


REDUCING ANTIBIOTICS USE IN ADULT PATIENTS WITH LOCALISED DENTOALVEOLAR ABSCESS IN ROMPIN DENTAL CLINIC

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Abstract

Antibiotics are generally not advised for patients with localised dentoalveolar abscesses (LDA) in outpatient dental clinics, as their overuse can lead to antibiotic resistance. A verification study conducted at Rompin Dental Clinic revealed that 50.1% of adult patients with LDA were prescribed antibiotics. This study aimed to reduce the rate of antibiotic prescriptions for adult patients with LDA to 30.0% within one year, which is in line with the established standard. This quality improvement study used universal sampling and measured the percentage of LDA prescription slips with antibiotics prescribed. The two main contributing factors identified were substandard practices by dental officers and external pressures to prescribe antibiotics. Additional factors included incorrect teachings from peers, lack of awareness of current guidelines and recommendations, lack of experience, inadequate knowledge of antibiotic use, misdiagnosis and management, and pressure from staff and patients. To address these issues, strategies were implemented in three phases: 1) enhancing dental officers' practices through a newly developed care process, displaying a prescribing guide, and conducting Continuous Dental Education sessions; 2) emphasising staff and public education through social media and an Antibiotics Awareness Week campaign; and 3) ensuring adherence to previous strategies. As a result, the percentage of antibiotic prescriptions for LDA decreased from 50.1% to 28.6 % in 2019, followed by 21.3% in 2020 and 22.9% in 2021. Continuous monitoring through regular education and enforcement can promote a healthy antibiotic-prescribing culture among dental officers, helping to curb antibiotic resistance.

KEYWORDS: Antibiotics, Localised dentoalveolar abscess, Over-prescription, Dental

Problem

In Malaysian primary care clinics, antibiotic prescriptions occur in at least one in five patient encounters (1). The Malaysian National Medicines Policy focused on the quality use of medicines by healthcare providers and consumers, recognising that misuse leads to antimicrobial resistance, which is challenging to treat and control (2). In response, the Ministry of Health Malaysia has implemented the Antimicrobial Stewardship Program in healthcare facilities, aiming to limit broad-spectrum antibiotic use unless specifically indicated in the National Antimicrobial Guidelines (3, 4). Although the program has shown a reduction in antimicrobial use, reports of antibiotic overprescription still exist.

In dental settings, toothaches are often attributed to localised infections such as pulpitis or a localised dental abscess (LDA), which typically require only local dental treatment (4-10). However, most dental patients received antibiotic prescriptions as the first treatment option (11-14). Indications for antibiotic prophylaxis include medically compromised patients, complex minor surgeries, dental implants and bone graft insertions, major maxillofacial procedures, and head and neck cancer surgeries (9, 15, 16).

Rompin Dental Clinic (KPR), located in Pahang, is a public primary dental clinic within the vicinity of a public primary care health clinic. It delivers a range of oral health services, including restorations, scaling, extractions, minor oral surgeries, and oral health promotion to the community across all age groups, covering a population of approximately 40,742 (17). The clinic employs 32 staff members, consisting of 11 dental officers, six dental therapists, one dental technologist, eight dental surgery assistants, three health attendants, and three drivers. This clinic is the main dental facility for oral health treatment in Rompin due to its location in a small suburban town, approximately 133 km from the nearest tertiary dental specialist referral facility for major oral surgeries.

A cost review by the pharmacy department in our primary care facility found that the dental clinic incurred the highest expenditure on antibiotics for LDA, with

toothache being the most common cause of dental visits. Upon further investigation, it was found that amoxicillin was frequently prescribed for LDA. Therefore, this study aimed to improve the rate of antibiotic use among adult patients with LDA from 50.1% to 30.0% within one year.

Background

One in ten dentists administers antibiotics in outpatient dental clinics, making them one of the most common prescribers (18-20). Dental or dentoalveolar abscesses are common presentations in primary care outpatient dental settings, characterised by a localised collection of pus in the alveolar bone at the root apex of the tooth. The abscesses frequently result from dental caries, trauma, deep fillings, or failed root canal treatment (21). Systemic antibiotics are generally not advised for patients with LDA due to their limited efficacy (22, 23). However, globally, unnecessary antibiotic prescriptions in dentistry can reach up to 80%, even among dental specialists (24, 25).

