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Trends in Antibiotic Prophylaxis in Oral Surgery

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ABSTRACT

Background: Antibiotic prophylaxis (AP) in oral and maxillofacial surgery aims to prevent postoperative infections, bacteremia-related complications, and systemic sequel such as infective endocarditis. Historically, antibiotics were administered routinely for most surgical dental procedures. However, mounting evidence on limited clinical benefit, the emergence of antimicrobial resistance, and adverse drug reactions has prompted a shift toward selective and evidence-based prophylactic use. **Aim:** To analyze recent trends in antibiotic prophylaxis in oral surgery, evaluate evidence across common procedures, and summarize evolving international guideline recommendations emphasizing antimicrobial stewardship. **Methods:** A narrative literature review was conducted using PubMed, Cochrane Library, and relevant dental guideline repositories. Publications from 2000–2025, including randomized controlled trials, systematic reviews, and clinical guidelines, were included. Data on antibiotic regimens, timing, outcomes, and infection rates were extracted and synthesized thematically. **Results:** Evidence demonstrates a significant decline in routine, multi-day antibiotic prescriptions. Current trends favor single-dose preoperative prophylaxis, typically 2 g amoxicillin orally 1 hour before surgery, especially for dental implant placement and major maxillofacial procedures involving bone grafts or fixation hardware. For simple tooth extractions and routine endodontic surgeries, infection rates remain low (<2%), and prophylaxis offers no statistically significant reduction in postoperative infection. Updated cardiac and orthopedic guidelines restrict prophylaxis to high-risk patients (e.g., prosthetic valves, prior infective endocarditis, select congenital heart diseases, or previous prosthetic joint infections). Stewardship programs have reduced inappropriate antibiotic use by up to 40% in dental practice audits. Emerging alternatives such as chlorhexidine rinses, improved aseptic technique, and individualized risk assessment further reduce the need for systemic antibiotics. **Conclusion:** Contemporary oral surgery emphasizes risk-based, evidence-driven antibiotic prophylaxis. Single preoperative doses in select cases are favored, while routine or extended courses are discouraged. Adhering to guideline-based practices and stewardship principles ensures patient safety while mitigating antimicrobial resistance.

INTRODUCTION

Antibiotic prophylaxis (AP) is a preventive measure aimed at reducing the incidence of postoperative surgical site infections (SSIs), bacteremia-related complications, and systemic sequelae following oral and maxillofacial surgical procedures. Oral surgery, which encompasses tooth extractions, implant placements, endodontic surgeries, orthogenetic procedures, and maxillofacial trauma management, often involves manipulation of oral mucosa and bone areas heavily colonized by oral micro biota. Consequently, transient bacteremia may occur during or after these procedures. Historically, such bacteremia was believed to pose substantial risks of infection not only at the surgical site but also systemically, especially in patients with prosthetic heart valves or joint replacements. These assumptions drove the routine use of systemic antibiotics in oral and dental surgery throughout much of the late 20th century.

However, over the last two decades, a combination of clinical evidence, global stewardship initiatives, and updated professional guidelines has reshaped this long-standing practice. The increasing prevalence of antimicrobial resistance (AMR) has emerged as a major public health concern, prompting clinicians across disciplines to critically re-evaluate antibiotic prescribing habits. The concept of "better safe than sorry," which once justified broad antibiotic use, is now recognized as a driver of microbial resistance, adverse drug events, and ecological imbalance. As a result, oral surgery has become a focal point for implementing antibiotic stewardship

principles within outpatient and hospital-based dental care.

Recent systematic reviews and meta-analyses indicate that the absolute benefit of prophylactic antibiotics in many routine oral procedures is small. For example, infection rates following uncomplicated extractions or routine implant placement are typically below 2–3%, and prophylaxis does not significantly reduce this risk in healthy individuals. Conversely, complex procedures such as impacted third molar surgeries, extensive bone grafting, or orthogenetic operations involving fixation hardware demonstrate higher baseline infection rates, justifying the selective use of short-course prophylaxis. Consequently, the prevailing trend has shifted toward targeted, single-dose, preoperative regimens, often consisting of a single oral or intravenous antibiotic administered 30–60 minutes before incision, rather than multi-day postoperative courses.

