

Exploring Public Understanding of Antibiotics: A Survey of Sixth Formers and Dental Students

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Introduction

Antimicrobial resistance (AMR) is primarily driven by microbial evolution, however human behaviour plays a crucial part. For example, frequent misconceptions and demand-side pressures that lead to misuse can result in AMR. There is worldwide evidence that shows inaccurate beliefs regarding antibiotics that accelerate resistance and undermine stewardship goals. These beliefs can range from when they are needed and how long they should be taken which can translate to inappropriate use, incomplete adherence and unnecessary prescriptions.

Literature review

An interesting modified Delphi study explored antimicrobial misconceptions in various healthcare settings. This study investigated primary care, nursing homes and community pharmacies across five European countries to identify key misconceptions that can significantly distort antibiotic use in routine care. For example, there was a common belief that "antibiotics help with viral colds" and much confusion surrounding resistance mechanisms. Expert consensus ($\geq 80\%$ agreement) was reached on 30% of the 44 statements from the investigation. The low score highlights the need for tailored, setting-specific communication strategies. In response to the alarming figures, the authors developed practical educational tools, such as leaflets, to address these knowledge gaps (Chalkidou et al., 2023). The study also sheds light on how misconceptions persist even among trained professionals. Reinforcing the need to examine the root of misunderstandings that may manifest in educational pathways among students progressing from sixth form to university into healthcare service providers (Chalkidou et al., 2023).

Another European survey mapped this landscape by triangulating the perspectives of patients, physicians, and pharmacists in the outpatient sector. There were substantial patient knowledge gaps, where antibiotics were widely reported for ailments for which they offer little to no benefit, reflecting weak symptom-pathogen mapping in lay reasoning, for example, "cough/flu needs antibiotics". Moreover, the study stated that miscommunication arose when healthcare professionals assumed patients expected antibiotics for common illnesses, leading them to prescribe antibiotics "just in case" to appease patients. This did not align with many patients' reports of a neutral stance, suggesting a need for symptomatic, non-antibiotic care, along with clear explanations (Fal et al., 2024). The study links inappropriate use to systemic factors, including easy access, leftover use, and rushed consultations. Moreover, the study suggests that campaigns such as European Antibiotic Awareness Day can shift the reasons for using antibiotics, indicating that behaviour is malleable when messaging is specific and timely. This idea reinstates the importance of a well-designed educational input and its ability to influence both beliefs and behaviours (Fal et al., 2024).

Dental settings are an important "pressure point" in community antibiotic use. As dental pain and local infections are often best managed operatively, yet it is common for patients to expect or request antibiotics as "strong" pain relievers. This idea

conflates analgesia with antimicrobial action which can cause issues. An extensive cross-sectional survey of dental clinic visitors in Saudi Arabia (n = 1455) quantified these misconceptions with striking clarity: ~30% believed antibiotics treat viral infections, and ~20% were happy to stop early if they felt better. 69% of patients thought that antibiotics decrease inflammation, and 52% believed they relieve pain. The study reported that nearly half were unfamiliar with the term "antibiotic resistance" and only ~27% identified overuse as a cause. There was a distinction in awareness of resistance among participants with higher education than those without (AOR \approx 2.94). Demonstrating that formal education influences conceptual understanding in ways relevant to stewardship, which provides a clear correlation between education and behaviours towards antibiotics (Alharbi et al., 2025).

Collectively, these studies support a graded model of antibiotic understanding. Public groups and dental patients display recurrent misconceptions, uncertainty about resistance, and readiness to adopt heuristics, which refers to the belief, such as "strong medicine must equal better" or "stop when better"). Non-healthcare undergraduates show partial correction of viral or bacterial distinctions, yet remain vulnerable to potency and onset-of-action myths. Healthcare students and professionals possess more accurate schemas, yet still exhibit setting-specific gaps.

Method

Study design

This study employed a cross-sectional survey design to investigate knowledge, misconceptions, and attitudes toward antibiotic use and resistance across various educational levels. I developed the questionnaire with support from the project supervisor, Dr Holmes.

Participants

A total of 26 responses were collected, comprising n = 9 sixth form students, n = 9 undergraduates, and n = 8 dental undergraduates.

