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Antibiotics use, urgency and beliefs about antibiotics in the case of acute pharyngitis

Wzorce używania antybiotyków, niecierpliwość oraz przekonania dotyczące antybiotyków w przypadku ostrego zapalenia gardła

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Abstract

Introduction and Objective. The study investigates patterns of antibiotic use among patients in the Lublin area of eastern Poland, aiming to understand the motivations behind self-medication. Specifically, the study focuses on identifying repeatable patterns of antibiotic use and assessing differences in self-medication behaviours based on these patterns.

Materials and Method. A survey was conducted at a Family Doctor›s clinic in Lublin, involving primary care patients. Participants completed an anonymous questionnaire consisting of three sections: demographics and general health assessment, pharyngitis occurrence and management, and beliefs about antibiotic use, pain sensitivity, and urgency.

Results. Three distinct subgroups emerged from the analysis: Pattern A (62%) – rarely suffered from acute pharyngitis and rarely used antibiotics without medical consultation or shortened the period of antibiotic treatment; Pattern B (29%) – often suffered from acute pharyngitis and rarely used antibiotics without medical consultation, or shortened the period of antibiotic treatment; Pattern C (9%) – Frequently self-medicated with antibiotics, often without medical consultation. These patterns correlated with subjective health assessment, pain sensitivity, urgency, and beliefs about antibiotics.

Conclusions. The study highlights diverse attitudes towards acute pharyngitis symptoms and antibiotic use. Physician alertness should focus on patients with high urgency levels, severe pain, recurrent infections, prior antibiotic self-medication, and a propensity to shorten antibiotic therapy. Understanding these patterns is crucial for tailored interventions promoting rational antibiotic use. Further research should explore similar behaviour patterns in other infectious diseases to guide clinical decision-making and mitigate antibiotic resistance.

Key words

antibiotic, self-medication, risk factors, behaviour patterns, determinants, pharyngitis

Streszczenie

Wprowadzenie i cel pracy. Celem pracy było zbadanie wzorców stosowania antybiotyków wśród pacjentów w rejonie Lublina, ze szczególnym uwzględnieniem zrozumienia motywów samoleczenia. Badanie skupia się na identyfikowaniu powtarzalnych wzorców stosowania antybiotyków oraz na ocenie różnic w samoleczeniu na podstawie tych wzorców.

Materiał i metody. Przeprowadzono oryginalne badanie przekrojowe z udziałem pacjentów z przychodni lekarza rodzinnego w Lublinie. Uczestnicy wypełnili anonimową ankietę, składającą się z trzech sekcji: (1) zawierającej pytania metryczkowe i dotyczące ogólnej oceny stanu zdrowia, (2) dotyczącej częstości występowania i leczenia zapalenia gardła oraz (3) odnoszącej się do przekonań dotyczących stosowania antybiotyków, wrażliwości na ból i poziomu niecierpliwości.

Wyniki. Analiza wykazała trzy wyraźne podgrupy pacjentów: Wzorzec A (62%): chory rzadko cierpiał na ostre zapalenie gardła i rzadko stosował antybiotyki bez konsultacji medycznej lub skracał okres leczenia antybiotykami. Wzorzec B (29%): pacjent często cierpiał na ostre zapalenie gardła i rzadko stosował antybiotyki bez konsultacji medycznej lub skracał okres leczenia antybiotykami. Wzorzec C (9%): chory często stosował samoleczenie antybiotykami, często bez konsultacji medycznej. Te wzorce korelowały z subiektywną oceną swojego zdrowia przez pacjenta, wrażliwością na ból, pilnością oraz przekonaniami dotyczącymi antybiotyków.

Wnioski. Badanie podkreśla zróżnicowane podejścia do objawów ostrego zapalenia gardła oraz stosowania antybiotyków. Uwaga lekarzy powinna być skoncentrowana na pacjentach z wysokim poziomem niecierpliwości, doświadczających silnego bólu, osobach z nawracającymi infekcjami, takich, którzy wcześniej leczyli się sami antybiotykami oraz ze skłonnością do skracania terapii antybiotykowej. Zrozumienie tych wzorców jest kluczowe dla promowania racjonalnego stosowania antybiotyków. Dalsze badania powinny zweryfikować podobne wzorce zachowań u pacjentów cierpiących na inne choroby zakaźne.