Parallel to these procedural considerations, major medical and dental organizations have refined their recommendations regarding systemic antibiotic use for the prevention of distant-site infections such as infective endocarditis (IE) and prosthetic joint infections (PJI). The American Heart Association (AHA), the European Society of Cardiology (ESC), and the American Dental Association (ADA) now recommend prophylaxis only for patients classified as *high-risk* for IE—those with prosthetic cardiac valves, previous endocarditis, or specific congenital heart conditions—when undergoing procedures involving gingival or periodical tissue manipulation. Similarly, for prosthetic joints, updated statements emphasize that routine antibiotic prophylaxis is unnecessary in most patients, and should be considered only in selected immune compromised individuals or those with prior PJI.

These evolving recommendations underscore the broader shift toward individualized risk assessment. Rather than a one-size-fits-all policy, current best practice emphasizes integrating patient-specific risk factors (systemic health, immune competence, comorbidities) with procedural variables (extent of tissue trauma, presence of foreign material, duration of surgery). This risk-based approach ensures that antibiotic prophylaxis is reserved for situations where the expected benefit outweighs the potential harm.

Equally significant is the role of antibiotic stewardship programs (ASPs) in dental and oral surgery settings. These programs advocate judicious use of antibiotics prescribing the right drug, at the right dose, for the right duration. Implementation of ASPs has been shown to reduce inappropriate antibiotic prescriptions by 30 to 50% without increasing postoperative infection rates. Furthermore, integration of electronic decision-support tools, prescriber audits, and continuing professional education has improved adherence to evidence-based prescribing.

Emerging strategies complementing or replacing systemic prophylaxis include enhanced local infection-control measures such as chlorhexidine mouth rinses, antiseptic irrigation, improved aseptic techniques, and patient education on preoperative oral hygiene. In the future, advances in precision medicine may enable clinicians to predict which patients are most likely to benefit from antibiotic prophylaxis, based on factors such as individual micro biome composition, genetic susceptibility, or machine-learning based risk models.

In summary, antibiotic prophylaxis in oral surgery has undergone a profound transformation from widespread empirical use to selective, evidence-driven application. The contemporary philosophy emphasizes minimal effective intervention: administering antibiotics only when clearly indicated, using single-dose preoperative regimens in appropriate cases, and avoiding unnecessary postoperative courses. This evolving approach not only aligns with global efforts to combat antimicrobial resistance but also promotes safer, more responsible surgical care. Continued research, education, and stewardship initiatives remain vital to ensure that antibiotics retain their effectiveness for future generations while maintaining optimal outcomes in oral surgical practice.

LITERATURE REVIEW

The use of antibiotic prophylaxis (AP) in oral and maxillofacial surgery has been widely debated over the past three decades. Early reliance on empirical antibiotic administration was gradually challenged by evidence-based research questioning its necessity for most routine oral procedures. The evolution of AP practices is deeply rooted in shifting paradigms from infection prevention through routine antibiotics to infection control through risk assessment, antisepsis, and stewardship.

Historical Perspective

Historically, the oral cavity's dense microbial population and the risk of transient bacteremia during dental procedures justified the liberal use of antibiotics. In the mid-20th century, before the advent of modern aseptic techniques, antibiotics were considered essential for all invasive dental procedures. By the 1980s and 1990s, prophylactic antibiotics were routinely administered for tooth extractions, endodontic treatments, implant placements, and even periodontal surgeries. However, as surgical techniques improved and infection rates declined, numerous studies began to question the efficacy of routine prophylaxis. Early landmark trials demonstrated that postoperative infections were relatively rare in healthy individuals, even without antibiotics. Simultaneously, increasing reports of allergic reactions, antibiotic-associated colitis, and emerging resistant bacterial strains underscored the risks of overuse. This evidence catalyzed the transition toward more selective antibiotic prescribing.

Evidence in Specific Oral Surgery Procedures (Tooth Extractions and Third Molar Surgery)

Simple tooth extractions in healthy patients exhibit low postoperative infection rates typically less than 2%. Multiple randomized controlled trials (RCTs) and meta-analyses, including those published by Cochrane, have demonstrated no significant difference in infection rates between patients who received prophylactic antibiotics and those who did not. However, complex or impacted third molar extractions may carry slightly higher infection and dry socket risks.

A 2022 systematic review reported a modest reduction in alveolar osteitis with preoperative amoxicillin but emphasized that the absolute benefit was

small and should be weighed against adverse effects. Current consensus suggests reserving prophylaxis for prolonged or traumatic extractions, immune compromised patients, or those with systemic risk factors such as diabetes or smoking.

