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Coronavirus Pandemic

Insights of community pharmacists on antibiotic misuse during the COVID-19 pandemic in the northern region of Cyprus

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Abstract

Introduction: The global healthcare system faced unparalleled challenges during the coronavirus disease 2019 (COVID-19) pandemic, potentially reshaping antibiotic usage trends. This study aimed to evaluate the knowledge, perceptions, and observations of community pharmacists concerning antibiotic utilization during and after the pandemic; and offer crucial insights into its impact on antibiotic usage patterns and infection dynamics.

Methodology: This cross-sectional study involved 162 community pharmacists in Northern Cyprus. Data were gathered via a structured survey, including pharmacist demographics, antibiotic knowledge, perceptions of antibiotic resistance, and observations on antibiotic misuse during and after the COVID-19 pandemic. The data were analyzed by biostatistical methods.

Results: Over 90% of pharmacists demonstrated high awareness of antibiotic overuse and resistance. The average antibiotic use knowledge score was 5.09/7. The majority expressed interest in further education (85.2%) and participation in campaigns (96.9%) to promote appropriate antibiotic use. Notably, 87.7% of participants observed an increase in respiratory infections post pandemic, and 45.7% reported administering more antibiotics, reflecting heightened demand. Furthermore, 63.6% noted increased demand for unprescribed antibiotics, while 45.7% expressed concerns about potential neglect of the antibiotic resistance issue as a consequence of the pandemic.

Conclusions: The study highlights critical changes in antibiotic dispensing patterns among community pharmacists during and after the COVID-19 pandemic. The results here underscore the pivotal role of pharmacists in antibiotic stewardship, advocating for ongoing education, and stricter prescription regulations to optimize antibiotic use and combat resistance.

Key words: antibiotic; community pharmacists; COVID-19; pandemic; antibiotic resistance.

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Introduction

The emergence of the novel coronavirus disease 2019 (COVID-19) pandemic was an unprecedented global health crisis in late 2019 and healthcare systems adapted rapidly in response to new challenges globally [1]. The pandemic influenced various facets of healthcare, including the frequency of co-infections with respiratory pathogens, and, indirectly, the patterns of medication use [2]. Potential surge in antibiotic prescriptions was one of the most important concerns, driven by both genuine clinical need and perceived demand. This phenomenon added a layer of complexity to the ongoing global challenge of antibiotic misuse, growing resistance problem, and associated consequences [3].

There was an observable increase in antibiotic prescriptions during the initial phases of the COVID-19 pandemic across various healthcare settings. The main drivers of this surge were (i) the need to address secondary bacterial infections in COVID-19 patients and (ii) the uncertainty surrounding diagnosis in the early stages of the pandemic [3]. The increase in antibiotic usage raised concerns about potential overuse, leading to heightened scrutiny of prescribing practices and their implications on public health. Obviously, misuse and overuse of antibiotics have long been recognized as the major parameters contributing to the development of drug-resistant bacteria globally [4]. The increased utilization of antibiotics during the pandemic further exacerbated this concern, potentially accelerating the development and spread of antibiotic-resistant strains [2].

As the final point of contact between patients and prescription pharmaceuticals, community pharmacists play a crucial role in the global healthcare system [5]. Their insights and observations are invaluable in understanding medication utilization patterns, patient behaviors, and healthcare trends [6]. Furthermore, community pharmacists are well-placed to provide crucial information regarding the patterns of antibiotic

use, potential discrepancies between prescribed and dispensed antibiotics, and the concerns and questions raised by patients during the pandemic [7,8]. Thus, exploring pharmacists' perspectives on antibiotic consumption and associated parameters provides a vital perspective in comprehending the broader picture of antibiotic use during this crisis.

This cross-sectional study aimed to examine community pharmacists' general knowledge, perceptions on antibiotic use, and observations regarding the impact of the COVID-19 pandemic on antibiotic usage among the public in Northern Cyprus. Data on prescribing trends, pharmacists' observations, and patient interactions were collected and analyzed to gain insights into the evolving landscape of antibiotic use during and in the aftermath of the COVID-19 pandemic.

