for antibiotic stewardship programs are geared for high income developed countries (*Lancet* [Editorial], 2015) and these programs should consider different approaches for LMIC settings where socio-cultural SMA practice vary from country to country.

Guatemala would benefit from national and regional support in developing regulations regarding the rational use and dispensing of medications in the pharmacy so that incentives in antibiotic dispensing shift from financial interests to antimicrobial preservation. Solutions to this global problem must be innovative and use the evidence based information (Fitchett, 2015) provided by this and other studies, in order to preserve antimicrobial effectiveness (Aryee & Price, 2015).

Limitations of this study include those known for cross-sectional studies. Although the four pharmacies included in the study offer a contrast in terms of the socioeconomic characteristics of their clients, these pharmacies are not representative of all pharmacies in Guatemala. Selection of the four pharmacies was determined by access given by their owners.

Our findings contribute to the general understanding surrounding informal antibiotic use in Guatemala and may serve as the basis for understanding regulations regarding the rational use of antibiotics in these particular settings. Nonetheless, there is much that needs to be identified and researched regarding informal pharmacy practice in Guatemala.

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