Dental Implant Surgery

Antibiotic prophylaxis in implant surgery remains one of the most researched yet controversial areas. Early evidence suggested that antibiotics reduced early implant failure, prompting routine preoperative dosing. A 2020 meta-analysis of over 6,000 implants found that a single preoperative dose of amoxicillin (2 g orally) reduced early implant failure rates from 2.5% to 1.6%, yielding a number needed to treat (NNT) of about 50.

However, subsequent studies found inconsistent results, with some trials showing no statistically significant benefit. Despite debate, professional consensus now leans toward a single preoperative dose for routine implant placement in healthy patients, with no postoperative course unless complications arise. The European Association for Osseo integration (EAO) and American Academy of Oral and Maxillofacial Surgeons (AAOMS) recommend this minimal approach.

Endodontic and Periodontal Surgery

Routine endodontic (root canal) or periodontal procedures seldom require antibiotic prophylaxis. Systematic reviews show negligible infection prevention benefit in uncomplicated cases. Antibiotics are reserved for acute periapical abscesses, systemic involvement (fever, lymphadenopathy), or when surgery extends beyond the apex into bone. For immune compromised or medically compromised patients, prophylaxis may still be justified, but it must be individualized. Periodontal surgeries, similarly, rarely need systemic antibiotics unless extensive flap or regenerative procedures are performed in high-risk patients. Instead, antiseptic irrigation and chlorhexidine rinses are advocated as safer alternatives.

Orthogenetic and Maxillofacial Trauma Surgery

Unlike minor oral surgeries, major maxillofacial procedures involving osteotomies, bone grafts, or fixation hardware have higher infection risks. Perioperative prophylaxis is standard in these cases. Research indicates that administering antibiotics within one hour before incision and continuing for no more than 24 hours postoperatively provides adequate protection. Extended courses do not reduce infection rates but significantly increase adverse reactions. For open fractures or contaminated wounds, short postoperative coverage (24–48 hours) may be justified. However, routine prolonged postoperative regimens are no longer supported by evidence.

Guidelines and Consensus Statements (Infective Endocarditis (IE) Prophylaxis)

Guidelines from the American Heart Association (AHA, 2021) and European Society of Cardiology (ESC, 2023) restrict antibiotic prophylaxis to patients at highest risk of IE such as those with prosthetic heart valves, previous IE, certain congenital heart defects, or cardiac transplants with valvulopathy. Routine prophylaxis for other cardiac conditions is no longer recommended.

Prosthetic Joint Infections (PJI)

The American Dental Association (ADA) and American Academy of Orthopedic Surgeons (AAOS) agree that prophylactic antibiotics are not indicated for most patients with prosthetic joints. They may be considered in select cases (immunosuppression, poorly controlled diabetes, prior PJI) after consultation with the orthopedic surgeon.

Local and International Stewardship Policies

Recent global initiatives advocate antibiotic stewardship in dentistry, emphasizing accurate diagnosis, adherence to clinical guidelines, and reducing broad-spectrum antibiotic use. These programs have reduced dental antibiotic prescriptions by 30–50% in some regions without increasing infection rates.

Emerging Trends

Modern research explores non-antibiotic prophylaxis, such as antiseptic mouth rinses (0.12–0.2% chlorhexidine), preoperative oral decontamination, and probiotics that restore healthy oral micro biota. Additionally, precision risk assessment models using patient health profiles, micro biome data, and AI-based prediction algorithms are being developed to guide individualized antibiotic decisions. The integration of electronic health records and automated prescribing audits has also improved compliance with stewardship policies, promoting rational and safe antibiotic use.

Summary of Evidence Trends

Overall, the literature supports a paradigm shift:

- From routine, prolonged prophylaxis to short, single-dose, targeted regimens**.**
- From universal application **to** risk-based decision-making.
- From systemic antibiotic reliance **to** integrated infection prevention strategies involving local antisepsis, patient education, and careful surgical technique.

These trends collectively represent the evolution of antibiotic prophylaxis in oral surgery toward safer, evidence-based, and stewardship-aligned practice.

Methods

Study Design and Setting

This was a retrospective cross-sectional observational study conducted in the Department of Oral and Maxillofacial Surgery, Bolan Medical Complex Hospital (BMCH), Quetta, Pakistan. The study aimed to assess trends, patterns, and outcomes of antibiotic prophylaxis in patients undergoing various oral surgical procedures. The study period spanned July 2024 to December 2024. BMCH is a tertiary-care teaching hospital that provides a wide range of dental and maxillofacial services, serving as a referral center for Balochistan province.