Methodology

Ethical considerations

Ethical approval for this study was obtained from the Eastern Mediterranean University Research and Publication Ethics Board (approval number: ETK00-2023-0053). Additionally, an official letter stating permission and suitability to conduct the study was received from the official pharmacists' association of Northern Cyprus.

Study design, population, and timeline

This investigation adopted a descriptive, cross-sectional design initiated in early November 2022 with the use of a paper-based, structured questionnaire in Turkish language. The first lockdown in response to the COVID-19 pandemic was in March 2020, which was recognized as the beginning of the pandemic in the country. The last lockdown was in January 2022, and this was recognized as the beginning of the post-pandemic phase in the country (based on records in the press reports). The study population was selected to mirror the demography of the community pharmacists in Northern Cyprus. There were 363 pharmacies in Northern Cyprus (at time of the study, according to website of the pharmacists' association of Northern Cyprus [9]). Assuming a confidence level of 95%, the projected sample size was estimated at 184 by using the openepi tool (https://www.openepi.com/); however, a total of 162 pharmacies actively participated in the study.

Data collection tool and pilot study

The questions included in the survey were a combination of questions based on previous literature, and questions developed for this study [10–14]. The survey included a total of 28 questions, in addition to 4 demographic questions requesting gender, age, recent graduation level, and years of experience. The survey was prepared in the local language, Turkish. There were three sections and the possible responses for the questions in each section were "agree", "neutral", and "disagree". The first section consisted of 14 questions and aimed to evaluate community pharmacists' perception of antibiotic usage. The second section included 7 questions which evaluated the knowledge of community pharmacists about antibiotic misuse in Northern Cyprus. The third section consisted of 7 questions to evaluate the perceptions of community pharmacists about antibiotic misuse during and after COVID-19.

A preliminary pilot study involving a cohort of 15 pharmacists was conducted to assess the feasibility of the survey instrument and to refine the study protocol. This pilot phase aimed to identify any potential challenges in data collection and to ensure the clarity and relevance of the survey questions. Based on the feedback and insights obtained from this pilot group, minor adjustments were made to the questionnaire to enhance its comprehensibility and applicability to the target population of pharmacists.

Statistical analysis

Microsoft Excel for Mac, version 16 (Microsoft® Corp., Redmond, WA, USA) was used for data management. The data were analyzed by using IBM Statistical Package for Social Sciences (SPSS) for Macintosh operating system (macOS), version 26.0 (Armonk, NY, USA). Descriptive statistics, Fisher's exact test, and Chi square tests were used to analyze the data. Chi square cross-tabulations were conducted to assess the associations between parameters. A p value below 0.05 was considered statistically significant.

Results

Demographic characteristics

A total of 162 pharmacists participated in our survey. The mean age was 37.20 years (minimum 22 years, maximum 77 years; 25th percentile 28 years, 75th percentile 41 years). 111 pharmacists had more than 4 years of experience. Out of a total of 162 participants, 53 (32.7%) were male, while 109 (67.3%) were female. The years of experience of pharmacists were categorized as follows: (i) pharmacists with 0–1 year of experience which included 10 (6.2%) pharmacists, (ii) those with 1–4 years of experience which included 41 (25.3%) pharmacists, (iii) those with 4–10 years of

Table 1. Knowledge of retail pharmacists about antibiotic misuse.

Statements	Number of participants who responded correctly* (n)	Percentage of participants who responded correctly (%)
Pharmacists can prescribe antibiotics without a prescription.	52	32.1
Inappropriate use of antibiotics leads to the spread of antibiotic resistance.	97	59.9
Although equally effective narrow-spectrum antibiotics are available, prescribing broad-spectrum antibiotics increases antibiotic resistance.	81	50
Conditions such as colds and coughs should always be treated with antibiotics as they will allow the patient to recover faster.	88	54.3
Antibiotics cannot cure flu	87	53.7
When symptoms convalesced, patients can stop taking the antibiotics	86	53.1
Antibiotics refer to any substance used to kill microorganisms or inhibit their growth.	18	11.1

*Each correct answer was considered as 1 point whereas wrong answers were 0 points.

experience which included 57 (35.2%) pharmacists, and (iv) those with over 10 years of experience which included 54 (33.3%) pharmacists.