Materials

The survey instrument was a structured questionnaire (see Appendix), divided into three sections: background, beliefs, and knowledge. The background section collected demographic and contextual information, including age group and educational background, which allowed comparisons across different audiences. The beliefs section explored participants' attitudes and assumptions about antibiotics, including whether they believed antibiotics are necessary to treat viral illnesses and how much they trusted specific sources for information. The knowledge section assessed factual understanding of how antibiotics work, their proper use, and the issue of antibiotic resistance. This structure was chosen deliberately to mirror the divide between pharmacological definitions (scientific knowledge) and public

misconceptions (beliefs and attitudes), ensuring the survey could capture both what people know and what they think.

Responses included a mixture of multiple-choice questions, Likert scale ratings, true/false questions, and open-ended questions, designed to capture both factual knowledge and attitudes. Allowing assessment of both baseline understanding and common misconceptions.

Procedure

The survey was distributed via multiple channels. Sixth-form students (aged 16–18) were recruited through the University of Leeds' Widening Participation Programme, Research for Excellence, which typically involves around 80 students. This group was targeted to capture variation in scientific background by asking about their A-level subjects and the content that they have studied relevant to pharmacology and antibiotics. Dental undergraduates were reached via group chats, while undergraduates from other courses were recruited by posting on a professional social media account. Posting the survey on these platforms increased recruitment and encouraged informal peer discussion, which added contextual richness to the project. The survey took approximately nine minutes to complete.

Data analysis

Data was extracted from Microsoft Excel and made into frequencies and percentages for descriptive statistical analysis. Allowing identification of prevalent misconceptions and comparison across the groups.

Ethics

Participation was voluntary, and no demographic information that could identify individuals was recorded. Procedures were conducted in alignment with the ethics guidance prepared by Dr Holmes and approved by the University of Leeds.

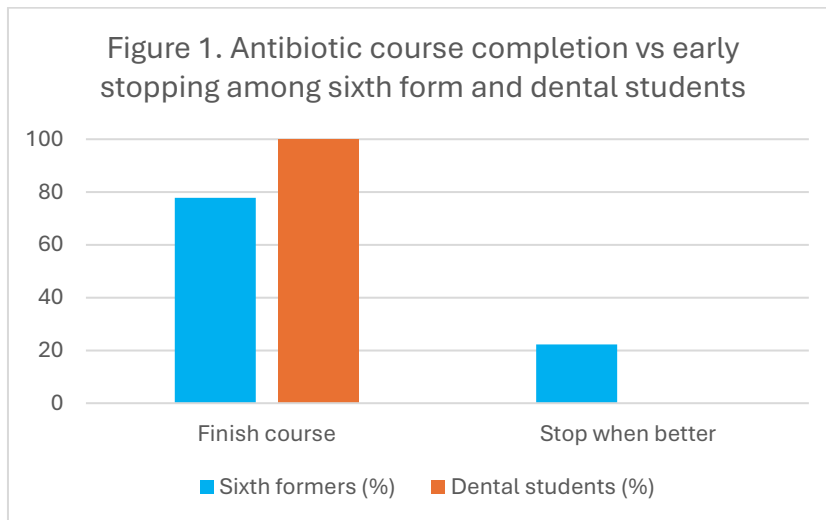
Results

A total of 26 participants completed the survey. The largest groups were sixth-form/college students (n=9, 34.6%) and undergraduate dental/hygiene & therapy students (n=8, 30.8%), with the remainder drawn from pharmacy, neuroscience, optometry, law, and other fields. Every respondent (100%) reported that they, or someone they knew, had taken antibiotics. Analysis of responses to specific questions and statements is crucial.

