Research Article

Perceptions of resident physicians towards antibiotic prescribing during the COVID-19 pandemic: a qualitative study

Wejdan Shroukh[1], Nada Yasein[2], Farihan Barghouti[2], Manar Yousef[2], Ghayda Alnajdawi[2]

1 *Middle East University (MEU), Amman, Jordan*

2 *The University of Jordan, Amman, Jordan*

Corresponding author: Wejdan Shroukh (wshrouk@meu.edu.jo)

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Abstract

Background: The COVID-19 pandemic affected physicians' practices of prescribing antibiotics for Upper Respiratory Tract Infections (URTIs).

Aim: This study aims to explore the perceptions of resident physicians in a teaching hospital towards antibiotic prescribing for Upper Respiratory Tract Infections (URTIs) during the COVID-19 pandemic.

Methods: This was a qualitative study based on conducting in-depth face-to-face interviews with resident physicians. Interviews were audio-recorded, transcribed verbatim in Arabic, translated to English, anonymised, and analysed thematically.

Results: Data analysis produced five broad themes: determinants of prescribing antibiotics for URTIs before and after the pandemic, uncertainty in differentiating between COVID-19 cases and other URTIs, the shift in antibiotic prescribing for URTIs following the pandemic, the place of azithromycin in the treatment of COVID-19, and patients' expectations of antibiotic prescribing.

Conclusion: The study demonstrated that the COVID-19 pandemic added to the complexity of controlling the use of antibiotics in a country that is already striving against inappropriate antibiotics utilization.

Introduction

Upper Respiratory Tract Infections (URTIs) are often self-limiting conditions affecting the nostrils, nasal cavity, pharynx, and larynx (Dehn Lunn 2018; Garcia et al. 2022). Influenza, the common cold, and pharyngitis are some of the most prevalent examples of URTIs that are caused by different strains of viruses (Garcia et al. 2022).

Being viral infections in the main, these types of infections do not benefit from antibiotic treatment most of the time (Jones and Samore 2017; Germeni et al. 2018). Certain cases of URTIs can be complicated with secondary bacterial infections requiring antibiotic treatment, however, this needs to be thoroughly investigated (Petersen et al. 2007; Hodgson et al. 2012). Otherwise, the use of antibiotics for treating viral URTIs contributes to the growing public health crisis of antimicrobial resistance and exposes patients to adverse reactions (Petersen et al. 2007; Jones and Samore 2017; Germeni et al. 2018). Despite this,

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evidence shows that URTIs remain the most common indication for which antibiotics are prescribed (Dehn Lunn 2018; Havers et al. 2018). This practice, which is described in the literature as "inappropriate antibiotic use", has been studied by many researchers. Several attempts have been made to understand the problem and suggest potential interventions to reduce its impact on antimicrobial resistance (Jones and Samore 2017; Silverman et al. 2017; Dehn Lunn 2018; Germeni et al. 2018; Havers et al. 2018; Karuniawati et al. 2020; Garcia et al. 2022).

The announcement of COVID-19 infection as a pandemic in 2020 added significantly to the burden of respiratory tract infection cases worldwide (WHO 2022). The pandemic which is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has affected millions of patients around the world since its commencement (WHO 2022). The implication of the pandemic was a spread of respiratory infection cases with symptoms comparable to other types of URTIs, particularly, Influenza (Flu) (CDC 2022a; WHO 2022). Testing for the virus has been the key factor in confirming the diagnosis of COVID-19 cases and subsequently, applying the accepted standards of care (Jarrom et al. 2022).

In terms of prescribing antibiotics during the COVID-19 pandemic, contradictory findings were observed in the literature. A recent meta-analysis showed that a relatively high proportion of COVID-19 patients included in the analysis received unnecessary antibiotic treatment (Langford et al. 2021). Some studies reported inappropriate antibiotic prescribing during the pandemic (Al-Hadidi et al. 2021; Armitage and Nellums 2021; Langford et al. 2021; Yasein et al. 2021; Murillo-Zamora et al. 2022; Tsay et al. 2022), while others reported a decline in the number of antibiotic prescriptions (Kitano et al. 2021; Rojas-Garcia and Antoñanzas 2021; Gillies et al. 2022; Norman et al. 2022). Much of the current literature on prescribing antibiotics for COVID-19 patients pays particular attention to the effectiveness of azithromycin. In spite of the suggested in-vitro activity of azithromycin as an antiviral agent against SARS-CoV-2, clinical data failed to prove the effectiveness of the drug (Siemieniuk et al. 2020; Hinks et al. 2021; Johnston et al. 2021; Kamel et al. 2022; Matoso Laranjo 2022).

