



GRADUATION PROJECT

Degree in Dentistry

ANTIVIRAL PRESCRIPTIONS AT SPANISH DENTAL OFFICES: A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: Antiviral drugs are pharmaceuticals designed to inhibit viral replication within human cells. In dental practice, they are primarily indicated for treating oral manifestations of the Herpesvirus family, such as Herpes Simplex (HSV) and Varicella Zoster (VZV). While antibiotic overuse in Spanish dentistry is well-documented, there is a significant lack of empirical research regarding antiviral prescription patterns and stewardship. **Objectives:** To evaluate the prescription of antiviral drugs in Spanish dental clinics, identifying the main clinical indications, the most frequently used medications, and general prescribing habits. **Methodology:** This quantitative, descriptive, and cross-sectional study utilized an anonymous, self-administered online questionnaire distributed to licensed dentists in Spain. Data collection occurred between November 2025 and March 2026. Ethical guidelines and data protection laws were strictly followed. **Results:** A total of 42 dentists participated, the majority being general practitioners. Results show that 84% of respondents encounter acute viral infections in daily practice, with HSV-1 being the most common (74%), followed by a significant clinical awareness of Oral HPV (40.5%). Regarding treatment, 55% of practitioners prioritize symptomatic care, although 76% have prescribed antivirals when required by clinical severity. Acyclovir remains the undisputed drug of choice (81%), with a clear preference for topical administration over systemic pills. **Conclusions:** Spanish dentists exhibit a conservative prescribing profile, favoring symptomatic treatment and topical Acyclovir. While viral pathologies are a relevant component of modern practice, further pharmacological training could enhance clinical confidence in the use of systemic antiviral therapy when indicated.

KEYWORDS

Dentistry ;spain ; Antivirus, frequency, indications.

RESUMEN

Introducción: Los fármacos antivirales son medicamentos diseñados para detener la replicación de los virus dentro de las células humanas. En la práctica odontológica, se indican principalmente para tratar manifestaciones de la familia Herpesvirus, como el Herpes Simple (VHS) y la Varicela Zóster (VVZ). Aunque el uso excesivo de antibióticos en la odontología española está bien documentado, existe una falta de investigación empírica sobre los patrones de prescripción de antivirales. **Objetivos:** Evaluar la prescripción de fármacos antivirales en las clínicas dentales de España, identificando las principales indicaciones clínicas, los medicamentos más utilizados y los hábitos generales de prescripción. **Metodología:** Este estudio cuantitativo, descriptivo y transversal utilizó un cuestionario online anónimo y autoadministrado distribuido a dentistas colegiados en España. La recogida de datos se realizó entre noviembre de 2025 y marzo de 2026. Se siguieron estrictamente las normas éticas y las leyes de protección de datos. **Resultados:** Participaron un total de 42 dentistas, en su mayoría generalistas. Los resultados muestran que el 84% de los encuestados encuentra infecciones virales agudas en su práctica diaria, siendo el VHS-1 la más común (74%), seguida de una notable conciencia clínica del VPH oral (40,5%). En cuanto al tratamiento, el 55% de los profesionales prioriza el cuidado sintomático, aunque el 76% ha prescrito antivirales cuando la gravedad clínica lo requería. El aciclovir sigue siendo el fármaco de elección indiscutible (81%), con una clara preferencia por la administración tópica frente a la sistémica. **Conclusiones:** Los dentistas españoles muestran un perfil de prescripción conservador, favoreciendo el tratamiento sintomático y el aciclovir tópico. Aunque las patologías virales son un componente relevante de la práctica moderna, una mayor formación farmacológica podría mejorar la confianza clínica en el uso de la terapia antiviral sistémica cuando esté indicada.

PALABRAS CLAVE

Odontología; España; Antivirales; Frecuencia; Indicaciones.