Stopping Antibiotics

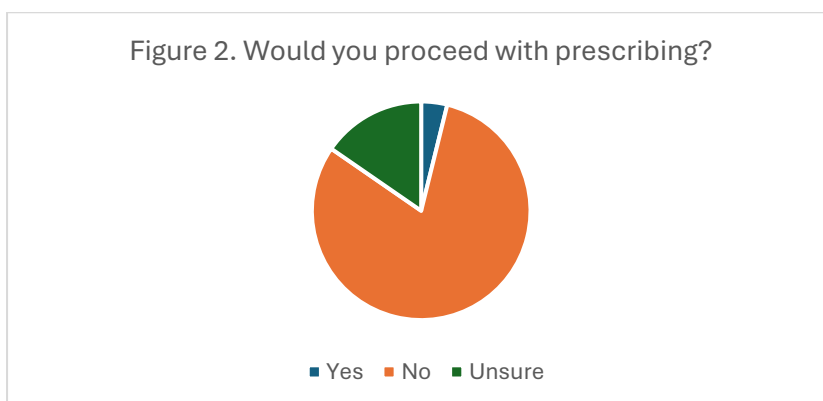
Participants were asked "If you feel better before finishing your course of antibiotics, what would you do?". Overall, 84.6% (22/26) stated they would only stop antibiotics once the prescribed course was completed. However, 7.7% (2/26) of sixth formers

admitted they would stop once they “felt better,” compared with 0% of dental students, who all reported finishing the course.



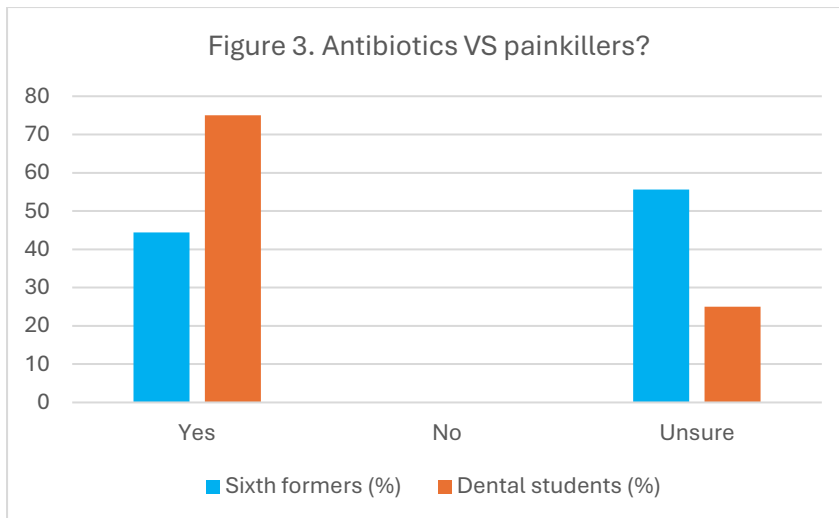
Prescribing if Unsure

Participants were asked “ If you were a doctor and were unsure if a patient needed a certain antibiotic, would you proceed with prescribing? “. The majority (80.8%, 21/26) said they would not prescribe antibiotics if they were unsure of the need. However, 3.8% answered “Yes,” and 15.4% selected “Not sure.”



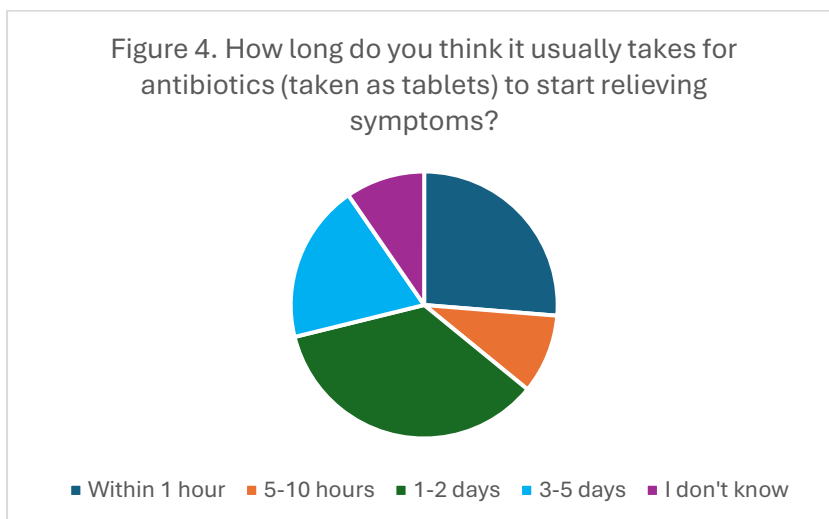
Perceptions of Antibiotic Strength

Participants were asked “Do you think antibiotics are stronger than painkillers?”. 61.5% (16/26) answered “Yes,” 34.6% (9/26) were unsure, and only 3.8% (1/26) correctly answered “No.” Among sixth formers, 44.4% (4/9) said “Yes” and 55.6% (5/9) were unsure. Among dental students, 75.0% (6/8) incorrectly answered “Yes,” and 25.0% (2/8) were unsure.