Although antibiotics may be considered for those who are medically compromised (4, 10, 22, 26-30), dentists may make the common mistake of giving heavier consideration to non-clinical factors such as patient insistence, expenses, pressure from assistant staff, and time restrictions when prescribing antibiotics (31, 32). The intentions of dentists play a significant role in their antibiotic-prescribing practices (32). Both patients and dentists may hold beliefs about antibiotic use that can influence prescribing habits (32). Miscommunication between them may easily lead to antibiotic overprescription in primary care (19-21, 28, 31-33).

Overuse of antibiotics disrupts gastrointestinal function, causes organ toxicity, and contributes to the development of antimicrobial resistance (20). This is a significant issue as many microorganisms have developed resistance to conventional antibiotics due to alterations in the resistance genes (19, 20, 22, 27, 34-36). The presence of resistant strains in the oral microflora may also induce other systemic infections (37). Antibiotic resistance can be challenging to handle medically, with a higher risk of

side effects and severe infections, leading to frequent hospitalisations and higher mortality rates (20, 29, 34, 35).

To address this issue, strategies such as evidence-based prescribing guidelines, regular monitoring, and enforcement are essential (38). Adopting better prescribing practices can be achieved through brief educational interventions, audits, and the introduction of prescribing tools (27, 39-41). In the long run, these strategies are expected to enhance adherence to appropriate antibiotic use and reduce wastage (39-42).

Measurement

This quality improvement study utilised a universal sampling approach. The key indicator measured was the percentage of LDA prescription slips with antibiotics prescribed. Based on the diagnosis recorded by the dental officer, a tooth-related infection was later classified as either LDA or dentoalveolar abscess with systemic involvement. For this study, the LDA diagnosis was used to calculate the indicator, as this subset of diagnosis typically does not require antibiotics and is relevant to the issue of antibiotics overprescription. Antibiotics are classified as Group B drugs, which require a prescription from a licensed doctor or dentist (43, 44). Hence, a prescription slip (Perubatan 6A-Pin.3/96) indicating antibiotics prescribed for LDA was used in the numerator measurement.

Prescription slips identified with the diagnosis of LDA, with or without antibiotic prescriptions, among patients aged 18 years and above attending the KPR outpatient clinic were included in this study for the denominator measurement. This study excluded non-tooth-related infections and patients requiring prophylactic antibiotic coverage as recommended by the American Heart Association (45). The formula used to measure the indicator in this study was:

$\frac{\text{The number of LDA prescription slips with antibiotics prescribed}}{\text{The total number of LDA prescription slips}} \times 100$
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The indicator was designed to measure the percentage of LDAs with

antibiotic prescriptions, following the guidelines of the World Health Organisation (WHO) (46, 47). The WHO recommended that the percentage of antibiotic use should be below 30% to reflect an optimal pharmacological situation (48). Therefore, our study adopted this standard of 30%. This threshold accommodates post-operative dental procedures and special cases, such as medically compromised patients who are immunosuppressed or with congenital or acquired altered defence mechanisms (9, 22). Data collected from 698 prescription slips during a verification study from January 2018 to December 2018 revealed that 50.1% of LDA cases among adult patients at KPR were prescribed antibiotics. Following this verification study, strategies were implemented from January 2019 to June 2021, with re-evaluations conducted every six months to assess the effectiveness of these interventions.

Initial Assessment of the Problem

Based on discussion among the project group members, literature reviews, and an interview with an Oral and Maxillofacial surgeon, the factors contributing to the problem were mapped out as depicted in Figure 1. Two main categories of factors were identified: substandard practices among dental officers and negative external pressures on them.

A self-administered questionnaire was distributed to 29 dental officers in the Rompin district to quantify the potential factors influencing inappropriate antibiotic prescribing. The self-developed questionnaire included six potential contributing factors identified from the problem analysis chart. Respondents were asked to select the factor(s) they believed most contributed to the problem. The cumulative counts for each factor were totalled to establish a baseline for prioritisation. The four factors perceived as most prominent contributing factors were: 1) incorrect teachings passed down from peers (69.0%); 2) lack of experience (62.1%); 3) unawareness of current antibiotic guidelines and recommendations from updated literature (58.6%) and; 4) pressure from patients and assistant staff (55.2%). Two