Słowa kluczowe

samoleczenie, czynniki ryzyka, wzorce zachowań, determinanty, zapalenie gardła, antybiotyki

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INTRODUCTION

Self-medication. Self-medication pertains to the autonomous management of symptoms related to acute conditions and occasional utilization of medications prescribed by a physician during exacerbations of chronic diseases [1]. The judicious use of medications aligned with specific symptoms necessitates thorough education of a patient. An advantageous aspect of self-medication lies in the prompt and targeted application of potentially efficacious treatments, thereby averting symptom progression [1]. Conversely, self-medication poses a spectrum of risks, encompassing the inadvertent selection of inappropriate therapies, the manifestation of severe adverse effects, failure to recognize the identical active ingredient under distinct nomenclature, improper dosage administration, potential drug interactions, and the usage of expired medications [1, 2].

Beliefs on self-medication and entitlement to antibiotics. With the exception of objective reasons for and against the self-medication, subjective reasons also play an important role in a patient›s decision whether to self-administer a drug.

From the patient›s perspective, the motivations for self-medication may stem from challenges in securing timely appointments with healthcare professionals, an unfavourable financial situation, personal familiarity with symptoms from prior experience, easy access to medications, a belief that the aetiology of the ailment is of secondary importance, apprehension of a diagnosis indicating a serious condition, and a desire independently to address one›s health [3, 4].

According to Sailler et al., self-medication may align with the desire for an immediate response to a distressing symptom. The authors underscore that individuals, dissatisfied with or mistrustful of allopathic medicine, will decide to use self-prescribed phytotherapy or homeopathy in the belief that they are devoid of risks [5]. A study in New Zealand showed that a higher level of the entitlement to antibiotics is more likely among religious people, men, and people with lower educational level. When it comes to psychological factors, the authors discovered that a diminished self-assessed health status and elevated levels of psychological distress increased the level of entitlement towards antibiotics [6].

Determinants pertaining to patients who self-medicate, revealed in the meta-analysis by Ahmed et al., encompassed prior encounters with antibiotics and similar symptoms, the perceived mildness of the illness, intention to expedite recovery and save time, cultural convictions regarding the healing efficacy of antibiotics, counsel from family or friends, and possession of a personal supply of antibiotics at home [3].

Urgency. Emotional urgency is a sub-dimension of trait impulsivity, defined as the tendency to act impulsively in response to intense negative emotion [7]. Urgency is identified as having greater clinical relevance to psychopathology and emotional dysfunction disorders than non-emotional sub-dimensions of impulsivity [8]. Negative urgency is a risk factor for opioid cravings and non-opioid illicit substance use [9]. Positive urgency was recognised as an important mediator between marijuana expectancies and marijuana use patterns [10]. Although studies suggest the possible role of urgency in antibiotic misuse, no evidence presenting relation between urgency or general impulsivity and antibiotic use was found in the literature reviewed.

Self-medication with antibiotics as a threat to public health. The global phenomenon of self-medication with antibiotics poses a significant health risk. Such behaviour plays a contributory role in the escalation of antimicrobial resistance among bacteria [11]. As highlighted in the Annual Epidemiological Report on Antimicrobial Resistance in the EU/EEA (EARS-Net) for 2022, antimicrobial resistance (AMR) persists at elevated levels and exhibits an annual increase. Notably, between the transition from 2021–2022, there was a 7% surge in the reported instances of resistant strains.

The European Centre for Disease Prevention and Control has disclosed that nearly two million individuals within the European Economic Area (EEA) contract infections from antibiotic-resistant bacteria annually, resulting in approximately 30,000 fatalities each year [12]. Consequently, addressing antimicrobial resistance has emerged as a pivotal objective, as underscored by the European Council's policy for 2023 [13].

