

Knowledge, attitudes, and practices concerning self-medication with antibiotics among the public in Aseer region, Saudi Arabia

Majed Mohammed Al Saleh (1)
 Roqayya Mohammed Alhayyani (2)
 Yara Mofarih Assiri (2)
 Afnan Muslah Alshahrany (2)
 Fatimah Yahya Asiri (3)
 Ahad Essa Mohammad (3)

(1) Family Medicine Consultant, Joint Program of Family Medicine, Saudi Arabia
 (2) Family Medicine Resident (PGY3), Joint Program of Family Medicine, Saudi Arabia
 (3) Medical intern, College of Medicine, King Khalid University, Saudi Arabia

Corresponding author:

Roqayya Mohammed Alhayyani
 Family Medicine Resident (PGY3), Joint Program of Family Medicine,
 Saudi Arabia
Email: shehatafarag@yahoo.com

Received: January 2021; Accepted: February 2021; Published: March 1, 2021.

Citation: Majed Mohammed Al Saleh et al. Knowledge, attitudes, and practices concerning self-medication with antibiotics among the public in Aseer region, Saudi Arabia. World Family Medicine. 2021; 19(3): 25-31

DOI: 10.5742/MEWFM.2021.94002

Abstract

Background: Antibiotics are a cluster of drugs used to combat microorganisms and treat infections, hence they are the major tool to help the natural defence of the body in the management of infection. Internationally, antibiotic misuse has been reported to be due to multiple factors, including lack of compliance, and availability of antibiotics as over-the-counter medications with absence of rules and regulations that prohibit such practice.

Aim: To assess knowledge, attitudes, and practices concerning self-medication with antibiotics among the public in Aseer region, Saudi Arabia.

Methodology: A population based cross-sectional survey was conducted targeting the general population in Aseer region, southern Saudi Arabia. Persons on long use of antibiotics due to chronic health problems were excluded. Data were collected over a period of four months based on a pre-structured electronic questionnaire. The questionnaire was constructed by researchers with the help of experts and intensive literature review.

Results: A total of 843 participants completed the study questionnaire. Participants' ages ranged from 18 to 66 years old with mean age of 34.3 ± 11.3 years old. The majority of participants were females (70.5%; 594) and Saudis (99.3%; 837). Exactly 796 (94.4%) of the respondents reported that Antibiotics should be purchased according to a doctor's prescription, and 450 (89%) correctly said that Antibiotics have side effects, and sometimes are dangerous. Regarding participants' attitude, 812 (96.3%) of the participants agreed that it is necessary to have additional information regarding the use of antibiotics, 688 (81.6%) agreed that the effectiveness of treatment diminishes if the full course of antibiotic therapy is not completed. As for practice, exactly 94.4% of the participants reported that they carefully read the instructions included before using antibiotics.

Conclusions & recommendations: In conclusion, the study revealed that the population in Aseer region had poor knowledge regarding antibiotic use in total. Also, participants' practice was questionable and needed to be improved to adhere to safe practices with antibiotic use.

Key words: Antibiotics, Awareness, Attitude, Practice, General population, Knowledge, Antibiotics misuse, Prescription.

Background

Antibiotics are the drugs used to fight microorganisms and combat infections, hence they are the major tool to help the natural defense of the body in the management of infection [1]. An infection was considered serious until the discovery of antibiotics. The meaning of antibiotics is “against life”, which is derived from the fact that an antibacterial drug is extracted from living creatures and used to kill or attenuate bacteria. However, there is an obvious association between longer duration and multiple courses of antibiotic intake and higher rates of bacterial resistance [2-4]. The misuse of antibiotics could be due to poor awareness regarding antibiotics prescription, the indication of patient's intake, and weak spreading awareness among patients through physicians and negative attitudes and practice patterns [5-7]. The applicability of strict control methods related to their prescription are important factors that involve interactions between health caregivers, community pharmacists and populations [8, 9]. Nosocomial infections caused by multi-resistant, bacillus Gram-negative bacteria are associated with high morbidity and mortality, especially in intensive care units and wards, and the costs of hospital stays are increased with patients requiring 2nd or 3rd line drugs that are less effective and more toxic and expensive [10].