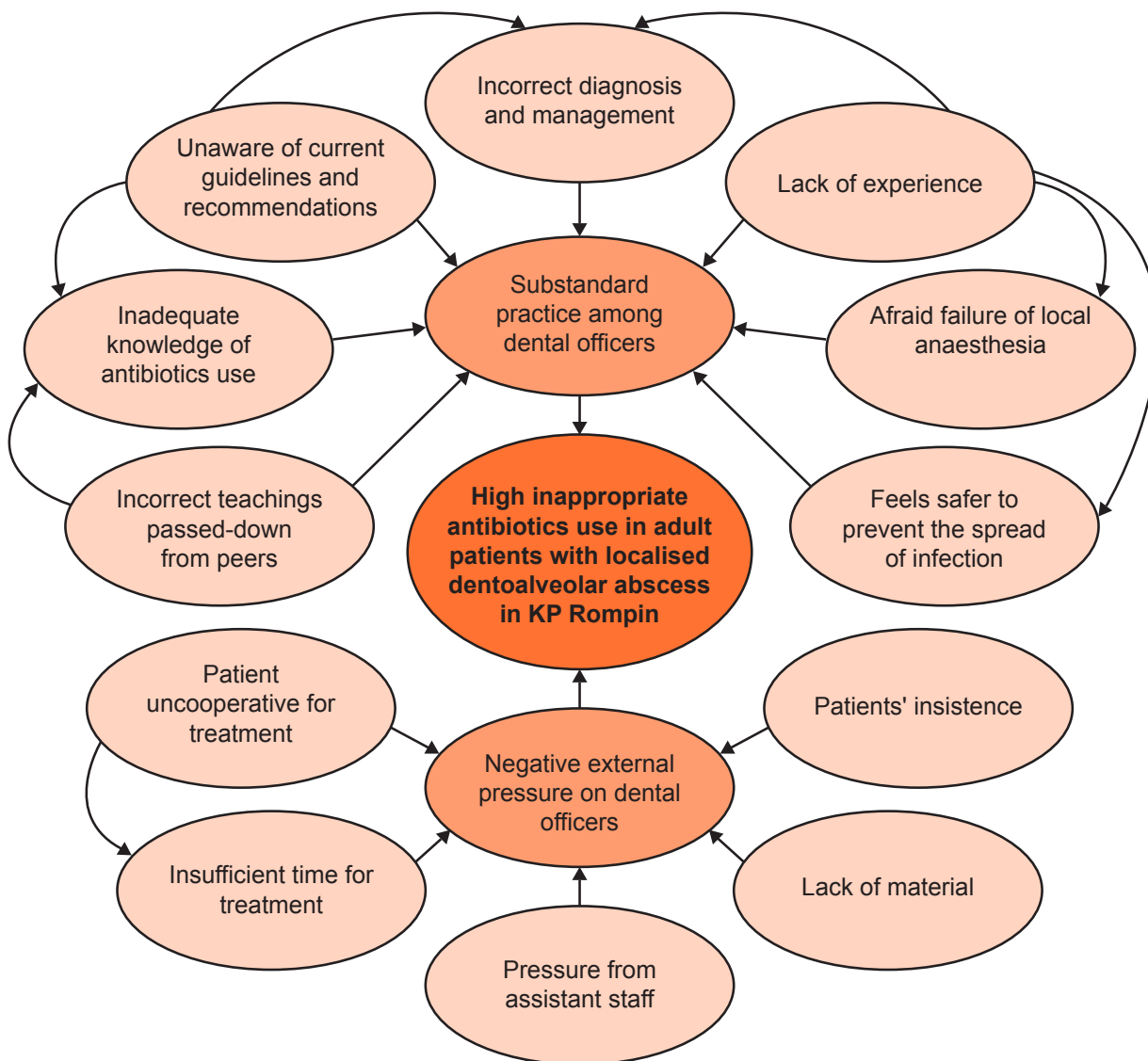


Figure 1: Problem analysis chart for the inappropriate antibiotic prescriptions in LDA in KPR

other factors, each scoring 31.0%, were inadequate knowledge of antibiotic use and incorrect diagnosis and management. We focused on improving these factors due to their high scores, and there was control over these aspects when planning interventions.