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1. INTRODUCTION

1.1 Definition and classification of antiviral drugs

Antiviral drugs are a complex class of pharmaceuticals that are mainly used to stop viruses from replicating within human cells during infection (1). These agents differ from other classes of antimicrobials, a broader category that also includes antibacterial (antibiotic), antifungal, and antiparasitic medications, both structurally and functionally (2). Antiviral drugs and virucides need to be distinguished pharmacologically. Virucides are external agents (chemicals, antibodies, or natural compounds) that physically deactivate or destroy virus particles, either outside the body or prior to cell entry, whereas antivirals prevent intracellular viral replication and are generally thought to be relatively harmless to the host (2).

Based on their mode of intervention, therapeutic strategies intended to fight viral infections can be broadly classified(1). True antivirals fall into the first category and work by preventing the infected host cell's internal replication cycle(1). Agents that are intended to prevent the initial infection of the host cell membrane, such as particular antibodies or virucides, make up the second group(1). Lastly, immunomodulators make up the third group. They mainly work by altering the host's systemic reaction to the viral challenge(1).

Antiviral medications are usually categorized using two main approaches: either by the particular viral species or family they target (e.g., medications for HIV, influenza, or herpes viruses) or, more scientifically, by their pharmacological function and mechanism of action(3). Nucleoside reverse transcriptase inhibitors (NRTIs), protease inhibitors, fusion inhibitors, and integrase inhibitors are examples of functional classifications that characterize agents according to the particular molecular pathway they disrupt(3).With formulations including eye drops, inhaled powders, intravenous infusions, injections, and topical creams, the variety of administration routes further highlights their specialized utility(3).

1. 2 Mechanism of action of antiviral agents

Antiviral drugs work by interfering with crucial phases of the viral life cycle by specifically targeting non-host processes required for viral propagation(1,4). Attachment to the host cell, entry, uncoating, genome replication and expression, self-assembly, maturation, and ultimate release are all common steps in the viral cycle(1,5). Antivirals can act therapeutically at almost any of these phases(5).

Attachment,	Entry,	and	Uncoating	Inhibition
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Through interactions between viral and host surface proteins, the virus attaches itself to the host cell during the first stage of infection. One important class of antivirals that target this process are entry and fusion inhibitors(3,4). By changing the structure of host cell coreceptors, these substances such as CCR5 antagonists like maraviroc avoid the crucial fusion stage between the viral envelope and the host cell membrane(3). For some complicated viral infections, like the Human Immunodeficiency Virus (HIV), blocking this first stage is a very effective treatment(3,4).

Inhibition of genome replication and expression:

The most prevalent and important pharmacological mechanism for antivirals used in oral medicine, especially those that target Herpes Simplex Viruses (HSV), is probably the inhibition of nucleic acid synthesis (5). Because of their structural resemblance to natural host metabolites, a number of potent antiviral drugs, such as acyclovir, are categorized as antimetabolites(5). For example, acyclovir functions by imitating the natural components of viral DNA(1). The viral DNA polymerase incorporates this nucleoside analog into the expanding viral nucleic acid chain. Its incorporation results in chain termination, which effectively stops the viral genome replication process because it lacks the required 3' hydroxyl group(1,4).

The activity of viral polymerases is directly disrupted by other substances, such as polymerase inhibitors(4). These medications may directly impair polymerase function by acting as allosteric inhibitors or nucleoside analogs(4). For instance, baloxavir marboxil is administered as a pro-drug that hydrolyzes to an active form that prevents replication by inhibiting the activity of the viral endonuclease(6). The precision of antiviral therapy is highlighted by this targeted approach to replication inhibition. However, because of the selective pressure these medications exert, mutations in the targeted enzyme subunits such as polymerase or endonuclease can result in reduced susceptibility and clinically significant drug resistance(4, 6).