Internationally, antibiotic misuse was reported to be due to multiple factors, including lack of compliance, availability of antibiotics as over-the-counter medications with absence of rules and regulations that prohibit such practice [11, 12]. Lack of healthcare professional knowledge and/or appropriate patient education usually plays a key role in such findings [13]. Antibiotic misuse may have a massive effect on social, economic and health aspects due to the emergence of bacterial resistance which is the resistance of a microorganism to an antimicrobial drug that was originally effective for treatment of infections caused by it [13]. This phenomenon may lead to the ultimate result of failure of first-line antibacterial treatment forcing the patient to shift to less conventional medications, many of which are more expensive and/or associated with more serious side effects.

In 2011, WHO set the theme of World Health Day as ‘Combat Antimicrobial Resistance: No Action Today, No Cure Tomorrow’ [14]. In 2014, WHO reported increasing levels of antibiotic resistance that is threatening the control of bacterial diseases and resulting in social and economic burdens. It also reported a major knowledge gap about the magnitude of antibiotic resistance in the Middle East and worldwide [15].

Previous studies assessing knowledge and attitude regarding AB use and misuse among adult population of Kuwait and Jordan revealed unsatisfactory knowledge regarding AB use [16, 17]. Moreover, research in different parts of Saudi Arabia among adults showed patterns of inappropriate AB knowledge and practice [18-20]. Therefore, the purpose of the present study was to estimate the extent of antibiotic misuse and factors associated with

antibiotic self-medication among the Saudi population in Aseer region, southern Saudi Arabia.

Methodology

A descriptive cross-sectional approach was used targeting all accessible population in Aseer region, Southern Saudi Arabia. All those with ages of 18 years or more living in Aseer region were invited to participate in the survey. A total of 1,000 individuals received the study survey. Exactly 843 respondents completed the study questionnaire with a response rate of %. After obtaining permission from the Institutional ethics committee, data collection started. Data were collected from participants using an online pre-structured questionnaire. The researchers constructed the survey tool after intensive literature review and expert's consultation. The tool was reviewed using a panel of 3 experts for validation and applicability. Tool reliability was assessed using a pilot study of 30 participants with reliability coefficient (α -Cronbach's) of 0.79 for awareness, and 0.74 for attitude. The tool covered the following data: participants' socio-demographic data such as age, gender, work, and education. Awareness was assessed using 9 questions with one correct answer for each. Attitude was assessed by 10 items with a 5-point Likert scale ranging from 1 for strongly disagree to 5 for strongly agree. Practice regarding antibiotics use was assessed in the third part using 9 items. The questionnaire was uploaded online using social media platforms by the researchers and their friends during the period from 15th May till 30th of July 2020. All accessible and eligible population in the study setting were invited to fill in the attached tool.

Data analysis

After data were extracted, it was revised, coded, and fed to statistical software IBM SPSS version 22 (SPSS, Inc. Chicago, IL). All statistical analysis was done using two tailed tests. P value less than 0.05 was statistically significant. For awareness items, each correct answer was scored one point and total summation of the discrete scores of the different items was calculated. A patient with score less than 60% (6 points) of the maximum score was considered to have poor awareness while good awareness was considered if they had score of 60% (7 points or more) of the maximum. Composite mean for awareness items was assessed and participants with means score up to 3.5 out of 5 were considered to have negative or neutral attitude and others with a composite mean of 3.6 to 5 were considered to have a positive attitude. Negative statements scores were reversed where strongly disagree had 5 points and strongly agree had 1 point. Descriptive analysis based on frequency and percent distribution was done for all variables including demographic data, awareness items and participants' practice. Crosstabulation was used to assess distribution of awareness according to participants' personal and medical data. Relations were tested using Pearson chi-square test.

Results

The study included 843 participants who completed the questionnaire. Participant's ages ranged from 18 to 66 years old with mean age of 34.3 ± 11.3 years old. The majority of participants were females (70.5%; 594) and Saudis (99.3%; 837). University level of education was reported among 655 (77.7%) participants and 249 (29.5%) were working. As for monthly income, it was below 3000 SR per month among 784 (93%) participants and 15 (1.8%) had monthly income exceeding 10000 SR (Table 1).