Without a standardised operating procedure for LDA management, the care process at KPR was based on observations of daily practices by dental officers. The existing care process for LDA management included an additional step of administering antibiotics and reviewing them after one week, regardless of the patient’s medically compromised status, before removing the source of the infection. The critical steps identified were guided by the quantified contributing factors.

Strategy

Several strategies were identified and implemented to address the abovementioned factors over three phases, from January 2019 to June 2021. In Phase 1, the strategies included developing a new process of care based on literature, displaying a prescribing guide for dentoalveolar abscesses in the clinic as a reminder, and Continuous Dental Education (CDE) sessions. These strategies aim to improve dental officer’s practices. Phase 2 focused on public education and increasing awareness among assistant staff through social media promotions and an Antibiotic Awareness Week campaign. In the subsequent phase, no new strategies

were introduced; instead, the previously implemented strategies were continued. Compliance with the strategies was ensured through ongoing monitoring.

Phase 1: January – December 2019

Firstly, the process for managing LDA at KPR was newly developed based on a thorough review of guidelines and literature, as shown in Figure 2 (4, 10, 27, 28, 43, 45, 49). The practice of administering antibiotics for a week before removing the source of

infection was removed from the standard process.

Secondly, to further strengthen the care process, a prescribing guide for managing dentoalveolar abscess (as shown in Figure 3) was introduced. This guide serves as a general guide for dental officers, designed to assist in the management of dentoalveolar abscess cases across various settings, including primary dental clinics, hospitals, and non-hospital-based dental specialist clinics.