In the literature on the impact of COVID-19 pandemic on antibiotic prescribing, a study from Jordan formed the context of the current research. The study was conducted in Jordan University Hospital (JUH) with the aim of assessing the impact of an educational intervention on reducing antibiotic prescribing. Surprisingly, the study reported a rise in antibiotic prescribing after receiving the educational intervention regarding appropriate antibiotic use. This was attributed by the authors to the impact of the COVID-19 pandemic which occurred during the post-intervention period of the research (Yasein et al. 2021). Accordingly, the current study was carried out in the same setting in an attempt to explain the aforementioned findings. The current study utilizes a qualitative research approach to attain a deep understanding of the phenomenon under

investigation (Stevens and Wrenn 2013). The study aims to explore the perceptions of residents in a teaching hospital towards antibiotic prescribing for Upper Respiratory Tract Infections (URTIs) during the COVID-19 pandemic.

Materials and methods

This was a qualitative study based on conducting in-depth interviews with research participants. As mentioned in earlier sections of this paper, the current study was carried out in an attempt to explain findings of a previously conducted research reporting a rise in antibiotic prescribing rates during the COVID-19 pandemic (Yasein et al. 2021). Accordingly, in-depth interviews were deemed suitable to explore the perceptions and experiences of research participants towards antibiotic prescribing (Rutledge and Hogg 2020). This was expected to unfold the root causes of the rise in antibiotic prescribing that were reported previously in the same setting (Yasein et al. 2021). The Standards for Reporting Qualitative Research were followed to report findings of the current research (O'Brien et al. 2014).

Study participants

Convenience sampling was used to recruit research participants. All resident physicians working in the departments included in the preceding study were approached to take part in the research (Yasein et al. 2021). This included resident physicians in the departments of internal medicine, paediatrics, emergency, Ear, Nose, and Throat (ENT), and family medicine. Research participants were required to provide a verbal consent to take part in the study. The consent was audio-recorded as part of the research interviews.

Data collection

Face to face semi-structured interviews were conducted by two members of the research team. Data were collected over the time period between June, 2021 and March, 2022. A topic guide that was constructed by two members of the research team was used for data collection. The topic guide was informed by findings of a previously conducted research in the same setting (Yasein et al. 2021) and by reviewing the relevant literature on the topic under investigation. Interviews were audio-recorded, and qualitative data from semi-structured interviews were transcribed verbatim in Arabic, translated to English, and anonymised before commencing the analysis. Ethical approval and funding was granted for the research by the Deanship of Academic Research in the University of Jordan.

Data analysis

All translated transcripts were processed using Microsoft Word. The software features were utilized in data coding. Thematic (inductive) analysis was carried out to describe

any existing patterns in the dataset. This was perceived to be a flexible analysis method that can be used for a variety of research question types (Nowell et al. 2017). Data analysis followed the six phases of thematic analysis described by Braun and Clarke (Braun and Clarke 2006).

Results

The study included a total of 22 resident physicians working in different departments as follows: paediatrics department 4 participants, family medicine department 12 participants, Ear, Nose and Throat department two participants, and internal medicine department three participants. The following themes emerged from the analysis of participants' data:

1. Determinants of prescribing antibiotics for Upper Respiratory Tract Infections (URTIs) before and after the COVID-19 pandemic.