Table 2 demonstrates awareness regarding antibiotics use among the general population in Aseer region, south-western Saudi Arabia. Exactly 796 (94.4%) of the respondents reported that Antibiotics should be purchased according to a doctor's prescription, 450 (89%) correctly said that Antibiotics have side effects, and sometimes are dangerous, 612 (72.6%) agreed that overuse of antibiotics can lead to bacterial resistance, and 652 (66.7%) reported that repeated non-compliance with the course of antibiotic therapy increases bacterial resistance. Only 104 (12.3%) agreed that it is preferable to give the antibiotic intravenously for any case and 141 (16.7%) reported that antibiotics can prevent skin infections when put on wounds. Totally, 122 (14.5%) respondents had a good awareness level regarding antibiotics use and prescription.

Regarding participants attitude towards antibiotic use and prescription (Table 3), 812 (96.3%) of the participants agreed that it is necessary to have additional information regarding the use of antibiotics, 688 (81.6%) agreed that the effectiveness of treatment diminishes if the full course of antibiotic therapy is not completed, 688 (81.6%) refuted that the treatment can be stopped after one or two days after the improvement of your symptoms, 686 (81.4%) also refuted that one can self-prescribe antibiotics instead of consulting a doctor when suffering from a minor illness, and 593 (70.3%) agreed that reducing the inappropriate use of antibiotics plays an important role in preventing bacterial resistance to antibiotics while 179 (21.2%) agreed to have antibiotics with a common cold. Overall, 602 participants had a positive attitude towards safe antibiotic use and prescription (71.4%).

Table 4 illustrates practice regarding antibiotics use among the general population in Aseer region, south-western Saudi Arabia. Exactly 94.4% of the participants reported that they carefully read the instructions included before using antibiotics, 89.6% said that they experienced adverse reactions while self-medicating with antibiotics, 72.7% reported that they used antibiotics to prevent a common cold, and 63.3% changed their antibiotics during the self-medication period. Only 46.5% of the participants had multiple antibiotics at the same time during a specific infection and 51.6% changed the dose while self-medicating with antibiotics while 57.3% prefer intravenous antibiotics when they are sick.

Table 5 shows distribution of participant's awareness level and attitude towards antibiotic use by their personal data. Regarding awareness, 22.7% of old aged participants had a good awareness level regarding antibiotics use compared to 7.6% of those who were below 30 years with recorded statistical significance ($P=.001$). Also, good awareness was significantly higher among the less educated participants (26.8%) in comparison to highly educated (15%) ($P=.011$). Participants with undetected jobs had higher level of awareness than others (18.9% vs. 12.9% and 3.5%, respectively; $P=.001$).

As for attitude, 79.5% of old aged participants had a positive attitude towards safe antibiotics use and prescription compared to 63.6% of young age group ($P=.001$). Also, positive attitude was detected among 77.5% of those who are working in comparison to 66.7% of students ($P=.032$).

Discussion

The current study aimed to assess public awareness, attitude, and practice regarding antibiotics safe use and prescription in Aseer region, Saudi Arabia. The study revealed that more than half of the respondents were knowledgeable regarding importance of having antibiotics with physician prescription as unprescribed intake of antibiotics with inappropriate doses and duration mostly causes bacterial resistance, which is correct. This was lower than what was previously detected in a study conducted in Saudi Arabia [21] which revealed that 48 % of respondents reported using antibiotics without physician prescription. In addition, other studies from different areas including Iraq, Egypt, Jordan, Palestine, as well as other parts of the whole world showed irresponsible, overuse and self-medication with antibiotics [22-29]. Regarding bacterial resistance, the current study findings were consistent with what has been previously reported for antibiotic overuse as regards more antimicrobial resistance as well as appearance of resistant bacterial strains [30, 31]. Also, participants were knowledgeable regarding side effects and its dangerous consequences. The awareness items which were somewhat low, were route of intake of antibiotics where most participants preferred intravenous injections. In total, the study showed that overall awareness regarding antibiotics was poor (14%) irrespective of recording high awareness level for individual items. This can be explained by that not all participants were knowledgeable regarding all items but may have good knowledge for some items and poor for others and this makes the cumulative knowledge poor. The assessed poor awareness level in the current study was much lower than other similar research which assessed public awareness level of at least 50% with good awareness [32-35]. Higher awareness was reported among old aged participants which may be those who previously had infections or chronic disorders with bacterial infections and needed antibiotic intake making them familiar with their effect and use. The surprising finding was that good knowledge regarding antibiotic use was higher among low educated participants than university graduated groups