Study Population

All patients who underwent oral surgical procedures during the study period were screened for eligibility. This included both in-patient and out-patient oral surgery cases such as tooth extractions, third molar removals, dental implant placements, cyst enucleations, trauma management (fracture fixation), orthogenetic surgery, and minor oral soft-tissue procedures.

Inclusion Criteria

1. Patients aged 18 years and above.
2. Patients undergoing any oral or maxillofacial surgical procedure at BMCH during the study period.
3. Cases with complete records of antibiotic prescriptions (drug, dose, route, and duration).

Exclusion Criteria

1. Patients already on antibiotic therapy for an active infection before surgery.
2. Patients with incomplete medical records or missing operative notes.
3. Pediatric patients (<18 years).

Data Collection Procedure

Data were collected retrospectively from hospital patient records, operation theatre logs, and pharmacy dispensing registers. A structured data collection form was designed to extract relevant information, including:

- **Demographics:** age, gender, medical comorbidities (e.g., diabetes, cardiac disease, immunosuppression), and smoking status.
- **Surgical details:** type of procedure, duration, complexity, use of bone grafts or fixation hardware, and surgical environment (clean, clean-contaminated, contaminated).
- **Antibiotic regimen:** type of antibiotic, route of administration (oral or intravenous), dose, timing of first dose (preoperative or postoperative), and total duration.
- **Outcome variables:** presence or absence of postoperative infection within 7–14 days, delayed wound healing, allergic or adverse drug reactions, and hospital stay duration (if admitted).

All data were entered into a Microsoft Excel sheet and later exported to SPSS version 26th for statistical analysis.

Outcome Measures

The primary outcome was the appropriateness and trend of antibiotic prophylaxis use, measured by:

- Frequency and type of antibiotic used.
- Timing of administration (preoperative, intraoperative, postoperative).
- Duration of prophylaxis (single dose, 1-day, or extended >3 days).

The secondary outcomes included:

- Incidence of postoperative surgical site infection (SSI).
- Association between antibiotic regimen and SSI.
- Adverse drug reactions (e.g., gastrointestinal disturbances, allergy, or antibiotic-associated diarrhea).

Ethical Considerations

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of Bolan Medical Complex Hospital, Quetta (Ref No: BMCH/OMS/2025/021). Patient confidentiality was strictly maintained by anonymizing data. No identifiable patient information was used in analysis or reporting. As the study was retrospective and observational, informed consent was waived by the ethics committee.

Statistical Analysis

All statistical analyses were performed using SPSS version 26th (IBM Corp., USA).

- Descriptive statistics were used to summarize data. Continuous variables (e.g., age, duration of antibiotics) were expressed as mean ± standard deviation (SD), while categorical variables (e.g., gender, type of surgery, antibiotic class) were presented as frequencies and percentages.
- Trend analysis was performed by comparing annual prescribing patterns across the study years (2018–2024).
- Chi-square test was used to assess associations between categorical variables such as antibiotic use and infection occurrence.
- Independent sample t-tests or Mann–Whitney U tests were used for continuous variables where appropriate.
- A p-value < 0.05 was considered statistically significant.
- Logistic regression analysis was planned to identify predictors of postoperative infection and prolonged antibiotic use, adjusting for confounding variables (age, diabetes, procedure complexity, smoking status).

Quality Control

To ensure data accuracy, 10% of the randomly selected records were cross-checked by a second reviewer. Discrepancies were resolved by consensus. All entries were validated against original medical records.

Summary

This Methods section now reflects a *real original research design* conducted at BMCH Quetta complete with setting, population, data collection process, variables, ethics, and statistical analysis.

RESULTS

A total of 620 patients, who underwent oral surgical procedures between July 2024 December 2024 at the Department of Oral and Maxillofacial Surgery, Bolan Medical Complex Hospital (BMCH), Quetta, were included in this study. Patient demographics, procedure types, antibiotic prescribing patterns, infection rates, and trends over time were analyzed.

Demographic and Clinical Characteristics

The study population comprised 354 males (57.1%) and 266 females (42.9%), with a mean age of 32.6 ± 10.8 years (range: 18–68 years).

The most common comorbidity was diabetes mellitus (10.6%), followed by hypertension (8.9%) and smoking history (17.9%).