Community pharmacists' attitudes regarding antibiotic usage

Among the participants, 146 (90%), showed a high level of awareness for antibiotic overuse, while 136 (84%) pharmacists expressed concerns on the issue of antibiotic resistance. Additionally, 157 (96.9%) pharmacists upheld the belief in the potential of precise antibiotic usage to effectively address challenges associated with resistance.

In anticipation of the future, 98 (60.5%) community pharmacists felt optimistic about the new antibiotic development studies as a viable solution to fight the antibiotic resistance problem. The significance of comprehensive knowledge about antibiotics was underscored as pivotal for professional advancement, with 157 (96.9%) participant pharmacists emphasizing its indispensable role in their careers. In practice, 138 (90.7%) pharmacists expressed confidence in their ability to judiciously dispense antibiotics. Conversely, 133 (82.1%) identified room for enhancement within their professional circle.

Among all, 138 (85.2%) community pharmacists expressed a strong inclination towards further education on antibiotics. Likewise, 157 (96.9%) expressed willingness to actively engage in campaigns aimed at promoting appropriate antibiotic use.

Among pharmacists included in this study, 152 (94.4%) proactively engaged in enlightening patients about the prudent use of antibiotics and the potential challenges of resistance. In addition, 129 (80.2%) advocated for supervised utilization of antibiotics that were not obtained through prescription. Furthermore, 147 (91.4%) pharmacists indicated a proclivity to consult prescribers when confronted with uncertainty regarding the appropriateness of an antibiotic prescription. Detailed results are presented in Figure 1.

Figure 1. Responses of community pharmacists regarding antibiotic use. The survey included three possible responses: agree, neutral, and disagree. The 'agree' option was considered as a positive attitude; and 'neutral' and 'disagree' were considered as negative attitude. Percentages of participants with a positive attitude are represented with the blue color; and percentage of participants with negative attitude are represented with the brown color.

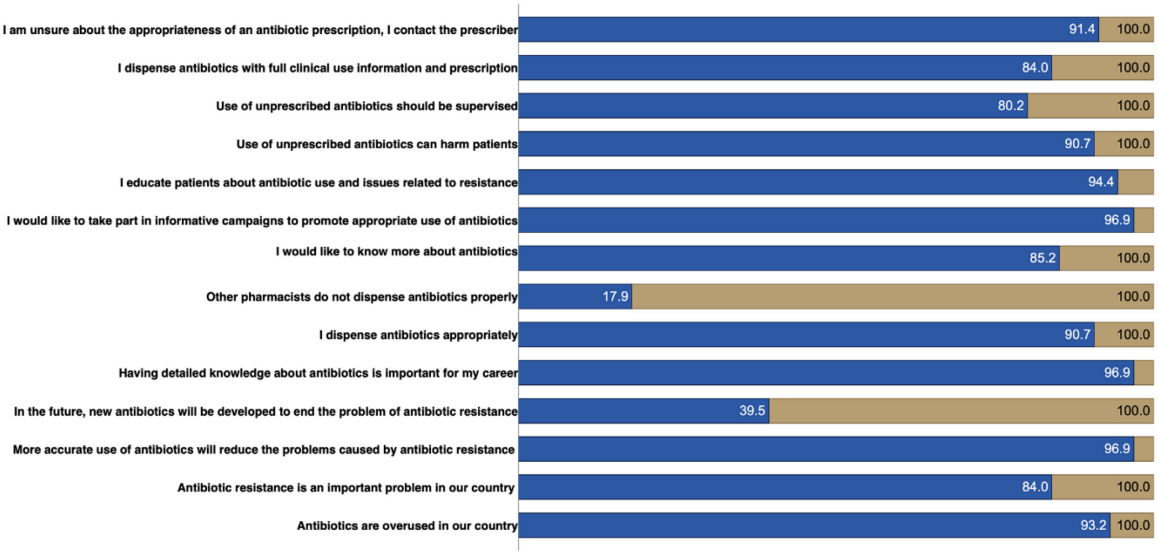


Table 2. Crosstabulation analysis of various parameters for significant associations between perceptions and practices.