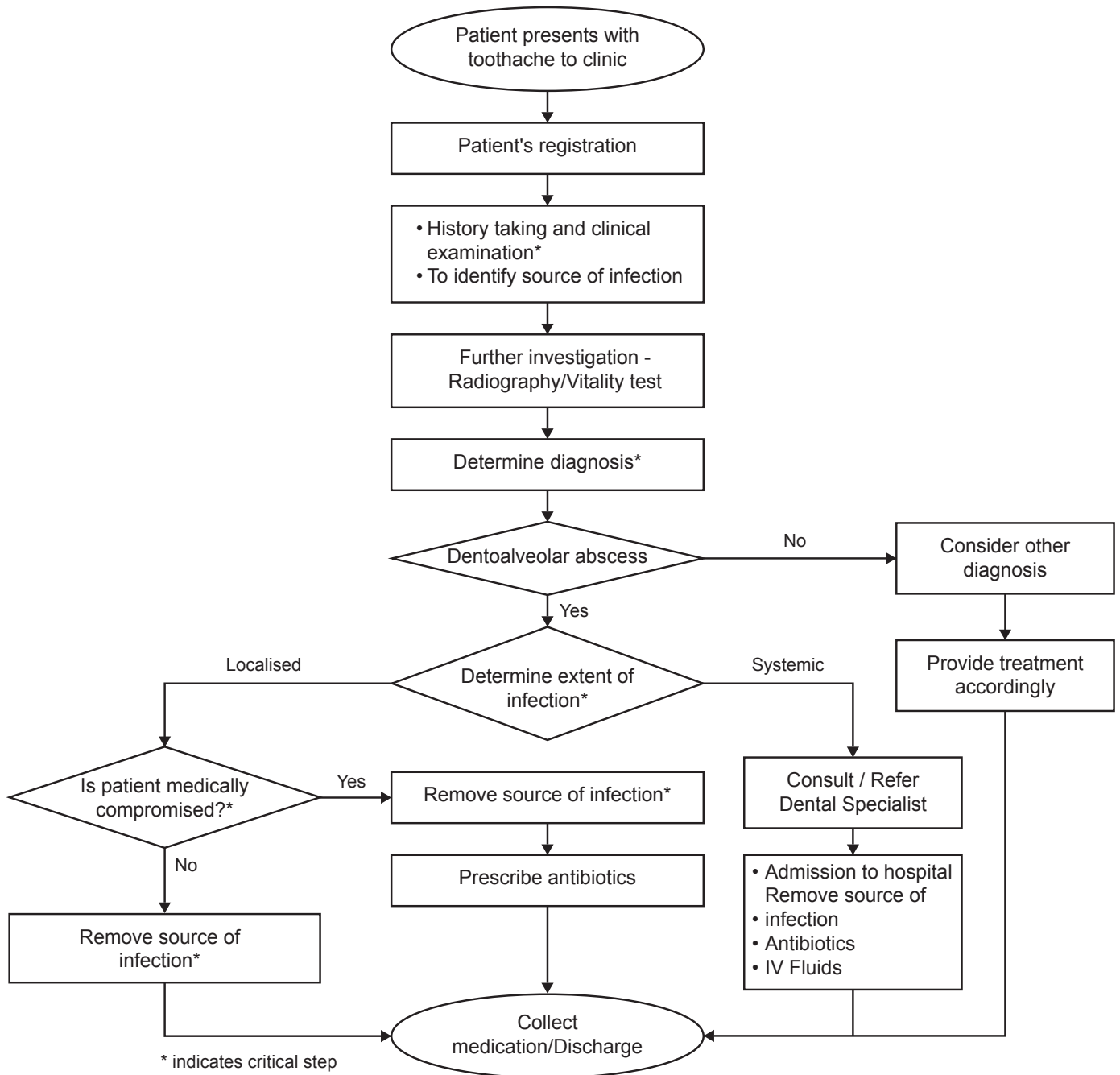


Figure 2 The newly developed process of care for LDA management in KPR as part of the strategy implementation.