Table 1. Personal characteristics of the study participants, Saudi Arabia, 2020

Personal characteristics		No	%
Age in years	< 30 years	330	39.1%
	30-39	240	28.5%
	40+	273	32.4%
Gender	Male	249	29.5%
	Female	594	70.5%
Nationality	Saudi	837	99.3%
	Non-Saudi	6	.7%
Educational level	Below secondary	41	4.9%
	Secondary	147	17.4%
	University/ more	655	77.7%
Job	Student	144	17.1%
	Working	249	29.5%
	Others	450	53.4%
Monthly income	<3000 SR	784	93.0%
	3000-10000 SR	44	5.2%
	> 10000 SR	15	1.8%

Table 2. Awareness regarding antibiotics use among general population in Aseer region, south-western Saudi Arabia

Awareness items	Right		Wrong		Don't know	
	No	%	No	%	No	%
Antibiotics are the same as anti-inflammatory	394	46.7%	207	24.6%	242	28.7%
Antibiotics should be purchased according to a doctor's prescription	796	94.4%	22	2.6%	25	3.0%
Antibiotics can be effective for treating viral infections	381	45.2%	295	35.0%	167	19.8%
Antibiotics can prevent skin infections when put on wounds	141	16.7%	427	50.7%	275	32.6%
It is preferable to give the antibiotic intravenously for any case	104	12.3%	531	63.0%	208	24.7%
You can stop treatment as soon as the symptoms disappear	86	10.2%	693	82.2%	64	7.6%
Overuse of antibiotics can lead to bacterial resistance	612	72.6%	70	8.3%	161	19.1%
Repeated non-compliance with the course of antibiotic therapy increases bacterial resistance	562	66.7%	103	12.2%	178	21.1%
Antibiotics have side effects, and sometimes are dangerous	750	89.0%	21	2.5%	72	8.5%
Overall awareness	Poor			Good		
	721 (85.5%)			122 (14.5%)		

Table 4. Practice regarding antibiotics use among general population in Aseer region, south-western Saudi Arabia.

Practice items	Always		Often		Sometimes		Seldom		Never	
	No	%	No	%	No	%	No	%	No	%
How often have you experienced adverse reaction while self-medicating with antibiotics?	23	2.7%	237	28.1%	399	47.3%	96	11.4%	88	10.4%
How often do you change antibiotics during the self-medication period	9	1.1%	58	6.9%	205	24.3%	262	31.1%	309	36.7%
How often do you change the dose while self-medicating with antibiotics	11	1.3%	47	5.6%	119	14.1%	258	30.6%	408	48.4%
How often do you carefully read the instructions included before using antibiotics	377	44.7%	161	19.1%	159	18.9%	99	11.7%	47	5.6%
Do you take multiple antibiotics at the same time during a specific infection?	24	2.8%	38	4.5%	154	18.3%	176	20.9%	451	53.5%
Do you choose more expensive or new antibiotics when you are sick?	34	4.0%	74	8.8%	199	23.6%	194	23.0%	342	40.6%
Do you prefer intravenous antibiotics when you are sick	25	3.0%	52	6.2%	173	20.5%	233	27.6%	360	42.7%
How often are antibiotics used to prevent colds	50	5.9%	63	7.5%	215	25.5%	285	33.8%	230	27.3%
Do you store antibiotics frequently?	45	5.3%	95	11.3%	171	20.3%	201	23.8%	331	39.3%

Table 5. Distribution of participants awareness level and attitude towards antibiotic use by their personal data