Along with the development of AMR, there is a need to use second line antibiotic treatment. Most often, second-line drugs cost more than those most often used, therefore AMR may generate a socio-economical burden among individuals with a lower income level [14, 15].

OBJECTIVE

The aim of the study was to address the prevalence of self-medication with antibiotics by the public which necessitates a comprehensive understanding of the motivations behind individuals resorting to antibiotic self-administration. Despite the unequivocal risks associated with self-medication involving antibiotics, the psychological determinants of such behaviour remain insufficiently delineated. Furthermore, there exists a dearth of research dedicated to identifying risk factors for these behaviours within local communities. While some studies in Poland have delved into antibiotic use, their quantity remains limited. Hence, the study aims to fill this gap by conducting a survey aimed at identifying the determinants of self-treatment and health-compromising behaviours in response to symptoms of a sore throat – pharyngitis.

This study seeks to explore both medical and psychological risk factors contributing to self-medication with antibiotics among the patient population within a family doctor›s clinic situated in the Lublin area of eastern Poland. Questions to be answered by the presented study:

1) Is there is a repeatable pattern of use of antibiotics among patients of family doctors? If the answer is affirmaive, there are consequently questions whether:
2) there is a difference between self-medication with antibiotics among subjects with different patterns of antibiotics use.
3) Is there is a difference among subjects with different patterns of antibiotics use in the following psychological factors:
   a. urgency;
   b. beliefs about antibiotics use.

MATERIALS AND METHOD

Study instrument. A cross-sectional study was conducted at a Family Doctor›s Clinic in Lublin among primary care patients who participated by completing an original

questionnaire. Data collection took place between December 2023 – January 2024. The study adhered to full anonymity, eliminating the necessity to obtain consent from the participants or local Bioethical Committees. Participants autonomously completed the survey and submitted it directly to the first author. The questionnaire was accessible online, facilitated by an easily accessible QR code, and in print.

The survey comprised 3 sections: 1) gathered demographic data and a self-assessment of general health; 2) explored the occurrence and diagnosis of pharyngitis, together with the strategies employed by respondents to manage symptoms; 3) aimed to discern beliefs about antibiotic use among the surveyed patients, pain sensitivity, and urgency – one of dimensions of impulsiveness.

The question about self assessment of general health, 6 questions about diagnosis of pharyngitis, and 4 questions about antibiotics beliefs, was prepared by two of the authors authors: Mikołaj Porzak and Robert Porzak. (It is customary to refer to authors only by their initials: MP and RP). Questions verifying pain sensitivity in pharyngitis were adapted from the Pain Assessment Numerical Rating Scale [16]. Questions about urgency were extracted from The Impulsive Behaviour Short Scale – 8 [17].

The set of 2 questions about beliefs was analysed as a one--dimensional scale of risky beliefs, with results between 0 (non-risky beliefs) and 10 (risky beliefs). Questions included in the scale of antibiotic beliefs were: 'For acute throat inflammation, antibiotics should always be prescribed', and 'Doctors should prescribe antibiotics more often in present times'. Reliability of the 2-questions scale of beliefs about antibiotic use in this study assessed with the use of McDonald's ω coefficient [18] was good (ω = 0.81). Reliability of the urgency scale in the original English version was ω = 0.82 and for German version – ω = 0.80. Reliability of the urgency scale in the study was even better – ω = 0.87. DOI of the survey is linked in the disclosure section.

Sample type and size. Demographic properties of the sample are presented in Table 1. The survey was conducted among 297 participants, of whom 190 (63.97%) were female and 107 (36.03%) were male. In terms of education level, the majority of participants held a Bachelor's/Master's degree or equivalent, accounting for 70.0% of the total participants. This group was followed by those with an upper secondary education (20.2%). A small fractions of participants also declared vocational education (3.7%), a doctorate or equivalent (4.7%), primary (1.0%) or lower secondary education (0.3%).