Three different variables were identified as the basis for deciding whether to prescribe an antibiotic for URTIs or not prior to the pandemic. First, patient's medical history including the duration and severity of symptoms before seeking medical advice. Second, the clinical examination where a decision to prescribe an antibiotic was based on the signs and symptoms of the patients. A number of signs and symptoms were highlighted by research participants and those included runny nose, fever (high or low grade fever), cough (productive or non-productive), and findings suggestive of follicular tonsillitis (presence of swelling, pus, or exudate). Third, clinical investigations including lab tests (inflammatory markers, C-reactive protein, or white blood cells count) and chest X-ray. A common view amongst interviewees was that upper respiratory tract infections are viral infections that do not require antibiotics use.

"First thing, upon examining the patient, if the patient has fever, cough, or red eyes these symptoms are more common with viral infections…also upon examination, there is hyperaemic throat….these are viral infections so just supportive management is needed and no need for antibiotics. But if there is bacterial source of infection (follicular tonsillitis), we can introduce oral antibiotics" P2

Following the commencement of the pandemic, the aforementioned three variables forming the basis for antibiotic prescribing relatively remained the same with some change in their focus. For example, the first factor which was patient's medical history had a new emphasis on collecting information about specific risk factors that were thought to be significantly associated with complications of the COVID-19 infection. Such risk factors included older age and the presence of comorbidities like cardiovascular disease and diabetes mellitus. Moreover, taking the medical history from the patient during the

pandemic included questioning about recent contact with COVID-19 patients and the status of vaccination against the virus. Clinical examination, the second determinant of antibiotic prescribing, became more focused on the severity of symptoms. Research participants perceived higher temperature and more severe symptoms as risk factors for COVID-19 complications like pneumonia. Clinical investigations, the third determinant of antibiotic prescribing, comprised mainly of the PCR (polymerase chain reaction) test to confirm the diagnosis of COVID infections, and chest X-ray to confirm the diagnosis of COVID-19 pneumonia.

"The important things are patient's age and the symptoms. With older patients, we have more concerns about developing bacterial super infections" P6

"The number of chest X-rays rose significantly. I mean… from what I have seen, I noticed that they became able to diagnose COVID-19 cases only using the X-ray. From this experience, I am convinced now that X-rays are the most useful tools. I have not read research about this, but from my experience here in the hospital I saw that based only on X-ray, you can tell if this is a possible COVID-19 case or not" P16

Patients' preference of using antibiotics had its impact on prescribing antibiotics in some cases. This will be further discussed in the last theme of the results.

2. Uncertainty in differentiating between COVID-19 cases and other Upper Respiratory Tract Infections (URTIs).

Whilst a minority mentioned that they were confident in diagnosing RTIs including COVID-19, the majority of research participants agreed on a general sense of uncertainty and lack of confidence in diagnosing patients with symptoms of URTIs following the commencement of the pandemic. It became challenging for physicians to differentiate between COVID-19 cases and other upper respiratory tract infections.

"Sure, it is becoming more confusing. Any patient with an URTI is treated as a COVID patient until proven otherwise" P3

Participants attributed this confusion in confirming the diagnosis to several factors. Factors highlighted by research participants included inability to perform the PCR test to all patients as this was perceived to be impractical, refusal to perform the PCR test by some patients, PCR tests yielding no results, the perceived inaccuracy of COVID-19 rapid tests, the variability and inconsistency of COVID-19 symptoms, the similarity between COVID-19 symptoms and other upper respiratory tract infections symptoms, and finally, uncertainty in interpreting chest X-ray findings.

"Of course I feel more confused about the diagnosis because even with COVID patients, every patient comes with different symptoms…so the symptoms are highly variable among patients" P4

"We cannot differentiate whether this is coronavirus or other URTI…of course we cannot perform a PCR test for all patients, but if the patient is highly suspicious we perform it" P12

A recurrent theme in the interviews was a sense amongst interviewees that the uncertainty in differentiating COVID-19 cases from other URTIs resulted in increased prescribing of antibiotics. It was a general perception among participants that COVID-19 patients are at higher risk of developing complications than other viral infection patients. Therefore, they tended to prescribe antibiotics as a "back up" plan in case those patients were actual COVID-19 cases who were at risk of deterioration at home. Moreover, research participants expressed concerns regarding the inability of their patients to come back to the clinic because of COVID related restrictions like self-quarantine. Consequently, they believed that it would be safer to prescribe antibiotics as a precautionary measure even if they were not certain about the diagnosis.