Personal data	Awareness level			Attitude level			
	Poor	Good	P-value	Negative/neutral	Positive	P-value	
Age in years	< 30 years	92.4%	7.6%	.001*	36.4%	63.6%	.001*
	30-39	85.4%	14.6%		27.1%	72.9%	
	40+	77.3%	22.7%		20.5%	79.5%	
Gender	Male	85.9%	14.1%	.824	28.9%	71.1%	.892
	Female	85.4%	14.6%		28.5%	71.5%	
Nationality	Saudi	85.5%	14.5%	.878	28.6%	71.4%	.796
	Non-Saudi	83.3%	16.7%		33.3%	66.7%	
Educational level	Below secondary	73.2%	26.8%	.011*	31.7%	68.3%	.629
	Secondary	91.2%	8.8%		31.3%	68.7%	
	University/ more	85.0%	15.0%		27.8%	72.2%	
Job	Student	96.5%	3.5%	.001*	33.3%	66.7%	.032*
	Working	87.1%	12.9%		22.5%	77.5%	
	Others	81.1%	18.9%		30.4%	69.6%	
Monthly income	<3000 SR	86.1%	13.9%	.125	27.7%	72.3%	.087
	3000-10000 SR	75.0%	25.0%		38.6%	61.4%	
	> 10000 SR	86.7%	13.3%		46.7%	53.3%	

P: Pearson X2 test

* P < 0.05 (significant)

with unclear explanation. Poorly educated persons may be more interested in asking the physician due to inability to understand instructions written with the drugs opposite to the highly educated.

Regarding public attitude and safe practice of antibiotics, the current study revealed that more than 70% of the study participants had a positive attitude towards safe use of antibiotics. Nearly all of the participants agreed on the importance of having additional information regarding the use of antibiotics and that the effectiveness of treatment reduces if the full course of antibiotic therapy is not completed. Also, more than 80% refuted that the treatment can be stopped after one or two days after the improvement of symptoms, and one can self-prescribe antibiotics instead of consulting a doctor when suffering from a minor illness. Besides the study revealed that 70% of the respondents confirmed that reducing the inappropriate use of antibiotics plays an important role in preventing bacterial resistance to antibiotics. These findings were consistent with other similar studies focused on public attitude regarding antibiotic uses [31, 36, 37]. Regarding participants' practice during antibiotic use, the study revealed that there was a discrepancy regarding participants' behaviour as more than 70 of them reported safe behaviours such as reading instructions before having the drug, reporting side effects but also, large proportions reported that they may change more than one antibiotic during their treatment course and changed the dose while self-medicating with antibiotics. These variations in behaviour may be attributed to their poor awareness especially regarding the role of antibiotics in treating viral infections. Participants' practices regarding antibiotics safe use and indications are also affected by their age as the young aged group are more risky for unsafe behaviours, especially females due to the continuous need for antibiotic use for themselves or their children [38].

Conclusions and Recommendations

In conclusion, the study revealed that the population in Aseer region had poor knowledge regarding antibiotic use in total but some of them were knowledgeable regarding the importance of physician prescription and completing the recommended dose. Also, participants' practice was questionable and needs to be improved to adhere to safe practices with antibiotic use. In contrast, participants' attitude was very good as the majority of participants had an acceptable attitude towards antibiotics role in treating infection, proper dose completion, and their need for delivering extra information regarding prescribed antibiotics. More effort should be paid to improve community awareness and practice regarding antibiotics and their proper and effective role if used correctly under physician supervision.

Acknowledgement

Authors acknowledge all survey participants and experts who shared in tool validation.