Inhibition of viral maturation and release:

The self-assembly of the new virions and their subsequent release from the infected cell, either by lysis or budding, constitute the last stage of the viral life cycle(1). Antivirals that target this phase include neuraminidase inhibitors, such as oseltamivir and zanamivir(3, 4). An essential enzyme for creating glycoproteins that aid in viral attachment is neuraminidase(3). These inhibitors block the activity of the enzyme and stop the release of newly formed, infectious virus particles from the host cell by imitating sialic acid, the enzyme's natural substrate(4). This system is essential for preventing the spread of viruses such as influenza A and B strains(3).

The range of antiviral medications that general dentists prescribe is heavily focused on those that work against the Herpesvirus family, which causes the most common acute viral oral lesions(7).Acyclovir is the primary pharmacological agent in this situation(7).Acyclovir, which comes in oral (tablet, capsule, suspension), intravenous, and topical cream forms, is mainly used to treat symptoms related to infections brought on by varicella-zoster virus (VZV) and herpes simplex virus (HSV)(7). Acyclovir's therapeutic role is crucial, even though it cannot eradicate the latent herpes virus. It relieves pain and discomfort and speeds up the healing of sores linked to outbreaks, like recurrent herpes labialis or primary herpes gingivostomatitis.

The scope of antiviral prescription by general dentists is primarily focused on the treatment of oral Herpesvirus manifestations because the treatment of highly systemic or complex viral diseases, such as influenza, Hepatitis C, or HIV, is usually the purview of specialized physicians. Therefore, the use and appropriateness of Acyclovir and its related pro-drugs (e.g., Valacyclovir) will be the main focus of any analysis of antiviral prescribing patterns in dental clinics, especially in Spain. This emphasizes the critical importance of determining when a topical agent is sufficient versus when a systemic prescription is pharmacologically justified(8). One of the main indicators of a prescriber's knowledge of viral pathology and compliance with evidence-based stewardship principles is the formulation and mode of administration (topical cream versus systemic tablet)(7,9).

1.3 Indications for antiviral use in dentistry

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lesions(7). Acyclovir is the primary pharmacological agent in this situation(7). Acyclovir, which comes in oral (tablet, capsule, suspension), intravenous, and topical cream forms, is mainly used to treat symptoms related to infections brought on by varicella-zoster virus (VZV) and herpes simplex virus (HSV)(7). Acyclovir's therapeutic role is crucial, even though it cannot eradicate the latent herpes virus. It relieves pain and discomfort and speeds up the healing of sores linked to outbreaks, like recurrent herpes labialis or primary herpes gingivostomatitis.

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1.4 Common antiviral drugs used in dental practice

A wide variety of microorganisms, including several viruses that can cause particular, transmissible infections, are constantly present in the oral cavity and its mucosal tissue(10). Since the infectious route can involve patients, their families, and the dental professional team, a thorough understanding of these viral infections is essential for daily dental practice(10). These viral infections can cause a wide range of clinical symptoms, from mild, asymptomatic spots to severe redness, blistering, ulcerations, and hyperkeratotic changes. For an accurate differential diagnosis, certain microbiological tests are frequently required(10).

Herpes Simplex Virus (HSV):

HSV-1 is the most common virus affecting the oral mucosa, with seroprevalence indicating that 70% to 90% of adults possess detectable antibodies(10). The virus is transmitted through direct contact with saliva and primarily locates in ectoderm-derived structures, including the oral mucosa(10).

1. Primary Infection: The initial exposure is often asymptomatic but can manifest as acute herpetic gingivostomatitis (AHGS), typically seen in children but sometimes in young adults(10). AHGS presents locally with painful vesicles and irregular ulcers on the gingiva, palate, and oral mucosa, coupled with systemic symptoms such as fever, malaise, and swollen, painful lymph nodes(10).

2. Recurrent Infection: Following primary infection, HSV remains latent, reactivating in 20%–40% of the population, commonly presenting as Herpes Labialis (cold sores)(10). Furthermore, research suggests a significant association between HSV-1 and the etiopathogenesis of aggressive periodontitis, implying a potential role in facilitating microbial dysbiosis within the oral cavity(10).