"Probably yes, the number of my antibiotic prescriptions increased because I fear that the patient will not be able to come back, or deteriorate at home and not be able to return to the hospital, or that the patient has to self-quarantine so I prescribed more antibiotics" P13

On the other hand, research participants reported that the likelihood of having a COVID-19 infection led the patients to insist on having an antibiotic (particularly azithromycin). In some of those cases, the physicians were under pressure to prescribe antibiotics for their patients which further contributed to the overall increase in antibiotics use.

3. The shift in antibiotic prescribing for Upper Respiratory Tract Infections (URTIs) following the COVID-19 pandemic.

A minority of interviewees argued that antibiotic prescribing was not affected or even declined after the commencement of the pandemic whilst the majority agreed that prescribing increased. Most of the participants pointed out that the increase was mainly in the use of azithromycin. While there was a general acceptance of the fact that COVID infection by itself is a viral infection that does not require an antibiotic for treatment, participants provided some justifications for prescribing antibiotics. Research participants reported concerns regarding the development of secondary bacterial infections among COVID-19 patients. It was a common belief that COVID-19 patients are at high risk of developing superinfections, therefore, the fear of actual or potential deterioration in patients' health was one justification for prescribing antibiotics.

"In the beginning of the pandemic, some COVID patients came with severe presentations and severe pneumonia, they would be given their chance not to worsening. They were given their chance of recovery so that we do not feel that we did not do our best with them" P8

Moreover, the idea that there are high risk patient groups who need additional protection from secondary infections was accepted by most of the participants. They mentioned elderly patients and those with comorbidities like cardiovascular disease, diabetes mellitus, asthma, and Chronic Obstructive Pulmonary Disease (COPD) as COVID patients who were eligible for receiving antibiotics.

"What we fear in particular is the presence of comorbidities like asthma, COPD, diabetes mellitus, and obese patients. Those patients are prescribed antibiotics because they can deteriorate and will not be able to come to the hospital" P7

Limitations on performing the clinical examination were also mentioned as one reason for prophylactic prescribing of antibiotics. As one interviewee said:

"Prescribing increased because sometimes when you see the patient you cannot perform a full physical examination. Many times you will have students in the clinic and you want to limit the spread of the infection, so you have to limit your physical exam. Therefore, you prescribe an antibiotic without being sure of the case for the fear of having a COVID case which can spread…so the use of antibiotics increased" P16

Another reason justifying the increase in antibiotic prescribing was the belief that azithromycin has an anti-inflammatory effect. This will be further elaborated in the following section.

4. The place of azithromycin in the treatment of COVID-19 cases.

Prescribing azithromycin for the treatment of COVID-19 was an accepted practice by the majority of research participants with varying justifications for its use. The most common rationale for prescribing azithromycin for COVID-19 cases was the perceived anti-inflammatory effect of the drug. Some interviewees argued that the anti-inflammatory effect of azithromycin places the drug as a first line treatment once a patient tests positive for COVID-19.

"Zomax works as an anti-inflammatory in addition to being an antibiotic. So we can use it in cases of severe viral infections with severe respiratory symptoms" P2

"When the test is positive we prescribe Zomax for the patient" P6

A number of participants believed in the evidence based prescribing of azithromycin. Some interviewees

mentioned reading published literature on the efficacy of azithromycin in the treatment of COVID-19. Others reported adhering to local protocols circulated on the hospital level or following guidance from senior physicians.

"Some studies showed that Zomax can be given to COVID-19 patients" P4

"Because most studies were on the use of azithromycin for COVID-19 cases, so it became the accepted routine for treatment" P10

Some participants described patients' preference for being prescribed azithromycin as it became a popular treatment of COVID-19 during the pandemic. This will be further detailed in the next theme (Patients' expectations of antibiotic prescribing).

It is worth mentioning that the vast majority of resident physicians reported prescribing azithromycin as their first choice when a need for an antibiotic emerged. In two cases, the use of amoxicillin and clavulanate was mentioned, however, participants explained that this was only in the beginning of the pandemic. Later, this was switched to prescribing azithromycin based on the perceived benefit at that time. In one other narrative, a resident physician reported prescribing levofloxacin for hospitalized patients.