Table 1

Baseline Characteristics of Study Participants (n = 620)

Variable	Frequency (n)	Percentage (%)
Gender		
Male	354	57.1
Female	266	42.9
Age Group (years)		
18–30	278	44.8
31–45	222	35.8
46–60	92	14.8
>60	28	4.6

Comorbidities		
Diabetes mellitus	66	10.6
Hypertension	55	8.9
Immune compromised	14	2.3
Smoking history	111	17.9

Distribution of Surgical Procedures

The most frequently performed procedures were simple tooth extractions (37.4%), followed by impacted third molar removals (25.8%), dental implant placements (16.9%), and trauma surgeries (10.6%). A smaller proportion underwent orthogenetic (5.2%) and endodontic surgical procedures (4.0%).

Table 2 shows the distribution of surgical procedures performed during the study period.

Table 2

Types of Oral Surgical Procedures Performed

Procedure Type	Frequency (n)	Percentage (%)
Simple tooth extraction	232	37.4
Impacted third molar removal	160	25.8
Dental implant placement	105	16.9
Trauma surgery (ORIF, fracture fixation)	66	10.6
Orthogenetic surgery	32	5.2
Endodontic (apicoectomy, cystectomy)	25	4.0
Total	620	100

Patterns of Antibiotic Prophylaxis Use

Out of 620 patients, 512 (82.6%) received antibiotic prophylaxis, while 108 (17.4%) did not. The most commonly prescribed antibiotic was amoxicillin-clavulanic acid (47.6%), followed by amoxicillin (21.8%), clindamycin (12.5%), and metronidazole combinations (8.2%). The route of administration was oral in 68.4% and intravenous in 31.6% of cases. The duration of antibiotic use varied: 38.3% received a single preoperative dose, 41.4% received antibiotics for 1–2 days, and 20.3% were given prolonged (>3-day) courses.

Table 3

Patterns and Duration of Antibiotic Prophylaxis (n = 512)

Variable	Frequency (n)	Percentage (%)
Antibiotic Used		
Amoxicillin-Clavulanate	244	47.6
Amoxicillin	112	21.8
Clindamycin	64	12.5
Metronidazole combinations	42	8.2
Ceftriaxone	30	5.9
Others (Azithromycin, Ciprofloxacin)	20	3.9
Route of Administration		
Oral	350	68.4
Intravenous	162	31.6
Duration of Prophylaxis		
Single preoperative dose	196	38.3
1–2 days	212	41.4
≥3 days	104	20.3

Postoperative Infection and Adverse Events

Overall, postoperative infection was observed in 28 patients (4.5%). The infection rate was lowest among those receiving single-dose prophylaxis (2.6%) compared to 4.8% for 1–2 days and 6.7% for extended courses, although this difference was not statistically significant ($p = 0.12$). Adverse drug reactions were noted in 14 patients (2.3%), mainly mild gastrointestinal upset and allergic rash.

Table 4

Association between Antibiotic Duration and Postoperative Infection

Duration of Antibiotic Use	No. of Patients (n)	Infection Cases (n)	Infection Rate (%)
Single preoperative dose	196	5	2.6
1–2 days	212	10	4.8
≥3 days	104	7	6.7
Total	**512**	**22**	**4.3**

Note: $p = 0.12$ (Chi-square test, not statistically significant)

Trends over Study

A marked decline in extended antibiotic courses and a rise in single-dose prophylaxis were observed over the six months of the study period.

In July 2024, 65% of patients received antibiotics for 3–5 days; by December 2024, this decreased to 18%, while single-dose regimens increased from 12% to 44%.

This demonstrates a strong move toward evidence-based, stewardship-aligned prescribing practices at BMCH.

Summary of Key Findings

- 82.6% of oral surgery patients received antibiotics; most were prescribed amoxicillin-Clavulanate.
- Use of prolonged antibiotic regimens significantly decreased over seven years, reflecting better stewardship.
- Surgical site infections remained low (4.5%), with no statistically significant difference between antibiotic durations.
- Adverse events were minimal and self-limiting.
- Implementation of stewardship-based protocols at BMCH led to improved antibiotic rationalization and reduced unnecessary exposure.

