Antibiotic Stewardship in Dental Procedures: A Multidisciplinary Approach

Awadh M. Alanizi[1], Nada A. Al Zahrani[2], Jehan H. Ben Hyzaam[3], Ali S. Aldossari[4], Abdulrahman A. Bin Mousa[5]

Health Affairs at the Ministry of National Guard

Abstract

Antibiotic resistance is a growing concern in dental practice, driven in part by the overuse and misuse of antibiotics. This study evaluates the effectiveness of a multidisciplinary antibiotic stewardship program involving dentists, pharmacists, and laboratory specialists in a tertiary hospital dental department. A mixed-methods approach was used, with quantitative data showing an increase in appropriate antibiotic prescribing from 57% to 85% and a reduction in adverse reactions from 12% to 5%. Qualitative findings highlighted the benefits of enhanced communication, shared decision-making, and improved patient outcomes. Despite barriers such as time constraints and resistance to change, the findings indicate that a collaborative approach significantly improves antibiotic stewardship in dental settings.

Keywords: Antibiotic Stewardship, Dentistry, Multidisciplinary Collaboration, Pharmacists, Laboratory Specialists, Antibiotic Resistance

Introduction

Antibiotic stewardship has become an increasingly critical concern in healthcare due to the rise in antibiotic-resistant bacteria, which poses a significant threat to public health (Ventola, 2015). In dental practice, antibiotics are often prescribed for prophylactic or therapeutic purposes to manage or prevent infections. However, evidence suggests that many antibiotic prescriptions in dentistry may be unnecessary or inappropriate, contributing to antibiotic resistance (Dar-Odeh et al., 2010). The misuse and overprescription of antibiotics have raised the need for a multidisciplinary approach to antibiotic stewardship, especially in dental settings (Cope et al., 2016).

The role of pharmacists, dentists, and laboratory specialists is crucial in optimizing antibiotic use in dentistry. Dentists are the primary prescribers in dental settings, but they may not always have access to comprehensive information about antibiotic resistance patterns or drug interactions (Palmer et al., 2001). Pharmacists, on the other hand, are experts in drug management and can provide valuable guidance on appropriate antibiotic selection, dosing, and potential interactions, enhancing the safe and effective use of these drugs (Aldeyab et al., 2012). Laboratory specialists contribute by providing microbiological data, which helps in identifying the causative pathogens and determining their antibiotic susceptibility, thus enabling targeted therapy (Moynihan and Petersen, 2004).

A coordinated effort among these professionals is essential to improve antibiotic prescribing practices in dental care, reduce the development of resistance, and ensure patient safety. This paper aims to explore the

role of pharmacists, dentists, and laboratory specialists in antibiotic stewardship within dental settings, focusing on how their collaboration can optimize antibiotic use and improve patient outcomes.

Literature Review

Antibiotic resistance is a growing global problem that has significant implications for dental practice. The misuse of antibiotics in dentistry has been highlighted in numerous studies as a key contributor to resistance (Dar-Odeh et al., 2010). Dentists often prescribe antibiotics empirically without microbiological evidence, which can lead to inappropriate use (Cope et al., 2016). Studies have shown that up to 81% of dental antibiotic prescriptions are not in line with clinical guidelines, suggesting a widespread issue with inappropriate prescribing practices (Palmer et al., 2001). This highlights the need for enhanced education and support for dentists regarding antibiotic stewardship.

Pharmacists have been shown to play a pivotal role in antibiotic stewardship by providing expertise in drug therapy and ensuring appropriate use of antibiotics (Aldeyab et al., 2012). A study by Klepser et al. (2015) demonstrated that pharmacist-led antibiotic stewardship programs in healthcare settings significantly reduced inappropriate antibiotic use and improved patient outcomes. In the context of dentistry, pharmacists can provide valuable support in selecting the right antibiotic, ensuring the correct dose, and preventing harmful drug interactions. This collaboration is particularly important for patients with complex medical histories or those on multiple medications (Aldeyab et al., 2012).

The role of laboratory specialists is also critical in guiding effective antibiotic use. Laboratory data, including microbiological culture and sensitivity testing, can provide dentists with the information needed to choose the most appropriate antibiotic therapy (Moynihan and Petersen, 2004). However, a study by Miller and Westgate (2014) found that laboratory services are often underutilized in dental settings, with many dentists relying on empirical treatment rather than evidence-based microbiological data. Integrating laboratory support into dental practice could significantly improve the appropriateness of antibiotic prescribing and help combat resistance.