Analyzed parameters	Significance
"I dispense antibiotics appropriately" and "Inappropriate use of antibiotics causes the spread of antibiotic resistance."	0.000*
"Use of unprescribed antibiotics can harm patients" and "Pharmacists can prescribe antibiotics without a prescription."	0.044*
"Antibiotics are overused in our country" and "Conditions such as colds and coughs should always be treated with antibiotics as they will allow the patient to recover faster."	0.030*
"I give antibiotics with full clinical use information." and "Inappropriate use of antibiotics causes the spread of antibiotic resistance."	0.002*
"Harmful effects of unprescribed antibiotics" and "Inappropriate use of antibiotics that cause antibiotic resistance."	0.002*
"Use of unprescribed antibiotics can harm patients" and "Pharmacists can prescribe antibiotics without a prescription."	0.044*

*Statistical significance of associations was calculated by Chi-square analysis. Only significant associations among all parameters are presented.

Knowledge of community pharmacists regarding antibiotic misuse

The mean score for the knowledge section of the survey was 5.09 out of 7. Among the participating pharmacists, 52 (32.1%) demonstrated accurate awareness that pharmacists are not authorized to prescribe antibiotics without a valid prescription. Additionally, 97 (59.9%) pharmacists displayed a correct understanding of the correlation between inappropriate antibiotic usage and the dissemination of antibiotic resistance. A total of 81 (50%) participants acknowledged that the prescription of broad-spectrum antibiotics in cases where equally efficacious narrow-spectrum alternatives are available, can exacerbate the antibiotic resistance problem. A total of 88 (54.3%) participants recognized that antibiotics should not be administered routinely for conditions like coughs and colds. Similarly, 87 (53.7%) participants accurately affirmed that antibiotics do not cure influenza, and 86 (53.1%) participants agreed that patients may discontinue antibiotic use if their symptoms improve. However, only 18 (11.1%) participants correctly defined antibiotics as medicines used to destroy or inhibit the growth of bacteria.

The most correctly answered question/statement was 'inappropriate use of antibiotics causes the spread of antibiotic resistance.', and least correctly answered question/statement was 'antibiotics refer to any substance used to kill microorganisms or inhibit their growth.' Details of this section are summarized in Table 1.

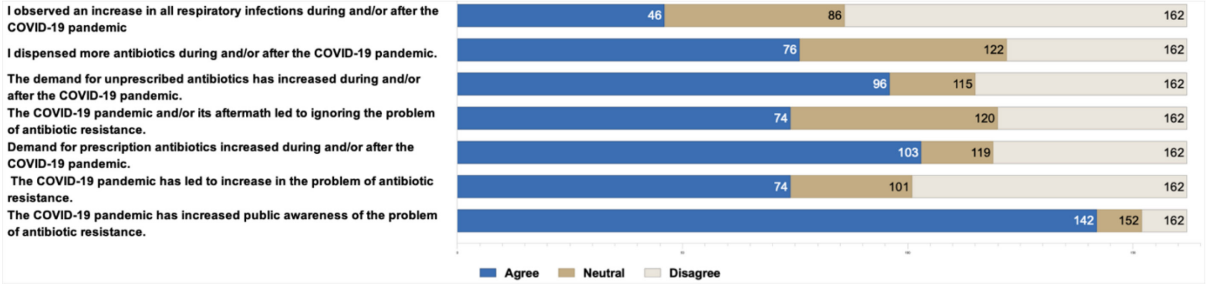
Perceptions of community pharmacists about antibiotic misuse during and after COVID-19

The antibiotic misuse perceptions of community pharmacists during and after COVID-19 are summarized in Figure 2. The majority, 142 (87.7%) pharmacists, reported that they observed an increase in respiratory infections during and/or after the pandemic. 75 (45.7%) pharmacists acknowledged administering more antibiotics during the pandemic period. Similarly, 104 (63.6%) respondents noted an increase in the demand for unprescribed antibiotics, while 75 (45.7%) pharmacists expressed concerns that the pandemic may have led to a neglect of the antibiotic resistance issue.