Most participants resided in large cities with a population between 100,000–500,000 (67.0%). Participants living in rural areas (13.5%), medium-sized cities with a population between 50,000–100,000 (9.1%), and very large cities with over 500,000 inhabitants (8.4%). There were also a couple of persons living in small cities with a population of up to 50,000 (2.0%). Most participants rated their financial situation as good (60.3%), followed by those who rated it as average (23.2%), very good (15.5%) and bad (1.0%).

The mean age of participants was: M = 40.67, SD = 12.43 ($M_{Females}$ = 41.01, SD = 11.98; M_{Males} = 40.07, SD = 13.23). There were no significant relationships between gender and other variables monitored in the research.

METHOD

The participants' responses to the authors' questionnaire was described statistically and the Two-Step Clustering procedure was applied to extract groups of participants different behavioural patterns of antibiotic use. The TwoStep Cluster Analysis procedure is an exploratory tool designed to reveal natural groupings (or clusters) within a dataset. The assumption states that variables in the cluster model are independent. Further, each continuous variable is assumed to have a normal (Gaussian) distribution, and each categorical variable is assumed to have a multinomial distribution.

Table 1. Demographic properties of participants

		Gender					
		Female		Male		Total	
		N	%	N	%	N	%
Education level	Primary	1	0.5	2	1.9	3	1.0
	Lower secondary	0	0.0	1	0.9	1	0.3
	Vocational	6	3.2	5	4.7	11	3.7
	Upper secondary	39	20.5	21	19.6	60	20.2
	Bachelor's/Master's or equivalent	138	72.6	70	65.4	208	70.0
	Doctorate or equivalent	6	3.2	8	7.5	14	4.7
Place of residence	Rural area	26	13.7	14	13.1	40	13.5
	Small city (up to 50,000)	3	1.6	3	2.8	6	2.0
	Medium city (50–100 thousand)	21	11.1	6	5.6	27	9.1
	Large city (100,000–500,000)	125	65.8	74	69.2	199	67.0
	Very large city (500,000+ inhabitants)	15	7.9	10	9.3	25	8.4
Financial situation	Very good	26	13.7	20	18.7	46	15.5
	Good	119	62.6	60	56.1	179	60.3
	Average	44	23.2	25	23.4	69	23.2
	Bad	1	0.5	2	1.9	3	1.0
	Total	190	100.0	107	100.0	297	100.0

However, empirical internal testing indicates that the procedure is fairly robust to violations of both the assumption of independence and the distributional assumptions [19]. The variables included to the procedure were:
1) taking an antibiotic without consulting a doctor;
2) not seeking medical attention despite the symptoms of acute throat inflammation;
3) shortening antibiotic treatment without consulting a doctor.

The Bayesian Information Criterion was applied to automatically determine the 'best' number of clusters. All calculations were performed using IBM SPSS 29 statistical package. Reliability was assessed using R.

RESULTS

Groups. The 3 subgroups of subjects were extracted with the use of Two-Steps Cluster analysis. These sub-groups were labelled according to the declared behaviour as 'Patterns'. The first subgroup (Pattern A) consisted of 184 people (62%). These were people who did not declare taking antibiotics or discontinuing antibiotic therapy without consulting a doctor. In the second subgroup (Pattern B), there were 86 people (29%) who often did not consult the symptoms of acute pharyngitis with a doctor, but took antibiotics without medical consultation only exceptionally and did not arbitrarily interrupt antibiotic therapy. The third group (Pattern C) consisted of 27 people (9%) who regularly skipped symptom consultations with a doctor, took antibiotics without a prescription, and discontinued their use without medical consultation. No significant relationships were found between subgroup membership and demographic variables monitored in the study. However, it was noted that the age of subjects in Pattern A subgroup was slightly higher than in the other 2 subgroups ($M_{Pattern\ A} = 41.88$, SD = 12.43; $M_{Pattern\ B} = 38.63$, SD = 12.00; $M_{Pattern\ C} = 38.89$, SD = 13.17).

Patterns of antibiotic use. The characteristics of antibiotic use among the subgroups (Patterns) is presented in Table 2 and Chart 1.