How Long Antibiotics Take to Work

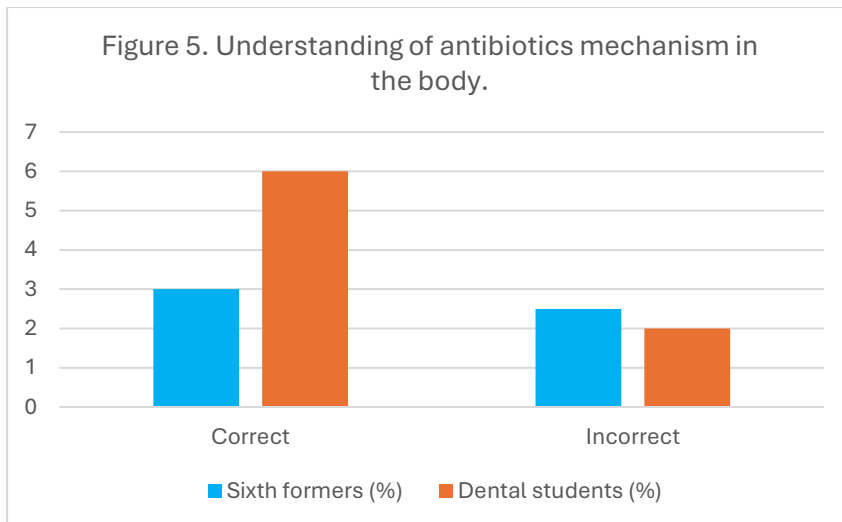
Participants were asked “How long do you think it usually takes for antibiotics (taken as tablets) to start relieving symptoms?”. Responses varied: 42.3% (11/26) believed antibiotics take 1–2 days, 23.1% (6/26) said 3–5 days, 11.5% (3/26) thought within 1 hour, 11.5% (3/26) said 5–10 hours, and 11.5% (3/26) did not know.



Sixth formers were more likely to give unrealistic answers, with 22.2% (2/9) stating antibiotics work within 1 hour, compared to 0% of dental students. Dental students more commonly selected 3–5 days (50.0%, 4/8).

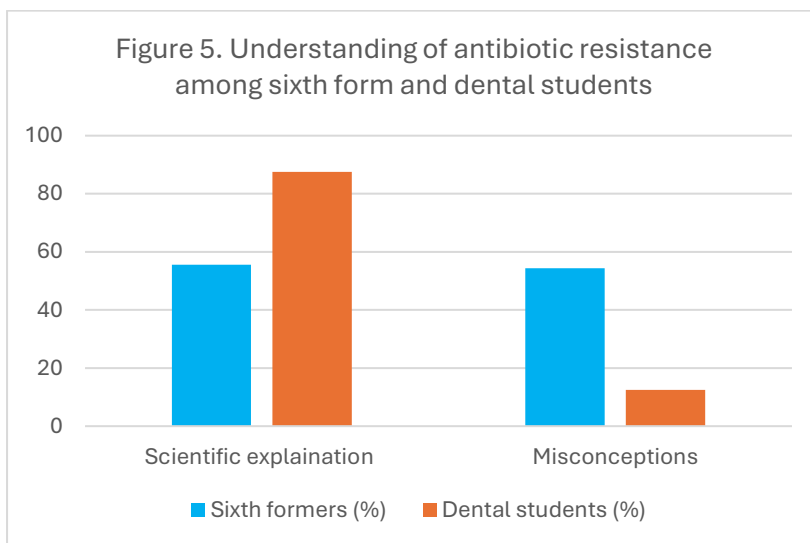
Understanding of Antibiotics

Accurate explanations (e.g. “kill bacteria by damaging cell walls” or “stop replication”) were provided mainly by dental students (75.0%, 6/8). Vague or incorrect explanations (e.g. “they dissolve in the stomach,” “they work like white blood cells,” “not sure”) were frequent among sixth formers (66.7%, 6/9).