5. Patients' expectations of antibiotic prescribing.

Responding to patients' pressure and preference for using antibiotics for URTIs seemed to be a challenge for research participants. Patients' expectations of being prescribed an antibiotic was one of the reasons for prescribing antibiotics before and after the pandemic. However, it was evident that this pressure was a significant contributor to the rise in antibiotic prescribing after the pandemic in particular. It was reported by interviewees that some patients with confirmed or potential COVID-19 infection explicitly asked for antibiotics, particularly azithromycin. According to research participants, this was the basis for increased conflicts with the patients after the pandemic.

"Patients ask more for antibiotics now, and has increased our conflicts with them" P5

"It increased in the beginning because patients became fearful and asked for antibiotics whether it was a viral or bacterial infection" P10

"For me, antibiotics prescribing increased because the patients ask to be prescribed antibiotics" P22

Discussion

This study provides an opportunity to advance our knowledge of the aspects of prescribing antibiotics for URTIs. This paper focuses on changes in antibiotic prescribing behaviours after the COVID-19 pandemic and aims to explore factors driving this change.

Since the spread of the coronavirus disease, literature has emerged that offers contradictory findings about patterns of prescribing antibiotics during the pandemic. For example, Rojas-Garcia and Antoñanzas from Spain reported a general decline in antibiotic prescribing in the first year of the pandemic. They ascribed this reduction in antibiotic prescribing to the applied personal protection measures at the time of the study including lockdown and other pandemic related restrictions like social distancing (Rojas-Garcia and Antoñanzas 2021). These findings seem to be consistent with other studies from Canada and Australia (Kitano et al. 2021; Gillies et al. 2022).

Results of the current study, however, are broadly consistent with research reporting an increase in antibiotic prescribing during the pandemic (Al-Hadidi et al. 2021; Armitage and Nellums 2021; Langford et al. 2021; Kamara et al. 2022; Murillo-Zamora et al. 2022; Tsay et al. 2022). The increase in antibiotic prescribing during the COVID-19 pandemic that was reported in the current research was justified by the perception that COVID-19 patients are at higher risk of developing secondary bacterial infections. Particular patient populations (namely the elderly and those with comorbidities) were further perceived to be at higher risk of secondary infections. Similar results were reported by Murillo-Zamora et al. who concluded that COVID-19 patients with comorbid conditions were more likely to receive empirical antibiotic prescriptions (Murillo-Zamora et al. 2022). They also identified patients with pneumonia upon admission to hospital, male patients, and those experiencing a longer course of the disease as COVID-19 patient populations at higher risk of receiving empirical antibiotic treatment (Murillo-Zamora et al. 2022). However, it is worth noting that the impact of using antibiotics in older COVID-19 patients could not be confirmed in a comparative study conducted by Rosca et al from France (Rosca et al. 2022).

Literature on antibiotic prescribing during the COVID-19 pandemic suggests additional explanations for the rise in prescribing rates. For example, replacing face to face consultations with telephone consultations and other types of telehealth was described as a contributing factor to the rise in antibiotic prescribing by Tsay et al and Armitage and Nellums (Armitage and Nellums 2021; Tsay et al. 2022). Other factors identified in the literature include the severity of illness, trying to avoid overwhelming already burdened health systems, and the lack of clear guidance on using antibiotics for COVID-19 patients (Al-Hadidi et al. 2021; Langford et al. 2021; Tsay et al. 2022).