Varicella Zoster Virus (VZV)

VZV, a human herpes virus, causes two distinct clinical entities in the oral context (10):

1. Primary Infection (Varicella/Chickenpox): This highly transmissible infection causes exanthema and enanthema, characterized by oral ulcers on the buccal mucosa, gingiva, and palate(10). Importantly, these lesions are often comparatively painless, distinguishing them from AHGS ulcers(10).

2. Reactivation (Herpes Zoster/Shingles): VZV remains latent in sensory ganglia after primary infection and may reactivate, particularly in the elderly or immunocompromised individuals(10). If the maxillary or mandibular branches of the trigeminal nerve are involved, approximately 15% of cases will present with unilateral oral ulcers(10). A critical clinical implication is that the profound neuralgia and associated pain caused by trigeminal VZV infection may severely mimic odontogenic toothache(10).

This potential for VZV-induced pain to masquerade as an endodontic or periodontal emergency underscores a crucial risk factor for antimicrobial misuse in dentistry. If a practitioner, faced with an ambiguous presentation of severe unilateral pain or complex mucosal lesions, fails to differentiate viral etiology from bacterial infection, they may reflexively prescribe antibiotics (a documented common practice in Spain (11,12), leading to delayed appropriate antiviral therapy and contributing unnecessarily to the local and global antimicrobial resistance crisis(13).

1. 5 Side-effects and contraindications of antiviral therapy

In dentistry, a thorough evaluation of the infection's severity, the patient's immune status, and the timing in relation to the onset of symptoms must all be taken into consideration before prescribing systemic antiviral medication(9,14).

Handling the Herpes Simplex Virus (HSV)

For immunocompetent patients with mild HSV infections, such as mild primary herpetic gingivostomatitis (AHGS), the initial course of treatment is mainly symptomatic(10). In situations where brushing is uncomfortable, this usually entails bed rest, adequate hydration, analgesics (such as ibuprofen), and the use of antimicrobial mouthwashes (such as chlorhexidine) to prevent secondary infections and lessen plaque buildup(9,10).

Systemic antiviral therapy is only used in certain high-risk situations(9,14).

- Severe Primary Infections: The preferred medication for treating severe infections in patients who are not immunocompromised is a systemic antiviral agent, usually Acyclovir(9,10).
- Immunocompromised Patients: Systemic antiviral therapy is necessary for any initial or recurrent infection in an immunocompromised patient(9,10).
- Recurrent Herpes Labialis: For routine, mild recurrence in immunocompetent patients, topical antiviral creams (acyclovir or penciclovir) applied at the first sign of infection are suitable(9,10). Systemic oral antivirals should only be considered for severe, frequent, or persistent recurrent lesions(14).

Management of Varicella Zoster Virus (VZV)

The management of primary VZV (chickenpox) is generally symptomatic, focusing on fever control, hydration, and reducing itching(10). However, in severe cases, antiretroviral therapy is advised(10).

For the management of orofacial Herpes Zoster (shingles), systemic antivirals are strongly recommended(14). The administration of systemic antivirals has been shown to reduce the incidence of postherpetic neuralgia, a severe and chronic pain complication, and to reduce viral shedding(14).

The Time-Critical Window: The efficacy of antiviral treatment for VZV is critically dependent on timely administration. Treatment must be commenced as soon as possible, ideally within 72 hours of the onset of the rash, to maximize the reduction in pain duration, limit the spread of the rash, and reduce the risk of complications such as corneal infection(14). This

narrow therapeutic window necessitates prompt and accurate diagnosis by the prescribing clinician.

Referrals and Specialist Care Clinical guidelines require patients with certain complex presentations to be referred to a hospital or specialist(9,14). These include patients who are pregnant or nursing, those who have ophthalmic involvement, and those who are seriously immunocompromised or ill systemically(9,14). To guarantee a thorough, multidisciplinary approach to managing systemic viral disease, referral is crucial.