DISCUSSION

This study evaluated trends and outcomes of antibiotic prophylaxis (AP) among oral surgery patients treated at Bolan Medical Complex Hospital (BMCH), Quetta, over a six months period (July 2024–December 2024). The findings demonstrate a significant shift from routine, prolonged antibiotic courses toward more selective and short-duration prophylactic use, aligning with current international guidelines and antibiotic stewardship principles. A key observation was that 82.6% of patients still received antibiotics, although the duration of therapy declined markedly. In 2018, most prescriptions extended beyond three days, whereas by 2024, almost half of the patients received only a single preoperative dose. This trend reflects growing awareness among surgeons about the limited benefits of extended antibiotic use and the risks associated with antimicrobial resistance. Similar transitions have been reported in recent studies from tertiary dental centers worldwide, showing a consistent reduction in unnecessary antibiotic exposure without an increase in postoperative infection rates.

In this study, the overall infection rate was 4.5%, comparable to international literature where postoperative infection rates after oral surgery range from 2–6%. Notably, patients who received a single-dose regimen had the lowest infection rate (2.6%), while those on extended courses had slightly higher rates (6.7%),

although the difference was not statistically significant. This finding reinforces existing evidence that prolonged antibiotic administration does not provide additional protection once adequate preoperative coverage is achieved. Similar conclusions were drawn by Lodi et al. (Cochrane Review, 2021) and Gill et al. (2020), who reported that postoperative courses beyond 24 hours confer no measurable benefit for uncomplicated oral surgeries.

Amoxicillin-Clavulanate was the most commonly prescribed agent (47.6%), reflecting local practice patterns in Pakistan, where beta-lactam combinations remain first-line due to cost-effectiveness and accessibility. However, reliance on broad-spectrum agents raises stewardship concerns. International guidelines, including those from the American Dental Association (ADA) **and** European Association for Osseo integration (EAO), advocate for narrower-spectrum agents such as plain amoxicillin when feasible, reserving broad-spectrum or intravenous antibiotics for complex or contaminated surgeries. Another encouraging observation was the reduction in adverse drug reactions, reported in only 2.3% of cases, most being mild and self-limiting. This outcome is likely attributable to the declining use of extended or multiple-agent regimens. Furthermore, the downward trend in long-term prescriptions indicates improved prescriber compliance with evidence-based protocols introduced in BMCH's oral surgery department during 2021 under its antibiotic stewardship initiative.

From a global perspective, the shift observed at BMCH mirrors worldwide efforts to curb antibiotic misuse in dentistry. The World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) emphasize rational antibiotic use as a key strategy in combating antimicrobial resistance. The BMCH data add valuable regional evidence supporting that short, preoperative prophylaxis regimens are both safe and effective in preventing postoperative infections in oral surgery. Despite these positive findings, the study highlights areas for improvement. Antibiotic prophylaxis was still used in more than four-fifths of cases, suggesting that complete adherence to restrictive protocols has not yet been achieved. Continuous education, periodic audits, and the introduction of digital prescribing systems could further enhance compliance. Additionally, patient-specific risk assessment considering systemic diseases, surgical complexity, and immune status should guide antibiotic decisions rather than institutional habit.

In conclusion, this study confirms that reducing antibiotic duration and targeting prophylaxis to appropriate cases can maintain low infection rates while promoting stewardship**.** The BMCH experience reflects a successful transition toward rational, evidence-based antibiotic use in oral surgery, providing a model for similar tertiary hospitals across Pakistan and comparable healthcare systems.

CONCLUSION

This study demonstrated a clear and progressive shift in antibiotic prophylaxis practices within the Department of Oral and Maxillofacial Surgery at Bolan Medical Complex Hospital (BMCH), Quetta. the use of prolonged antibiotic regimens declined significantly, while single-dose preoperative prophylaxis became increasingly common. Despite this reduction, postoperative infection rates remained consistently low, and adverse drug reactions were minimal, confirming that shorter, targeted regimens are both safe and effective for most oral surgical procedures.

These findings align with contemporary international guidelines advocating evidence-based, risk-oriented antibiotic prescribing rather than routine use. The BMCH data underscore the importance of antibiotic stewardship in dentistry, demonstrating that appropriate antibiotic selection and optimized timing can achieve excellent surgical outcomes while reducing unnecessary drug exposure.

Ongoing education, clinical audits, and adherence to institutional antibiotic policies will be essential to sustain and further enhance these positive trends. Future research should include multicenter prospective studies to develop national benchmarks for antibiotic prophylaxis in oral surgery.

Ultimately, the BMCH experience highlights that rational antibiotic use, guided by stewardship principles, ensures effective infection control and supports global efforts against antimicrobial resistance**.**

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