There were significant differences (Kruskall Wallis tests' p-level below 0.001) between Patterns A, B and C in all dimensions of antibiotic analysed in the study. The detailed comparison of subgroups (patterns) is presented in Table 3.

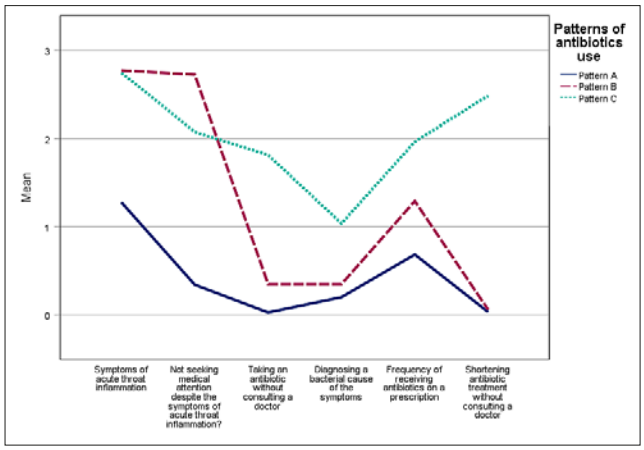

Figure 1. Antibiotic use in subgroups of subjects (Patterns)

As seen in the tables and charts above we have extracted three patterns of antibiotic use in case of acute pharyngitis.

Pattern A. Participants in this subgroup exhibited the lowest frequency of experiencing symptoms of acute pharyngitis. Despite experiencing symptoms less frequently than the others, they tended to manage their symptoms independently, and were less likely to seek medical attention. However, they also demonstrated the lowest incidence of taking antibiotics without a prescription, most likely due to their infrequent episodes of acute pharyngitis. This pattern suggests a potential, but rather low inclination towards self-care practices and antibiotic misuse.

Pattern B. Participants experienced symptoms of acute pharyngitis very often. Despite this, they demonstrate a pro-health attitude, with a higher tendency to seek medical attention and adhere to good practices associated with antibiotic use. This pattern suggests a balanced approach to healthcare seeking and antibiotic utilization, despite the high frequency of acute pharyngitis symptoms.

Pattern C. This subgroup represents a similar frequency of symptoms of acute pharyngitis as Pattern B. Nevertheless, the participants exhibited the highest frequency of taking antibiotic without consulting a doctor, as well as the highest incidence of bacterial angina confirmed by a doctor. The high possibility of self-administering antibiotics may stem from storing them in a home first aid kit, and left after previous anginas, which is suggested by the highest frequency of receiving a prescription for antibiotic and strongest tendency to self-reduce the time of antibiotic treatment. Pattern C suggests a very high inclination towards self-medication practices and antibiotic misuse.

Patterns of antibiotics use vs. health, pain, and beliefs about antibiotics. Subjective self-assessment of health, pain sensitivity and the 2 psychological factors: urgency (dimension of impulsiveness) and beliefs about antibiotics, are described in Table 4.

Subgroups of subjects with different antibiotic use patterns differed significantly in their willingness to use antibiotics for pain ($H_{K-W} = 8.836$; $p = 0.012$), urgency ($H_{K-W} = 14.971$; $p < 0.001$), and beliefs about antibiotics use ($H_{K-W} = 13.197$; $p < 0.001$). The ROC Curve (Receiver Operating Characteristics) was established to determine the cut-off scores differentiating the Pattern C subgroup from Patterns A and B [20]. The cut-off point for pain intensity prompting antibiotic use without consulting a doctor is 1.50; cut-off point for urgency – 2.25, and for beliefs about antibiotics use – 1.25. The differences in the self-assessment of health and pain intensity prompting a visit to the doctor were not significant. Table 5 presents detailed comparisons of subgroups with different patterns of antibiotics use in the 3 significantly different variables.

The results of comparison between subgroups showed that the subjects in Pattern C had significantly higher pain intensity, urgency, and anti-health beliefs than the subjects in Pattern A and Pattern B. The subjects in Pattern B also had a significantly higher pain intensity and anti-health beliefs than the subjects in Pattern A.