1.6 Antiviral prescription practices in Spain

Antiviral medications have a variety of possible adverse effects, which differ based on the particular medication, dosage, and length of treatment, just like all systemic pharmacological agents(8). Gastrointestinal problems like nausea, vomiting, and diarrhea are frequently reported side effects of antiviral drugs(8). Dry mouth, exhaustion, joint and muscle pain, skin rash, headaches, lightheadedness, and insomnia are examples of additional systemic reactions(8).

The effects on the central nervous system (CNS) of acyclovir, the main antiviral medication used in dentistry, require special consideration. CNS symptoms like agitation, confusion, drowsiness, and dizziness are linked to acyclovir(7). Because older people are frequently more susceptible to the drug's CNS effects than younger adults, these side effects are especially noticeable in this demographic(7). Given that Herpes Zoster (shingles), an infection that strongly warrants the use of systemic antivirals, primarily affects elderly patients, this sensitivity is a significant prescribing consideration(10). Serious iatrogenic complications for elderly patients may arise if the prescribing dental clinician fails to fully evaluate the patient's medical history and age-related systemic vulnerabilities prior to prescribing systemic Acyclovir(7).

When prescribing antivirals, each patient's risks and benefits must be carefully weighed(7). Known drug allergies are absolute contraindications. Additionally, vulnerable groups, such as pregnant or nursing women, require special attention and frequently

referrals(14). In non-clinical reproduction studies, some antiviral drugs, like baloxavir marboxil, do not exhibit any negative developmental effects; however, because careful risk assessment is required, vulnerable groups must receive professional guidance(6). According to general prescribing guidelines, dentists must confirm that patients with orofacial VZV are currently receiving the proper medical care(14).

1.7 Importance and objectives of the study Rationale / Importance.

Antimicrobial resistance (AMR), which compromises the effectiveness of necessary drugs, is widely acknowledged as one of the biggest public health issues of the twenty-first century(12,13). Antiviral resistance, including the selection for resistant Herpesvirus strains, is a similar and expanding threat to public health, whereas bacterial antibiotic resistance has historically been the focus of international attention(10). All medical professionals, including dentists, must follow the "One Health" framework in order to practice effective antimicrobial stewardship, which guarantees the responsible use of all antimicrobial classes(13,15).

The Spanish Context of Antimicrobial Prescription
In Spain, dentists play a vital role in primary care and make a substantial contribution to the country's use of antibiotics. Research shows that dentists write about 10% of all primary care prescriptions for antibiotics(12,15). Additionally, Spain has a high average annual prevalence of antibiotic use among patients, frequently surpassing that of other European Union nations, according to comparative data across Europe, Propolis has gained wide popularity over the last decades in several parts of the world. In parallel, the literature about propolis composition and biological properties increased markedly. A great number of papers have demonstrated that propolis from different parts of the world is composed mainly of phenolic substances, frequently flavonoids, derived from plant resins (16).

Previous studies consistently indicate that Spanish dentists have a culture of prescribing potentially inappropriate antibiotics. Research on antibiotics reveals that a significant percentage of prescriptions possibly as much as 80% in certain circumstances may be unnecessary(12,15). This includes the common, frequently preventative use of medications like amoxicillin and amoxicillin/clavulanic acid for procedures like third molar extractions that are not recommended(11,12). Contextual elements like working conditions, pressure

to meet patient expectations, and fear of complications all have an impact on these prescribing practices(15).

The scientific literature noticeably lacks empirical research specifically examining the patterns, indications, and appropriateness of antiviral drug prescription by Spanish general dental practitioners, despite the substantial documentation of antibiotic overuse. An important oversight in national antimicrobial stewardship surveillance is this data gap.