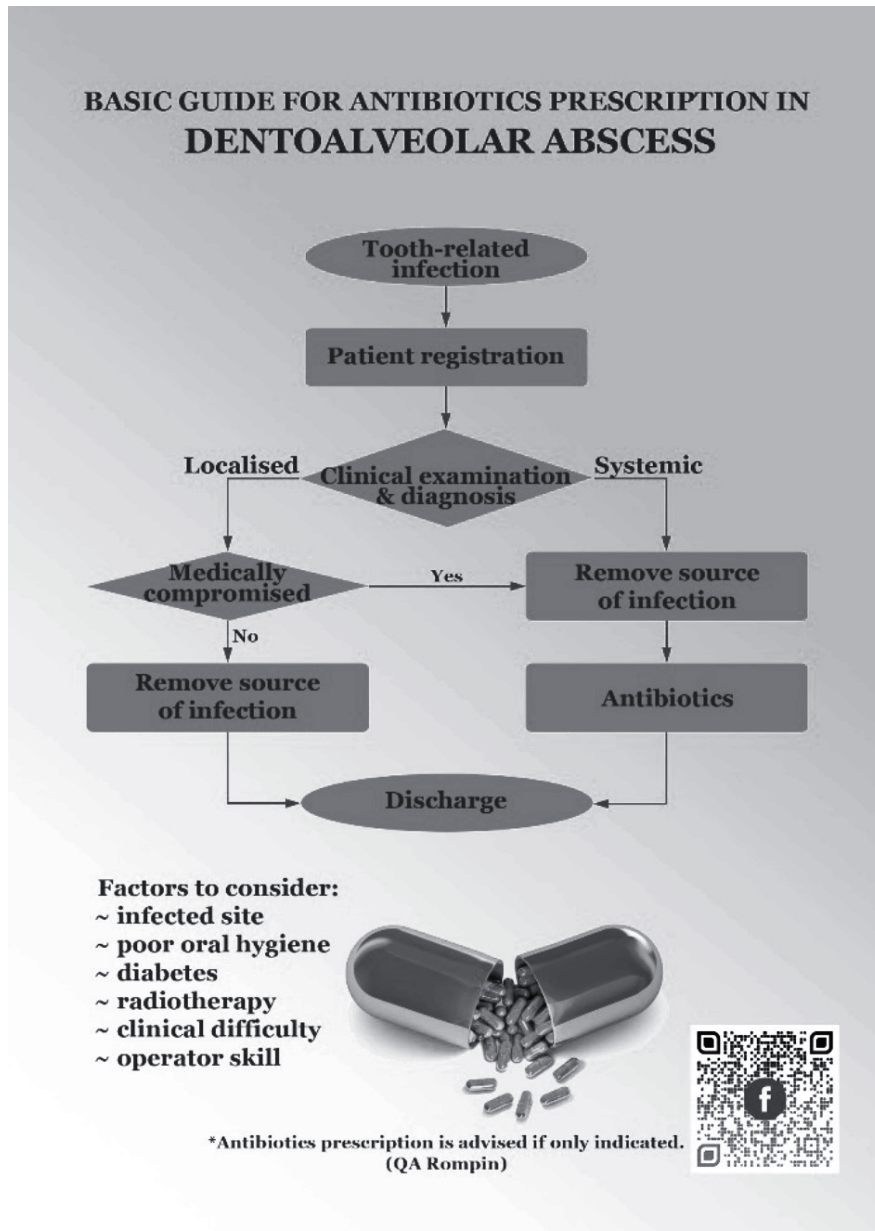


Figure 3: An antibiotic prescribing guide for dentoalveolar abscesses

This prescribing guide was developed in consultation with an Oral and Maxillofacial surgeon, chosen for their expertise in managing dentoalveolar infections and their deep understanding of the local context. This ensures that the guide is relevant and practical for local dental clinics. To validate the guide’s content, an interview with the surgeon was conducted in June 2019. According to the surgeon’s expert opinion:

- The prescribing guide addresses a comprehensive range of antibiotics indications, covering both local issues (such as periapical abscess and pulpitis) and systemic conditions (including space infections and cellulitis).
- Initial treatment involves removing the

source of infection, followed by medical support such as antibiotics and medications for immunocompromised patients.

- When prescribing antibiotics after removing the source of infection, several factors should be considered: the condition of the infected site, poor oral hygiene, patient adherence to instructions, medical complications, uncontrolled diabetes, and a history of radiotherapy. Clinical difficulty, such as highly mobile teeth without bony sockets, and the operator’s skill in performing extractions with minimal force and bleeding often negate the need for post-operative antibiotics.
- The benefits of this study include reducing over-prescription, lowering costs, and aligning with current guidelines.

Thirdly, dental officers received a one-hour CDE session focused on antibiotic use in dentistry, which covered the latest guidelines and LDA management strategies. This annual session aims to reinforce their knowledge and improve their prescribing practices. Prior to CDE, dental officers completed a quiz with five multiple-choice questions to assess their baseline knowledge on: 1) indications for antibiotic use in dentistry, 2) current antibiotic guidelines, and 3) diagnosing and managing LDA. A follow-up assessment was done one month after the CDE to evaluate knowledge retention. Dental officers who answered 4 out of 5 questions correctly were deemed to have a good understanding of LDA management and antibiotic use.

Phase 2: January – December 2020

The second phase of the initiative addressed a different perspective on contributing factors, specifically the patient's role and the behaviour of the assistant staff. This phase was attempted through simple education of LDAs, emphasising that antibiotics are often unnecessary, and raising awareness of antibiotic resistance to promote healthier oral health practices. To achieve this, we used various methods to educate staff and the public, including promotions on social media platforms such as the clinic and district health office's official Facebook pages, an infographic poster, a short educational film, and a Facebook Live session. During World Antibiotics Awareness Week in November, KPR organised an antibiotics awareness campaign to advocate for safe antibiotic use among our dental outpatients. This promotional campaign is planned to be conducted annually to ensure ongoing emphasis on this critical issue. The strategies implemented in the first phase were continued to maintain and further improve the outcomes.

Results

The percentage of LDA prescription slips with antibiotics prescribed among adult patients at KPR decreased significantly over the years, from 50.1% to 28.6%, 21.3%, and 22.9% (Figure 4). After three years of intervention, the Achievable Benefit Not Achieved (ABNA) reduced from 20.1% to -7.1%.

The implementation of CDE saw an increase in dental officers' knowledge of the management and antibiotics use in LDA, from 59.8% in 2018 to 90.9% in 2020. The emphasis on refresher courses enabled dental officers to gain better confidence and more working experience by applying their knowledge when treating patients with LDA. However, both factors require a prolonged duration of interventions. An indirect benefit observed in the pharmacy department was the reduced purchasing costs due to decreased antibiotic prescriptions for the dental clinic.

Lessons And Limitations

Although most dental officers are aware of proper antibiotic prescriptions, various factors influence their prescribing practices. Factors such as lack of experience in managing LDA and handling patient expectations fall within the dental officer's purview. However, factors such as insufficient monitoring, local control over antibiotic use, and antibiotic profit interests (18, 27, 50) may be beyond their control, which may limit the effectiveness of implemented strategies. In our study, dental officers had an acceptable level of knowledge regarding antibiotic use (59.8%) before the interventions. However, they still prescribed antibiotics for non-indicated cases, resulting in an ABNA of 20.1%. Good knowledge requires repeated reinforcements and audits to ensure consistent translation into positive habits (38, 41). Our strategies, including displaying the prescribing guide and conducting annual CDE sessions, serve as reminders to reinforce adherence to the new process of care for antibiotic prescriptions in LDA management.