Associations between perceptions and practices

The participants' responses to perception and practice related questions were analyzed by crosstab analysis to find significant associations between the perceptions of pharmacists and their practices. Specifically, we identified that the statements emphasizing the importance of appropriate antibiotic dispensing associated significantly with concerns about the spread of antibiotic resistance due to misuse. Additionally, we identified that the question regarding the caution against using unprescribed antibiotics aligned significantly with the risk of harm to patients. We also investigated the association between other statement pairs which are listed in Table 2 and which did not exhibit statistically significant associations.

Figure 2. Distribution of the perceptions of participants about antibiotic misuse during and after the coronavirus disease 2019 (COVID-19) pandemic. The aim of this section was to observe the changes in attitudes of community pharmacists during pre- and post-COVID-19 periods.



Discussion

The results of the current study revealed important insights on antibiotic usage during the COVID-19 pandemic. An overwhelming majority (87.7%) of pharmacists noted a rise in respiratory infections post-pandemic, signaling a shift in disease patterns. Moreover, 45.7% reported an increased administration of antibiotics, reflecting heightened demand. On the other hand, 63.6% observed a surge in demand for unprescribed antibiotics, while 45.7% expressed concerns about a potential neglect of the antibiotic resistance issue amidst the pandemic.

Initially, the overall knowledge of community pharmacists was evaluated to enlighten the profile of the participants aligning with previous studies that highlighted the importance of pharmacist knowledge in antibiotic stewardship efforts [14]. Despite the fact that the overall knowledge score was placed somewhere that can be admissible as medium-high (5.09/7), a small percentage (32.1%) demonstrated accurate awareness that pharmacists are not authorized to prescribe antibiotics without a valid prescription. It is assumed that in countries where antibiotics are easily obtained without a prescription from community pharmacies, antibiotic resistance emerges more rapidly [15]. Our data, which is consistent with the recent findings, suggest a need for measures aimed at strengthening the enforcement of prescription-only regulations, alongside training programs designed to educate pharmacy staff on the proper utilization of antibiotics [16].

Over 90% of the community pharmacists were aware of antibiotic overuse, and 84% expressed concern about resistance. Almost all believed in the importance of appropriate antibiotic usage. A majority were optimistic about new antibiotic development (60.5%) and stressed the importance of comprehensive antibiotic knowledge in their careers (96.9%). The participants also showed a strong interest in continuous education (85.2%) and active participation in campaigns (96.9%). It can be inferred that community pharmacists are prepared to take part in instructional programs aimed at enhancing the use of antibiotics when considered in the context of other studies [17]. It should be noted that, in Northern Cyprus, antibiotics are legally ‘prescription-only’ since 2016; yet pharmacists may dispense them without a prescription due to weak enforcement of regulations and an ineffective control system. This creates a paradox: although pharmacists show high awareness of antibiotic resistance, illegal dispensing persists due to patient demand and regulatory gaps. Strengthening enforcement, improving the functionality of electronic prescription systems, and enhancing public and pharmacist education are essential steps to align practice with knowledge. Collectively, the data highlight the critical role that pharmacists and their knowledge play in preventing antibiotic misuse and resistance; as a result, it can be suggested to implement the organization of multidisciplinary educational programs [18].

Community pharmacists also play pivotal roles in facilitating the prudent use of antibiotics, as demonstrated by various studies worldwide; and implementing educational strategies and interventions targeting identified shortcomings and attitudes could significantly enhance antibiotic dispensing and usage while minimizing resistance [8]. The observed increase in respiratory infections, reported by an overwhelming majority of pharmacists in the current study, aligns with previous studies that have highlighted the surge in such cases during outbreaks of respiratory illnesses [19,20]. In our setting, a notable percentage of pharmacists acknowledged administering more antibiotics during and after the pandemic. This underscores the critical role of pharmacists in responding to public health crises, a sentiment corroborated by research emphasizing their pivotal position in healthcare delivery [21]. The observed rise in demand for unprescribed antibiotics, especially reported directly by community pharmacists during this period, is remarkable and consistent with global concerns about antimicrobial self-medication, warranting urgent attention and intervention [22–24].