The established prescribing culture characterized by high rates of prophylactic and potentially non-evidence-based antibiotic use generates an urgent public health hypothesis that similar prescriptive tendencies may apply to antiviral agents(11,12). This hypothesis suggests that dentists may unnecessarily prescribe systemic antivirals (e.g., oral Acyclovir) for localized, self-limiting viral conditions (e.g., mild herpes labialis), where topical agents would suffice(9,10). Such inappropriate systemic exposure risks contributing to antiviral resistance and subjects patients to unnecessary systemic side effects, particularly in vulnerable groups like the elderly(7,10).

Therefore, this thesis is crucial for measuring this risk, establishing a baseline knowledge of antiviral usage in the Spanish dental industry, and proactively addressing the parallel threat of antiviral resistance, which is similar to the more well-known bacterial AMR crisis(13). The results will give the information needed to support Spanish dentists expressed desire for additional training and strengthen their position in antimicrobial stewardship programs(15).

2. OBJETIVE

The main objective of this thesis is to evaluate how antiviral drugs are prescribed in dental clinics in Spain, including their main indications and the general prescribing habits of dentists.

3. MATERIAL AND METHODS

3.1 Design of the research protocol

Type and design of the study :

The investigation is a quantitative, descriptive, cross-sectional, observational study : The primary objective is to describe the current state of antiviral prescription practices among Spanish dentists, assessing their professional experience, clinical exposure to viral infections, and the specific frequency, choice, and duration of antiviral agents prescribed for oral lesions.

The research is titled : **PRESCRIPTION DE ANTIVIRUS EN LAS CONSULTAS DENTALES ESPAÑOLAS : ESTUDIO TRANSVERSAL.**

Inclusion and Exclusion criteria :

The study is addressed to licensed dental professionals currently practicing in Spain.

Inclusion Criteria:

- Individuals holding a dentistry degree or who are oral medicine specialists.
- Actively engaged in clinical practice in Spain for at least one year.
- Explicitly grant consent to participate in the survey (Question 2: "Yes").

Exclusion Criteria:

- Participants who do not accept informed consent (Question 2: "No").
- Responses classified as incomplete or provided by non-practicing/retired dentists or students.

Sample size :

While no minimum mandatory sample size is required for the development of the Final Degree Project, the objective is to maximize participation to ensure the results are representative of the Spanish dental community.

The sampling method employed will be non-probability convenience sampling, combined with the snowball method, utilizing professional networks.

Intervention

As this is an observational study based on a survey, there are no interventions applied to study or control groups. The procedure consists solely of the administration and collection of data using the validated questionnaire.

3.2 Method of collection

Data collection instrument

The data collection tool is an anonymous, self-administered online questionnaire (survey), titled ***PRESCRIPCION DE ANTIVIRUS EN LAS CONSULTAS DENTALES ESPAÑOLAS: ESTUDIO TRANSVERSAL***. The use of a digital platform (Microsoft Forms) is the method of distribution, chosen for its accessibility. The final questionnaire will be included in the Annexes section of the manuscript.

The questionnaire is structured into four specific sections designed to measure the results:

1. **Ethics and Consent:** Confirms voluntary participation and obtains explicit digital consent (Questions 1, 2).
2. **Professional Profile and Demographics:** Gathers data on sex (Q3), age (Q4), years of clinical experience (Q5), and specialty practiced (Q6).
3. **Clinical Exposure and Viral Entities:** Assesses the frequency of encountering acute oral viral infections (Q7) and identifies the specific viruses observed in practice (Q8), including Herpes Simplex Virus and Varicella Zoster Virus.
4. **Antiviral Prescription Practices:** Quantifies prescriptive habits through specific questions (Q9–Q13)

3.3 Ethical issue and review approval

Ethical review and approval codes

All empirical research projects must obtain the necessary institutional approvals

Faculty/Department Approval (TFG Committee): The study has been approved by the department : OD.013/2526

UEM Research Ethics Committee (CI) Approval:

Informed Consent and Data Confidentiality

Ethical considerations are addressed by the first two questions of the survey :

- **Informed Consent:** Participants are informed that participation is voluntary and they may withdraw at any time (Question 1). Explicit consent is obtained via a required "Yes/No" question (Question 2).
- **Anonymity and Confidentiality:** The survey is completely anonymous, and no personal identifying information is collected.
- **Data Protection:** The data collected will be confidential and processed exclusively for research purposes in accordance with Spanish law, specifically *Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales*.