Uncertainty in diagnosing COVID-19 cases and the confusion with other types of URTIs were brought up by research participants in the current study and were highlighted as potential contributing factors to the rise of antibiotic prescribing. Similar findings were reported by other researchers (Langford et al. 2021; Rojas-Garcia and Antoñanzas 2021). Patients' pressure and expectation of receiving antibiotic treatment was also a driving factor to-

wards the rise in antibiotic prescribing in the current study. A recently published research from Bangladesh explored the potential factors affecting antibiotic seeking behaviours among COVID-19 patients. The study utilized qualitative research methods to attain a deeper understanding of patients' perceptions and behaviours. The study reported that COVID-19 patients may seek antibiotic treatment at varying stages of the disease. Some patients decide to use an antibiotic once they get in close contact with an infected patient in an attempt to limit the spread of the virus. Others may seek antibiotic treatment once they test positive for the virus and get severe symptoms. In such cases, the use of antibiotics was perceived to have a psychological rather than a pharmacological effect to ease the anxiety of infected patients. In another group of patients, antibiotic treatment was sought after failure of other home remedies in controlling COVID-19 symptoms (Kalam et al. 2022). These justifications may also explain findings of the current research regarding patients' expectations of being prescribed antibiotics during the COVID-19 pandemic.

The spike in prescribing azithromycin that was reported in the current study is consistent with reports and research findings from other parts of the world (Al-Hadidi et al. 2021; CDC 2022b; Tsay et al. 2022). It is well understood that prescribing azithromycin in the beginning of the pandemic was justified by early claims of its in-vitro activity against the virus (Matoso Laranjo 2022). Those reports prompted physicians to prescribe the macrolide antibiotic for COVID-19 cases and created a general agreement on its anti-inflammatory effect (Al-Hadidi et al. 2021). However, this efficacy could not be supported by adequate clinical evidence (Kamel et al. 2022).

Findings of this study have a number of important implications for clinical practice. The study demonstrated that the COVID-19 pandemic added to the complexity of controlling the use of antibiotics in a country that is already striving against inappropriate antibiotics utilization. While there has been a number of initiatives and programs to optimise antibiotics utilization in Jordan recently (Abdelmalek et al. 2021; Khasawneh et al. 2021; Yasein et al. 2021), coronavirus disease impeded the effective implementation of such activities.

Findings of this study call for caution that the current practices of antibiotic prescribing can complicate the problem of antimicrobial resistance in Jordan. Antimicrobial resistance has been accelerated by the increased use of antibiotics during the pandemic worldwide (PAHO 2022), and this is expected to be the case in Jordan based on the current study. While there is a lack of data that quantifies the problem of antimicrobial resistance in Jordan, high es-

timates of deaths secondary to infectious agents indicate the significance of the problem (Khasawneh et al. 2021).

This highlights a need for emphasizing antimicrobial stewardship principles when treating COVID-19 patients. This could be facilitated by adopting clear guidelines defining patient populations who are most likely to benefit from antibiotic treatment and those in which the risk of prescribing antibiotics outweighs the benefit. Moreover, patients need to be targeted by educational activities that promote appropriate antibiotic use focusing on the detrimental consequences of random utilization of antimicrobial agents. This has been highlighted in previous research (Abdelmalek et al. 2021), and needs to be further emphasized in the COVID-19 era.

Being conducted in a teaching hospital, findings of this study provide a learning opportunity for research participants. The study sample consisted of postgraduate students carrying out a residency program in a number of specializations. Consequently, implications highlighted by the research can inform the learning experience of students with regard to antimicrobial stewardship.

The major limitation of this study is the low level of heterogeneity of the study sample. While all resident physicians in the departments of internal medicine, paediatrics, emergency, Ear, Nose, and Throat (ENT), and family medicine were approached to offer participation in the study, the majority of respondents (12 out of 22) were from the family medicine department. Moreover, since a qualitative research design was used, generalizability of the results is not expected. However, findings of this research provided an insight into the practice of prescribing antibiotics during the COVID-19 pandemic and highlighted a potential problem. This can be further supported by findings of a previously conducted quantitative research in the same setting (Yasein et al. 2021).

Conclusion

This study points out that Jordan is highly likely to be among the countries that witnessed a negative impact of the COVID-19 pandemic on antibiotic prescribing. Evidence from the study highlights the importance of identifying opportunities for optimising antibiotic prescribing. Antimicrobial stewardship principles need to be emphasized as part of treating COVID-19 cases in the varying clinical practice settings in Jordan. Moreover, clinical guidelines on the management of COVID-19 need to be operationalized on the national and international level.

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