References

1. Nyati.P. Principals to guide antimicrobial therapy. *Pharmacology SEED* 2th ed, globalmedik,2011;53:420
2. Costelloe C, Metcalfe C, Lovering A, Mant D, Hay A. Effect of antibiotic prescribing in primary care on antimicrobial resistance in individual patients: systematic review and meta-analysis. *BMJ* 2010; 340, c2096:2091-c2096:2011.
3. Holmes CJ, Pellecchia R. Antimicrobial therapy in management of odontogenic infections in general dentistry. *Dent Clin North Am.* 2016; 60:497–507.
4. Vernet G, Mary C, Altmann DM, Doumbo O, Morpeth S, Bhutta ZA, et al. Surveillance for antimicrobial drug resistance in under-resourced countries. *Emerg Infect Dis.* 2014; 20:434–441.
5. Shaikh BT (2017): Anti-Microbial Resistance in Pakistan: A Public Health Issue. *Journal of Ayub Medical College, Abbottabad: JAMC.* 29: 184-185.
6. Sharma D, Patel RP, Zaidi STR, Sarker MMR, Lean QY, Ming LC (2017): Interplay of the Quality of Ciprofloxacin and Antibiotic Resistance in Developing Countries. *Frontiers in pharmacology,* 8: 546.
7. Franco BE, Altagracia Martinez M, Sanchez Rodriguez MA, Wertheimer AI (2009): The determinants of the antibiotic resistance process. *Infection and drug resistance,* 2: 1-11.
8. McArthur AG, Wright GD. Bioinformatics of antimicrobial resistance in the age of molecular epidemiology. *Curr Opin Microbiol.* 2015; 27:45–50.
9. Blair JM, Webber MA, Baylay AJ, Ogbolu DO, Piddock LJ. Molecular mechanisms of antibiotic resistance. *Nat Rev Microbiol.* 2015; 13:42–51
10. Evans H, Sawyer R. Preventing bacterial resistance in surgical patients. *Surg Clin N Am* 2009; 89(2):501–19. [17] Mulvey MR, Simor AE. Antimicrobial resistance in hospitals: how concerned should we be? *Can Med Assoc J* 2009; 180(4):408–15.
11. Hart CA, Kariuki S. Antimicrobial resistance in developing countries. *BMJ* 1998; 317:647–50. 12.
12. Byarugaba DK. A view on antimicrobial resistance in developing countries and responsible risk factors. *Int J Antimicrob Agents* 2004; 24:105–10.
13. Grigoryan L, Haaijer-Ruskamp FM, Burgerhof JG, et al. Self-medication with antimicrobial drugs in Europe. *Emerging Infect Dis* 2006; 12:452–9.
14. Huang Y, Gu J, Zhang M, et al. Knowledge, attitude and practice of antibiotics: a questionnaire study among 2500 Chinese students. *BMC Med Educ* 2013; 13:163.
15. Organization WH. Antimicrobial resistance global report on surveillance. 2014 (cited 2015). <http://www.who.int/drugresistance/documents/surveillancereport/en/> 15
16. Abasaeed A, Vlcek J, Abuelkhair M, et al. Self-medication with antibiotics by the community of Abu Dhabi Emirate, United Arab Emirates. *J Infect Dev Ctries* 2009; 3:491–7.
17. Awad AI, Aboud EA. Knowledge, attitude and practice towards antibiotic use among the public in Kuwait. *PLoS One.* 2015; 10:e0117910.
18. Jose J, Jimmy B, Al Gahliya Mohammed Saif AlSabahi G, Al Sabei A. A study assessing public knowledge, belief and behavior of antibiotic use in an Omani population. *Oman Med J.* 2013; 28:324–330.