3.4 Data Analysis

Once the data collection period is concluded, the results will be exported from the digital platform for statistical analysis

4. RESULTS

Part 1: Demographics and professional profile

Questionnaires were collected between november 2025 and March 2026. During this time, 42 questionnaire were filled up.

Demographics and Professional Profile

The study population shows a predominantly female distribution, with 67% (n=28) of respondents being women and 33% (n=14) men. This demographic reflects the modern shift observed in dental schools and among the younger generation of practicing dentists in Europe.

Regarding professional specialization (Fig. 1), the majority of the sample consists of General Dentists (24), followed by specialists in Periodontics (10), Implantology (8), and Oral Surgery (8). Other specialties, such as Endodontics, Oral Medicine, and Orthodontics, were also represented. The high participation of general practitioners is particularly relevant as they often serve as the primary diagnostic line for oral viral infections before any specialized referral.

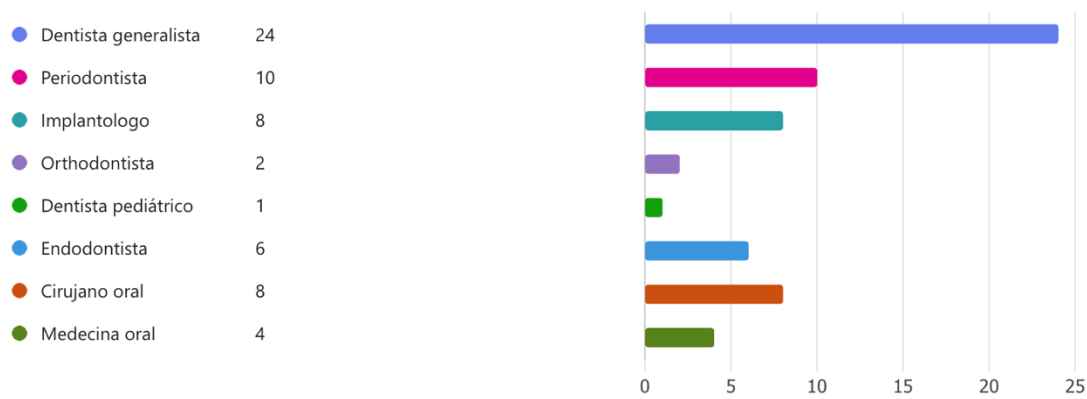


Fig.1 Dental specialty practiced

Part 2: Clinical Encounters with Viral Infections

Clinical Encounters with Viral Infections

Clinical experience with viral pathologies is highly prevalent among the participants, with 84% of dentists confirming they treat patients with acute viral infections in their daily practice. In

terms of frequency, 50% of respondents encounter these cases occasionally, while 15% see them frequently; notably, none of the participants reported "never" seeing such infections.

Among the specific viruses encountered shown in (Fig. 2), Herpes Simplex Virus Type 1 (HSV-1) dominates the clinical landscape, with 31 respondents reporting recurrent labial herpes and 22 reporting primary infections. Oral HPV (17) also shows a significant presence, highlighting a growing clinical awareness of HPV-related oral lesions, followed by Varicella Zoster Virus (6) and Epstein-Barr Virus (5). Its frequency is shown in (Fig. 3)