Table 2. Characteristics of antibiotic use in subgroups of subjects (Patterns).

		Pattern A		Pattern B		Pattern C		Total	
		N	%	N	%	N	%	N	%
Symptoms of acute throat inflammation	0 – less than 1/year, never	50	27.2	8	9.3	2	7.4	60	20.2
	1	64	34.8	12	14.0	6	22.2	82	27.6
	2	47	25.5	14	16.3	5	18.5	66	22.2
	3	17	9.2	24	27.9	5	18.5	46	15.5
	4	4	2.2	14	16.3	2	7.4	20	6.7
	5 and more	2	1.1	14	16.3	7	25.9	23	7.7
Not seeking medical attention despite the symptoms of acute throat inflammation	0 – less than 1/year, never	121	65.8	2	2.3	4	14.8	127	42.8
	1	63	34.2	11	12.8	7	25.9	81	27.3
	2	0	0.0	21	24.4	7	25.9	28	9.4
	3	0	0.0	34	39.5	3	11.1	37	12.5
	4	0	0.0	11	12.8	4	14.8	15	5.1
	5 and more	0	0.0	7	8.1	2	7.4	9	3.0
Taking an antibiotic without consulting a doctor	0 – less than 1/year, never	179	97.3	62	72.1	10	37.0	251	84.5
	1	5	2.7	18	20.9	5	18.5	28	9.4
	2	0	0.0	6	7.0	2	7.4	8	2.7
	3	0	0.0	0	0.0	4	14.8	4	1.3
	4	0	0.0	0	0.0	2	7.4	2	0.7
	5 and more	0	0.0	0	0.0	4	14.8	4	1.3
Diagnosing a bacterial cause of the symptoms	0 – less than 1/year, never	156	84.8	60	69.8	13	48.1	229	77.1
	1	24	13.0	23	26.7	7	25.9	54	18.2
	2	1	0.5	2	2.3	3	11.1	6	2.0
	3	1	0.5	1	1.2	2	7.4	4	1.3
	4	2	1.1	0	0.0	1	3.7	3	1.0
	5 and more	0	0.0	0	0.0	1	3.7	1	0.3
Receiving antibiotics on a prescription	0 – less than 1/year, never	110	59.8	27	31.4	8	29.6	145	48.8
	1	48	26.1	32	37.2	3	11.1	83	27.9
	2	10	5.4	12	14.0	7	25.9	29	9.8
	3	9	4.9	8	9.3	3	11.1	20	6.7
	4	4	2.2	4	4.7	3	11.1	11	3.7
	5 and more	3	1.6	3	3.5	3	11.1	9	3.0
Shortening antibiotic treatment without consulting a doctor	0 – less than 1/year, never	178	96.7	81	94.2	6	22.2	265	89.2
	1	6	3.3	5	5.8	1	3.7	12	4.0
	2	0	0.0	0	0.0	4	14.8	4	1.3
	3	0	0.0	0	0.0	7	25.9	7	2.4
	4	0	0.0	0	0.0	8	29.6	8	2.7
	5 and more	0	0.0	0	0.0	1	3.7	1	0.3

DISCUSSION

Antibiotic use patterns. The findings presented in the analysis suggest that the patterns of antibiotics use are related to the psychological factors, as well as to the declaration of pain sensitivity of the subjects. This result confirms the positive answer to the question whether there is a repeatable pattern of use of antibiotics among patients of family doctors.

The patterns of antibiotics use differentiate the risk of self-medication with antibiotics among subjects with different patterns of health status, which supports a positive answer to question (2). The relatively small size of the subgroup of patients who misuse antibiotics (9%) confirms that Poland has made important strides in tackling AMR in recent years [21]. This result is also consistent with the meta-analysis showing general tendency for de-escalation of antibiotic overuse[22]; however, it also confirms the necessity to continue efforts in reducing antibiotics overuse in Poland [21].