Providing public health education is challenging as it requires competent healthcare personnel and multi-level policy interventions (50, 51). In Phase 2, we aimed to reduce negative external pressures on dental officers by educating the public and assisting healthcare staff. However, lack of working experience remains a challenge, affecting dental officers' confidence, especially with additional external factors influencing clinical decision-making. Therefore, more focus and interventions are needed to ensure that dental officers

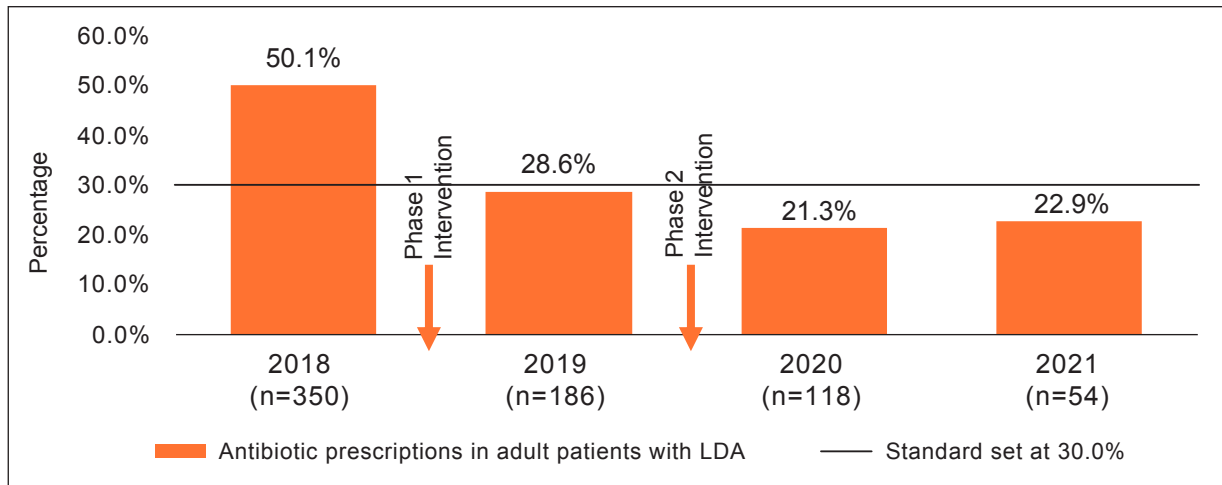


Figure 4: Antibiotic prescriptions in adult patients with LDA in KPR, 2018-2021

practice managing LDA based on clinical signs, as practice will eventually build their confidence. With increased confidence, dental officers would be less likely to be pressured by external factors when managing LDA. While we addressed patient insistence through public awareness programs, this factor involves public attitudes, which are challenging to change thoroughly.

Although the small sample size and geographic location limit data generalisation, the study provides insight into inappropriate antibiotic use from a dental perspective. No bias was evident as measurements were done using prescription slips and questionnaires. There is a possibility that LDA patients did not receive any prescriptions, possibly overestimating the percentage of LDA prescription slips with antibiotics prescribed. The clinical outcome and the cost saving were also not included as part of this study. Another study limitation is the role of unforeseen factors beyond the clinic's control, such as the turnover of dental officers to other districts and the COVID-19 pandemic, which affected both dental officers and the number of patients attending KPR (27, 50, 52).

Conclusion And The Next Steps

The percentage of LDA prescription slips with antibiotics prescribed in adult patients decreased within a year of implementing the interventions. Recognising the improvement and benefits of the study, we will continue monitoring the work process through regular education and enforcement

to ensure dental officers develop a healthy antibiotic prescribing culture to prevent antibiotic resistance. The remedial actions are relatively simple and can be implemented in the long-term. We intend to share our findings with the Pahang State Dental Health Department and other platforms to promote replicability so that dental facilities encountering similar problems can adopt these strategies.

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Conflict Of Interest

The authors declared that there were no conflicts of interest.

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