18. vElbur AI, Albarraq AA, Abdallah MA. Saudi Parents' knowledge, Attitudes and Practices on Antibiotic Use for Upper Respiratory Tract Infections in Children: A population-based Survey; Taif, Kingdom of Saudi Arabia. *J Med Res.* 2016; 2:99–103.
19. Abahussain NA, Taha AZ. Knowledge and attitudes of female school students on medications in eastern Saudi Arabia. *Saudi Med J.* 2007; 28:1723–1727.
20. Al-Shibani, Nouf et al. "Knowledge, attitude and practice of antibiotic use and misuse among adults in Riyadh, Saudi Arabia" *Saudi medical journal* vol. 38, 10 (2017): 1038-1044.
21. Belkina T, Al Warafi A, Eltom EH, Tadjieva N, Kubena A, Vlcek J. Antibiotic use and knowledge in the community of Yemen, Saudi Arabia, and Uzbekistan. *J Infect Dev Ctries.* 2014;8(04):424–9.
22. Al-Azzam S, Al-Husein B, Alzoubi F, Masadeh M. Self-medication with antibiotics in Jordanian population. *Int J Occup Med Environ Health.* 2007;20(4):373–80.
23. Dooling KL, Kandeel A, Hicks LA, El-Shoubary W, Fawzi K, Kandeel Y, et al. Understanding antibiotic use in Minya District, Egypt: physician and pharmacist prescribing and the factors influencing their practices. *Antibiotics.* 2014;3(2):233–43.
24. Al-Ramahi R. Patterns and attitudes of self-medication practices and possible role of community pharmacists in Palestine. *Int J Clin Pharmacol Ther.* 2013;51(7):562–7.
25. de Melo MN, Madureira B, Ferreira APN, Mendes Z, da Costa Miranda A, Martins AP. Prevalence of self-medication in rural areas of Portugal. *Pharm World Sci.* 2006;28(1):19–25.
26. Jassim A-M. In-home drug storage and self-medication with antimicrobial drugs in Basrah, Iraq. *Oman Med J.* 2010;25(2):1–9.
27. Muras M, Krajewski J, Nocun M, Godycki-Cwirko M. A survey of patient behaviours and beliefs regarding antibiotic self-medication for respiratory tract infections in Poland. *Arch Med Sci.* 2013;9(5):854–7.
28. Shet A, Sundaresan S, Forsberg BC. Pharmacy-based dispensing of antimicrobial agents without prescription in India: appropriateness and cost burden in the private sector. *Antimicrob Resist Infect Control.* 2015;4(1):1.
29. Ramay BM, Lambour P, Ceron A. Comparing antibiotic self-medication in two socio-economic groups in Guatemala City: a descriptive cross-sectional study. *BMC Pharmacol Toxicol.* 2015;16(1):11.
30. Nguyen KV, Do NTT, Chandna A, Nguyen TV, Pham CV, Doan PM, et al. Antibiotic use and resistance in emerging economies: a situation analysis for Viet Nam. *BMC Public Health.* 2013;13(1):1158.
31. El Zowalaty ME, Belkina T, Bahashwan SA, El Zowalaty AE, Tebbens JD, Abdel-Salam HA, Khalil AI, Daghriy SI, Gahtani MA, Madkhaly FM, Nohi NI. Knowledge, awareness, and attitudes toward antibiotic use and antimicrobial resistance among Saudi population. *International journal of clinical pharmacy.* 2016 Oct 1;38(5):1261-8.
32. Widayati A, Suryawati S, de Crespigny C, Hiller JE. Knowledge and beliefs about antibiotics among people in Yogyakarta City, Indonesia: a cross sectional population-based survey. *Antimicrobial Resistance and Infection Control.* 2012 Dec 1;1(1):38.
33. Aslam A, Gajdacs M, Zin CS, Binti Abd Rahman NS, Ahmed SI, Jamshed SQ. Public awareness and practices towards self-medication with antibiotics among the Malaysian population. A development of questionnaire and pilot-testing. *Antibiotics.* 2020 Feb;9(2):97.
34. André M, Vernby Å, Berg J, Lundborg CS. A survey of public knowledge and awareness related to antibiotic use and resistance in Sweden. *Journal of Antimicrobial chemotherapy.* 2010 Jun 1;65(6):1292-6.
35. You JH, Yau B, Choi KC, Chau CT, Huang QR, Lee SS. Public knowledge, attitudes and behavior on antibiotic use: a telephone survey in Hong Kong. *Infection.* 2008 Apr 1;36(2):153-7.
36. Vallin M, Polyzoi M, Marrone G, Rosales-Klitz S, Tegmark Wisell K, Stålsby Lundborg C. Knowledge and attitudes towards antibiotic use and resistance—a latent class analysis of a Swedish population-based sample. *PloS one.* 2016 Apr 20;11(4): e0152160.
37. Mitsi G, Jelastopulu E, Basiaris H, Skoutelis A, Gogos C. Patterns of antibiotic use among adults and parents in the community: a questionnaire-based survey in a Greek urban population. *International journal of antimicrobial agents.* 2005 May 1;25(5):439-43.
38. Larson E, Lin SX, Gomez-Duarte C. Antibiotic use in Hispanic households, New York city. *Emerging infectious diseases.* 2003 Sep;9(9):1096.