The psychological properties of the 3 subgroups of subjects with different behavioural patterns of antibiotics use, confirms the concept of the mediating role of positive urgency (3.1), as well as the role of beliefs and expectations (3.2) noted in the marijuana use model [10].

Limitations of determining the patterns. Differences in pain rating scales prompting people to take an antibiotic without consulting a doctor, perceived between subgroups with different patterns of taking antibiotics, may not initially appear

Table 3. Differences in antibiotics use between subgroups (Patterns) – U Mann-Whitney tests

	Patterns of antibiotics use					
	Pattern A – Pattern B		Pattern A – Pattern C		Pattern B – Pattern C	
	Z	p	Z	p	Z	p
Symptoms of acute throat inflammation	-7.452	<0.001***	-4.314	<0.001***	-0.144	0.886
Not seeking medical attention despite the symptoms of acute throat inflammation	-13.033	<0.001***	-6.872	<0.001***	-2.275	0.023*
Taking an antibiotic without consulting a doctor	-6.257	<0.001***	-9.717	<0.001***	-4.169	<0.001***
Diagnosing a bacterial cause of the symptoms	-2.828	0.005**	-4.748	<0.001***	-2.590	0.010*
Frequency of receiving antibiotics on a prescription	-4.484	<0.001***	-4.129	<0.001***	-1.759	0.079
Shortening antibiotic treatment without consulting a doctor	-0.987	0.324	-11.116	<0.001***	-8.092	<0.001***

Table 4. Subjective self-assessment of health, pain sensitivity, urgency, and beliefs about antibiotics

	Patterns of antibiotics use							
	Pattern A		Pattern B		Pattern C		Total	
	M	SD	M	SD	M	SD	M	SD
Self-assessment of health (0 – worst, 10 – best)	7.10	1.72	6.90	1.56	7.00	2.00	7.03	1.70
Pain intensity prompting a visit to the doctor	6.11	2.88	6.31	2.13	6.80	2.81	6.27	2.65
Pain intensity prompting antibiotic use without consulting a doctor	2.48	3.81	3.03	3.53	4.94	3.42	3.20	3.69
Urgency	1.93	1.83	2.21	1.89	3.44	1.95	2.15	1.90
Beliefs about antibiotics use – average from 1 (pro-health) – 10 (anti-health)	2.18	3/01	2.98	3.48	4.26	3.30	2.60	3.23

Table 5. Differences in health, pain sensitivity, urgency, and beliefs about antibiotics use between subgroups (Patterns of antibiotics use) – U Mann-Whitney tests

	Patterns of antibiotics use					
	Pattern A – Pattern B		Pattern A – Pattern C		Pattern B – Pattern C	
	Z	p	Z	p	Z	p
Pain intensity prompting antibiotic use without consulting a doctor	-0.968	0.333	-2.909	0.004**	-2.206	0.027*
Urgency	-1.263	0.207	-3.824	<0.001***	-2.858	0.004**
Beliefs about antibiotics use – average from 1 (pro-health) – 10 (anti-health)	-1.562	0.118	-3.599	<0.001***	-2.150	0.032*

to be fully consistent with other results. While numeric pain rating scales (NPRS) are reliable tools for measuring pain [16, 23], it is also important to remember that these instruments are highly correlated with emotional factors, including anxiety, depressed mood, fear and anger [24, 25]. One can speculate that in the question about anticipated pain prompting the use of an antibiotic without consulting a doctor, emotional factors may also have played a role. Perhaps the respondents attempted to rationalize their self-induced antibiotic use by justifying the violation with high perceived pain.