Collaborative approaches have been shown to enhance antibiotic stewardship efforts in various healthcare settings. For instance, integrating pharmacists into dental clinics has been shown to reduce unnecessary antibiotic prescriptions and promote adherence to guidelines (Zahabiyoun et al., 2015). Similarly, a study by Paskovaty et al. (2005) emphasized the importance of a multidisciplinary approach, including dentists, pharmacists, and laboratory personnel, in optimizing antibiotic use and minimizing resistance. By working together, these professionals can ensure that antibiotic use in dental settings is evidence-based, targeted, and appropriate.

Despite the clear benefits of a multidisciplinary approach, challenges remain in implementing effective antibiotic stewardship in dental settings. A study by Cope and Chestnutt (2014) highlighted barriers such as lack of awareness among dentists regarding antibiotic resistance, insufficient access to training, and limited collaboration with pharmacists and laboratory specialists. Addressing these barriers requires targeted educational initiatives and structural changes to promote better communication and collaboration among healthcare professionals involved in dental care.

In summary, the literature suggests that optimizing antibiotic use in dental practice requires a coordinated effort among dentists, pharmacists, and laboratory specialists. Each professional brings unique expertise that can contribute to reducing inappropriate antibiotic prescriptions and combating resistance. Enhanced

collaboration, education, and access to laboratory resources are key to achieving effective antibiotic stewardship in dentistry.

Methodology

This study was conducted in a tertiary hospital with a dedicated dental department that provides comprehensive oral healthcare services. The research employed a mixed-methods approach, integrating both quantitative and qualitative data collection methods to assess the effectiveness of a multidisciplinary approach to antibiotic stewardship in dental settings. The study focused on the collaboration between dentists, pharmacists, and laboratory specialists in optimizing antibiotic use.

Study Design and Participants

The study was conducted over a period of six months. Participants included dentists, pharmacists, and laboratory specialists working in the dental department of the hospital. A total of 15 dentists, 10 pharmacists, and 5 laboratory specialists participated in the study. Informed consent was obtained from all participants before the study commenced.

Data Collection

Quantitative data were collected through a retrospective review of patient records to evaluate antibiotic prescribing patterns before and after the implementation of a multidisciplinary antibiotic stewardship program. The records included information on patient demographics, diagnosis, prescribed antibiotics, dosage, duration, and any documented adverse reactions.

Qualitative data were gathered through semi-structured interviews with the participating healthcare professionals. The interviews explored their perceptions of antibiotic stewardship, challenges faced in implementing stewardship practices, and the perceived impact of collaboration on antibiotic prescribing. Each interview lasted approximately 30-45 minutes and was audio-recorded and transcribed verbatim for analysis.

Intervention

The intervention involved implementing a structured antibiotic stewardship program in the dental department, which included the following components:

1. Pharmacist Involvement: Pharmacists were integrated into the dental care team to provide consultations on antibiotic selection, dosing, and interactions.
2. Laboratory Support: Laboratory specialists provided microbiological testing and sensitivity data to guide targeted antibiotic therapy.
3. Education Sessions: Regular training sessions were conducted for dentists on appropriate antibiotic prescribing practices and the importance of reducing antibiotic resistance.

Data Analysis

Quantitative data were analyzed using descriptive statistics to compare the rate of antibiotic prescribing before and after the implementation of the stewardship program. The appropriateness of prescriptions was evaluated against clinical guidelines. Qualitative data from interviews were analyzed thematically, using NVivo software to identify key themes related to collaboration, barriers, and facilitators of antibiotic stewardship.

Ethical Considerations

The study received approval from the ethics committee. Participation was voluntary, and confidentiality was ensured by anonymizing all collected data. Participants were informed of their right to withdraw from the study at any time without consequence.

Findings

Quantitative Findings

The quantitative analysis revealed a significant improvement in antibiotic prescribing practices following the implementation of the stewardship program. The rate of appropriate antibiotic prescriptions increased from 57% pre-intervention to 85% post-intervention. The table below provides a summary of the changes in prescribing patterns:

Metric	Pre-Intervention (%)	Post-Intervention (%)
Appropriate Prescriptions	57	85
Empirical Prescriptions	43	15
Adverse Reactions Documented	12	5

The results indicate a substantial reduction in empirical prescribing and a corresponding increase in adherence to clinical guidelines, reflecting the effectiveness of the multidisciplinary approach.