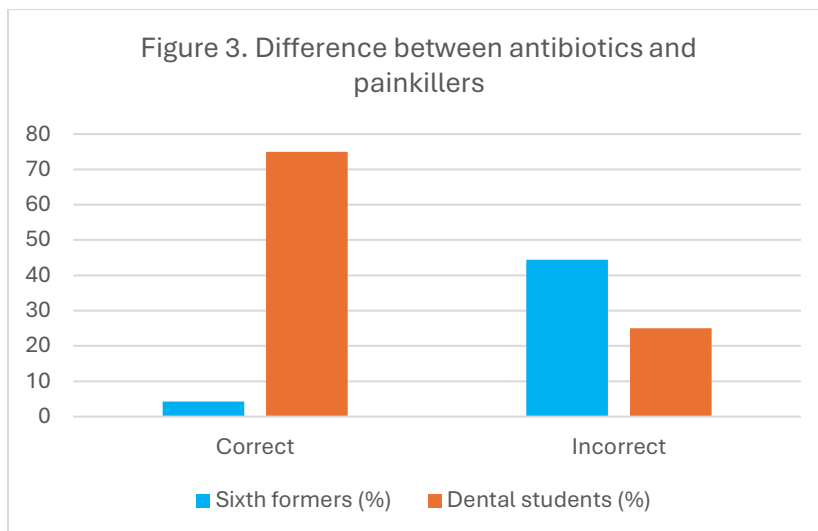
Understanding of Antibiotic Resistance

Scientific explanations based on mutations and natural selection were common among dental students (87.5%, 7/8). Misconceptions (e.g. “your body gets used to it,” “taking too much makes your body not react,” or “viruses mutate”) were frequent among sixth formers (55.6%, 5/9).



Difference between Antibiotics and Painkillers

Most dental students (75.0%) correctly distinguished antibiotics (used for infection treatment) from painkillers (symptom relief). In contrast, uncertainty and misconceptions were more common among sixth formers, with 44.4% giving vague or incorrect answers.



Trust in Information Sources

Respondents showed firm reliance on professional sources. 100% of GPs/doctors were trusted, and 96.2% trusted the NHS website completely or mostly. Google received moderate trust 46.2%, while YouTube, friends, and parents were less trusted. Social media was rated as the least reliable, with 53.8% of respondents reporting “not at all.”

Discussion

The survey examined the differences between knowledge and beliefs, comparing sixth-form students and dental undergraduates, to identify common misconceptions and their correlation with educational level. Overall, responses show a transparent educational gradient, with dental students generally displaying more accuracy compared to sixth-form students. However, both groups retained misconceptions; these results underscore that formal education improves conceptual understanding, but misconceptions remain embedded even among future healthcare professionals.

A striking observation was that nearly half of the sixth-form students were unsure of the purpose and function of antibiotics. Among these students, many respondents incorrectly identified viruses, such as influenza, as targets that can be treated. This finding aligns with previous studies, which have shown that the general public tends to confuse bacterial and viral infections, leading to inappropriate expectations for prescription (Fal et al., 2024). In this study, dental students correctly recognised bacterial infections; however, one in five still reported uncertainty about viral coverage, echoing the findings of Chalkidou et al. (2023) in their Delphi study, where consensus among healthcare professionals was incomplete. Overall, this suggests that while education reduces basic errors, grey areas persist even within healthcare education and training.

Misconceptions around antibiotic “strength” and comparison with [painkillers were particularly regular. Almost one third of sixth form students described antibiotics as “stronger” than painkillers and a smaller proportion of dental students also endorsed

this view. This misconception reflects a broader public heuristic previously suggested by Alharbi et al. (2025) where “potency” equates to effectiveness. This misconception among dental students suggests that standard curricula may not sufficiently address common patient-derived beliefs. Which is highly relevant once dental students graduate and are in a clinical setting as their ability to correct patients’ expectations may be compromised or limited.

After collecting responses, the pattern of antibiotic discontinuation also revealed concerning beliefs. As the majority of sixth-form students repeatedly admitted to stopping taking antibiotics once they felt better, this behaviour is a significant component in driving resistance (Fat et al., 2024). Fewer dental students admitted to this behaviour; however, still a minority reported uncertainty or conditional stopping. This finding aligns with the broader literature, which suggests that formal education improves awareness of resistance but, in one way or another, eliminates inappropriate behavioural intentions (Alharbi et al., 2025).