Antibiotic administering guidelines. Only a few common medical guidelines exist on when to prescribe antibiotics in cases of pharyngitis. The American Academy of Family Practice, the American College of Physicians (ACP), and the Centers for Disease Control and Prevention (CDC), as well as the Polish Otolaryngological Guidelines, advocate utilization of the criteria of these centers in the assessment of adult patients presenting with pharyngitis. These criteria consist of 4 key indicators: (1) subjective or objective fever; (2) absence of cough; (3) tender anterior cervical lymphadenopathy; and (4) tonsillar exudates [26]. Guided by the recommendations of the ACP, American Academy of Family Practice, and CDC, clinicians are advised to consider 2 primary management approaches: empirical treatment for individuals meeting 3–4 Centor criteria (referred to as the ACP empirical strategy), or conducting testing for patients exhibiting 2–3 criteria using a rapid antigen detection test (RADT), and subsequently administering antibiotics to those with a positive test result, or who meet all 4 criteria [27, 28]. Nevertheless, according to Linder et al., in 66% of visits, clinicians followed no specific strategy. The predominant cause for deviation from any recommended approach was the administration of streptococcal testing or antibiotics to patients deemed at low risk for streptococcal pharyngitis, with 0 or 1 Centor criteria [29].

Implications of antibiotic use patterns. The study may introduce a significant medical-psychological factor assisting in the decision to prescribe antibiotics for acute pharyngitis. During a patient›s visit presenting symptoms of acute pharyngitis, a familiar family physician could assess behavioural patterns based on prior visits and match them to one of the patterns delineated in this tudy. To assign a patient to a pattern of antibiotic use, the assessment of 2 aspects is sufficient: (1) retrospective analysis of the patient›s previous visits regarding the frequency of throat inflammation symptoms, frequency of self-administration of antibiotics, frequency of prematurely discontinuing the duration of antibiotic therapy prescribed by the doctor, and (2) assessment of the patient during the visit in terms of urgency and the level of reported pain and its adequacy to the objective, clinical indicators

determining the degree of throat inflammation. The level of reported pain intensity prompting antibiotic use without consulting a doctor above 1.5 in 0–10 numeric rating scale, may suggest a higher risk of self-medication with antibiotics.

Cautionary management in accordance with medical guidelines is particularly important when identifying a patient with a 'Pattern C of antibiotic use'. If a physician encounters such a patient during a visit, then special attention should be paid to adherence to guidelines, potentially prescribing antibiotics only in cases confirmed by objective methods of bacterial infection, and prescribing antibiotic quantities no greater than recommended in guidelines for treating streptococcal throat inflammation. Additionally, the physician should enforce follow-up visits with the patient to ensure that the patient has not prematurely discontinued antibiotic therapy. A very important aspect in the cases of patients with Pattern C is educating them about antibiotic resistance to some strains of bacteria.

In the case of encountering behaviour Patterns A or B in a patient, it is believed by the authors of the current stay that there is no need to apply special precautions. This is suggest mainly due to the fact of rare presentation of behaviours among patients exhibiting a given pattern, conducive to the development of antibiotic resistance by bacteria, such as self-administration of antibiotics and shortening the duration of antibiotic therapy [30].

CONCLUSIONS

Identified patterns highlight the diverse attitudes and practices concerning acute pharyngitis symptoms and antibiotic treatment among participants. Understanding these patterns is essential for tailoring interventions aimed at promoting appropriate healthcare seeking behaviours and rational antibiotic use in the management of acute pharyngitis.

According to the presented findings, the following patient characteristics should alert the physician during a visit: a high level of urgency, high level of pain above 1.5 of 10 reported by the patient during the visit, frequent throat infections in the past, positive history of self-medication with antibiotics in the past, and a tendency to shorten the duration of antibiotic therapy.

The study sheds new light on the factors that should be considered when a doctor decides to prescribe antibiotics for throat inflammation. Further studies with a similar structure are needed to apply the behaviour patterns observed in patients. It is promising that similar behaviour patterns could be studied in other infectious diseases, where patients tend to misuse antibiotics, allowing for the determination of antibiotic usage patterns in broadly defined infection cases. Taking into account patient characteristics in clinical decision-making could help limit the development of antibiotic resistance among bacteria and protect antibiotics, which should be the ultimate goal of every physician dealing with infectious diseases in their daily practice.

Another intriguing finding during of this study which worth further research is the aspect of high levels of pain in throat inflammation presented by patients self-administering antibiotics (Pattern C). Further analysis is needed to explore the relationship between pain sensitivity and improper antibiotic use.

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