Qualitative Findings

The qualitative data from the semi-structured interviews were analyzed to identify themes and sub-themes regarding the implementation of antibiotic stewardship. Three main themes emerged from the analysis:

1. Enhanced Collaboration
   - Sub-theme 1: Improved Communication

   Participants emphasized the value of improved communication among healthcare professionals. A dentist stated, "The involvement of pharmacists and lab specialists helped us understand the importance of targeted therapy, and communication became much easier."
   - Sub-theme 2: Shared Decision-Making

   Many participants highlighted the benefit of shared decision-making. A pharmacist noted, "Being part of the dental care team allowed me to provide input on antibiotic choices, ensuring safer and more effective treatment."

2. Barriers to Implementation
   - Sub-theme 1: Time Constraints

   Participants mentioned that time constraints posed challenges in implementing the program effectively. A laboratory specialist explained, "It was often challenging to perform sensitivity testing in a timely manner, which delayed the initiation of targeted therapy."
   - Sub-theme 2: Resistance to Change

   Some dentists were initially resistant to altering their prescribing habits. One dentist mentioned, "At first, I was hesitant to involve others in my decision-making, but over time, I saw the benefits."

3. Perceived Benefits of Stewardship
   - Sub-theme 1: Reduced Antibiotic Resistance

Participants reported a perceived reduction in antibiotic resistance in their practice. A dentist stated, "We started seeing fewer cases of treatment failure, which I believe is due to more appropriate antibiotic use."

- Sub-theme 2: Improved Patient Outcomes

Improved patient outcomes were frequently mentioned. A pharmacist shared, "Patients experienced fewer side effects, and their infections resolved more effectively when antibiotics were used appropriately."

Discussion

The findings of this study highlight the significant impact that a multidisciplinary approach to antibiotic stewardship can have on prescribing practices in dental settings. The increase in the rate of appropriate antibiotic prescriptions from 57% to 85% post-intervention suggests that integrating pharmacists and laboratory specialists into the dental care team can substantially enhance the quality of antibiotic use. This aligns with previous studies that have demonstrated the effectiveness of pharmacist-led stewardship programs in reducing inappropriate antibiotic use (Klepser et al., 2015).

The improved collaboration among healthcare professionals was a major factor contributing to the success of the stewardship program. The qualitative findings revealed that enhanced communication and shared decision-making were key benefits of this collaborative approach. Participants noted that the involvement of pharmacists and laboratory specialists not only facilitated better antibiotic selection but also improved the overall understanding of targeted therapy. These results are consistent with the literature, which emphasizes the value of multidisciplinary collaboration in promoting adherence to clinical guidelines and optimizing patient care (Zahabiyoun et al., 2015; Paskovaty et al., 2005).

The reduction in empirical prescribing and the corresponding decrease in documented adverse reactions from 12% to 5% highlight the importance of targeted antibiotic therapy guided by laboratory data. Laboratory specialists played a crucial role in providing microbiological insights, enabling dentists to choose the most appropriate antibiotics. This finding supports the argument that laboratory services are an essential component of effective antibiotic stewardship, particularly in dental settings where empirical prescribing is common (Miller and Westgate, 2014).

Despite these positive outcomes, several barriers to the implementation of antibiotic stewardship were identified. Time constraints and resistance to change were significant challenges faced by the participants. The reluctance of some dentists to involve other professionals in their prescribing decisions initially hindered the adoption of stewardship practices. This finding underscores the need for targeted educational initiatives to address misconceptions about antibiotic stewardship and to highlight the benefits of a collaborative approach (Cope and Chestnutt, 2014).

The perceived benefits of the stewardship program, including reduced antibiotic resistance and improved patient outcomes, indicate that such interventions have the potential to enhance both clinical effectiveness and patient safety. Participants reported fewer cases of treatment failure and improved patient satisfaction, suggesting that appropriate antibiotic use can lead to better health outcomes. These findings are in line with previous research demonstrating that antibiotic stewardship can reduce the prevalence of resistance and improve the overall quality of patient care (Aldeyab et al., 2012).

Overall, the study demonstrates that a multidisciplinary approach to antibiotic stewardship is both feasible and effective in dental settings. By involving pharmacists, dentists, and laboratory specialists, it is possible to optimize antibiotic use, reduce resistance, and improve patient outcomes. However, addressing the

barriers to implementation—such as time constraints and resistance to change—remains critical to ensuring the sustainability of these interventions.

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