The findings illustrate the disjunction between knowledge and behaviour. Some respondents who recognised that antibiotics should be taken to the end prescribed course nevertheless endorsed stopping when symptoms improved. While others who knew that antibiotics do not target viruses still associated them with viral illness. This aligns with broader evidence that schema-level understanding does not always translate into action-level behaviour (Fat et al., 2024). To bridge this gap, it requires stewardship messaging that not only identifies and corrects misconceptions but also addresses decision-making situations in which these behaviours occur.

The difference between the responses of dental students and sixth form students emphasised the importance of teaching exposure. The GDC (2015) states that all undergraduate dental students must meet specific teaching standards, including general pharmacology and AMR. This correlates with the higher conceptual understanding compared to sixth-form students. Furthermore, this supports Alharbi et al. (2025) 's finding that education level increases resistance awareness. However, considering this exposure, gaps in knowledge remain, indicating that the teaching may need reinforcement. Following this finding, there were differences within the sixth form group, depending on whether students were receiving teaching related to pharmacology or drug mechanisms. Those with related exposure demonstrated more accurate recognition of bacterial versus viral coverage and were less likely to believe in potency-based misconceptions. At the same time, students with no exposure were more uncertain about the purpose and mechanism of antibiotics. Furthermore, trust in information sources further highlighted differences between the two groups. For example, sixth-form students showed a higher reliance on Google, whereas dental students expressed greater trust in clinicians and the NHS website. This mirrors Chalkidou et al. (2023) 's research, showing that source credibility moderates the public's interpretation of antibiotic advice. This pattern reinforces the previous point on the importance of teaching. It suggests that embedding elements of pharmacology into all curricula, so everyone has exposure, could help narrow the knowledge gaps.

Overall, these findings support a graded model of antibiotic understanding, with one end of the spectrum represented by sixth form students, who, in this study, are considered to be the general public. They demonstrated frequent misconceptions and reliance on informal sources. At the other end, dental students showed accuracy but retained a few misconceptions. This stepwise gradient aligns with Fat et al. (2024) and Alharbi et al. (2025), reflecting how stewardship should be designed as a continuum, with reinforcement of basic knowledge in undergraduate curricula and building of professional consensus. Furthermore, several implications arise from the survey and study findings for the clinical setting. Hence, earlier integration of antimicrobial resistance into curricula could correct misconceptions before they solidify. In addition, curricula for dental students should be strengthened, which can be achieved by addressing common public beliefs and equipping students with communication strategies to support patients. These educational and structural changes in healthcare delivery could address the findings of Fat et al. (2024) linking misuse to rushed consultations and leftover prescriptions.

The study had a small and limited sample size, which precludes generalisability; however, the results still offer insight into how educational and teaching exposure can shape antibiotic knowledge. Future work should extend this comparison to a larger, more representative group. For example, future work could benefit from exploring sixth-form students from different schools and how that correlates with the standard of teaching in that school, or investigating whether there is a difference between undergraduate dental students who studied a previous degree and those straight from sixth form.

Conclusion

The study aimed to examine public knowledge, beliefs, and behaviours regarding antibiotics across educational stages, with a particular focus on sixth-form students and dental undergraduates. The findings reveal a stepwise improvement in understanding of AMR with higher levels of education, yet also highlight that misconceptions may persist even within healthcare students. An important nuance emerged within the sixth form group as those who studied pharmacology-related subjects demonstrated a more accurate understanding compared to their peers. These findings support prior evidence that teaching can raise awareness, as it may narrow misconceptions. The gradient observed here, from school to undergraduate, aligns with previous studies, indicating that education reinforcement is required at multiple stages and should be revisited. The findings also confirm the gap between individuals' knowledge and their actual behaviour. In this case, respondents were able to articulate that antibiotics should be completed accurately, yet some still indicated they would stop once they feel better. This mismatch emphasises the need for intervention based on decision-making training.

Ultimately, tackling antimicrobial resistance requires not only policy and prescribing reform but also reshaping how different groups conceptualise antibiotics.

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