The results of the current study provide important insights concerning antibiotic misuse during and post the COVID-19 pandemic from the perspective of community pharmacists. The notable surge in respiratory infections reported by the majority (87.7%) of pharmacists indicates a substantial shift in disease prevalence, possibly influenced by the pandemic's unique circumstances. This finding aligns with studies that have observed similar trends during outbreaks of respiratory illnesses [19,20,25–27]. Additionally, the significant proportion of pharmacists (45.7%) who acknowledged an increase in antibiotic administrations underscores the crucial role played by pharmacists in promptly addressing heightened demand for these medications during public health crises, in agreement with the findings of previous research [21]. The observed rise in demand for unprescribed antibiotics is consistent with global concerns surrounding antimicrobial self-medication, indicating a pressing need for interventions and educational initiatives targeting both healthcare providers and the public [22,24]. The worries expressed by 45.7% of

pharmacists about the potential neglect of the antibiotic resistance issue during the pandemic emphasize the importance of continued attention and education. This would ensure that crucial public health matters are not overlooked during crises.

The way pharmacists think about antibiotics is closely tied to how they dispatch them. Similarly, beliefs about how often antibiotics are used and when they should be prescribed for common illnesses show how attitudes affect prescription habits [28,29]. In the current study, statements emphasizing the importance of appropriate antibiotic dispensing were associated strongly with concerns about the spread of antibiotic resistance due to misuse ($p = 0.000$). Furthermore, the association between understanding the negative impact of antibiotic use without clinical information on antibiotic resistance, and appropriately dispensing antibiotics were significant as well ($p = 0.002$). Previous research showed us that knowing the risks of using antibiotics without a prescription, and understanding the connection between antibiotic misuse and resistance, can guide careful antibiotic dispensing [30]. Additionally, our data demonstrated that the caution against using unprescribed antibiotics aligns significantly with the risk of harm to patients and with antibiotic resistance ($p = 0.044$). In this context, not seeing an association between believing antibiotics can be harmful and understanding antibiotic resistance suggests that there may be a gap in understanding the bigger picture of antibiotic misuse [29]. Our results also suggest that there is a significant association between recognizing the issue of antibiotic overuse and the misconception about the effectiveness of antibiotics in viral infections to provide the patient with a faster recovery ($p = 0.030$). Similar observations have been reported in previous studies on public misconceptions about antibiotics despite it being well known that antibiotics are not for viral infections, and this actually shows that there is a long way to go to achieve success in appropriate antibiotic use within the community [31].

There are several limitations to consider regarding the results of our study. This study, conducted in Northern Cyprus, provides insightful but region-specific perspectives on community pharmacists' views and practices regarding antibiotics during and post the COVID-19 pandemic. Its cross-sectional nature offers a snapshot, yet limits long-term trend analysis. Reliance on self-reported data and voluntary participation may introduce biases.

Conclusions

This study provided valuable insights on the perceptions and practices of community pharmacists in Northern Cyprus concerning antibiotic use, during and after the COVID-19 pandemic. It demonstrated that antibiotic use patterns were affected by the pandemic. The findings revealed significant shifts in disease prevalence and antibiotic dispensing patterns.

The pharmacists recognized significant changes in antibiotic prescribing patterns and disease prevalence during and after the pandemic. While they exhibited a strong awareness of antibiotic resistance challenges and their pivotal role in stewardship, they acknowledged that there is room for improvement in antibiotic dispensing practices. Ongoing education and training programs for pharmacists, coupled with stricter enforcement of prescription-only regulations, are paramount to address their concerns. These measures are crucial for optimizing antibiotic use, combating resistance, and safeguarding public health.

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