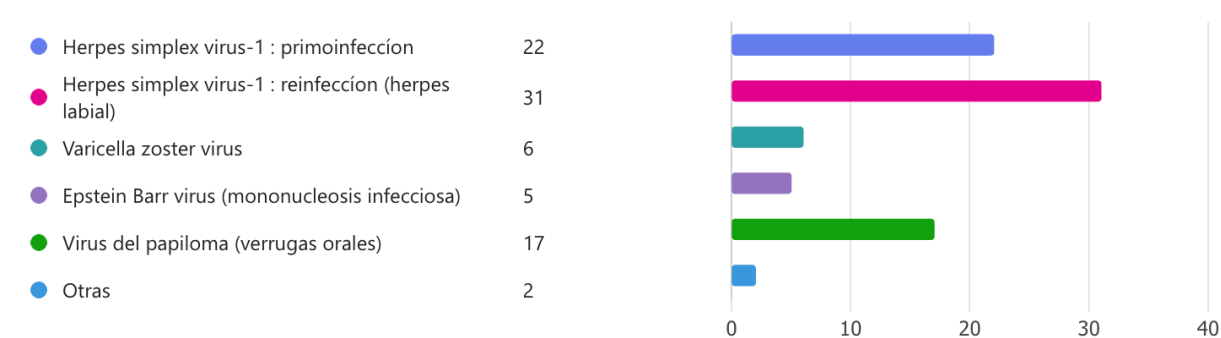


Fig.2



Fig.3

Part 3: General Treatment Approaches

Antiviral Therapy and Prescription Protocols

Regarding therapeutic approaches, there is a clear leaning toward conservative management; 55% of the dentists usually prescribe symptomatic treatment (pain relief, hydration), while 33% combine both symptomatic and antiviral therapies. Although symptomatic care is the preference for self-limiting infections, 76% of the practitioners have prescribed antivirals at some point when clinical severity required it. (Fig. 4)



Fig.4

The data reveals a preference for topical over systemic administration. Topical antivirals are prescribed "occasionally" or "frequently" by 51% of the group, whereas systemic (pill) antivirals are "never" used by 37% of respondents and only "frequently" by (5%. This suggests that systemic medications are likely reserved for severe, unmanageable, or immunocompromised cases. In terms of specific pharmacology,

Acyclovir remains the undisputed drug of choice among Spanish dentists (34 respondents), likely due to its cost-effectiveness and historical availability. Valacyclovir (12) follows as a distant second, chosen by some for its superior bioavailability and simpler dosing schedule, while drugs like Oseltamivir or Remdesivir showed no use in this dental context.

Si	31
No	10

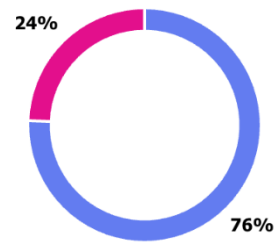


Fig.5

- **Data:** 76% Yes | 24% No
- **Commentary:** Even though Q9 showed a preference for symptomatic treatment, over three-quarters of the dentists *are* willing and able to prescribe antivirals when the clinical severity demands it.

Frecuentemente	3
Ocasionalmente	16
Rara vez	12
Nunca	6

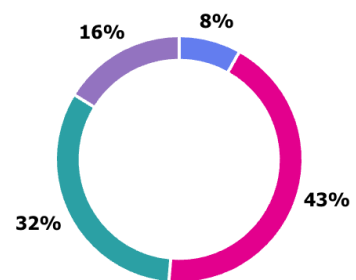


Fig.8

Data: 43% Occasionally | 32% Rarely | 16% Never | 8% Frequently

Frecuentemente	2
Ocasionalmente	12
Rara vez	12
Nunca	15

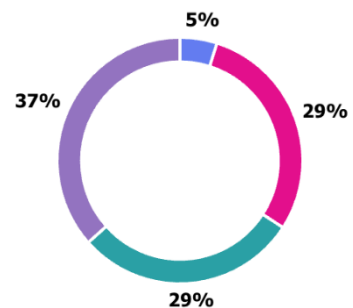


Fig.9

Data: 37% Never | 29% Rarely | 29% Occasionally | 5% Frequently

Part 4: Specific Antiviral Drugs and Protocols

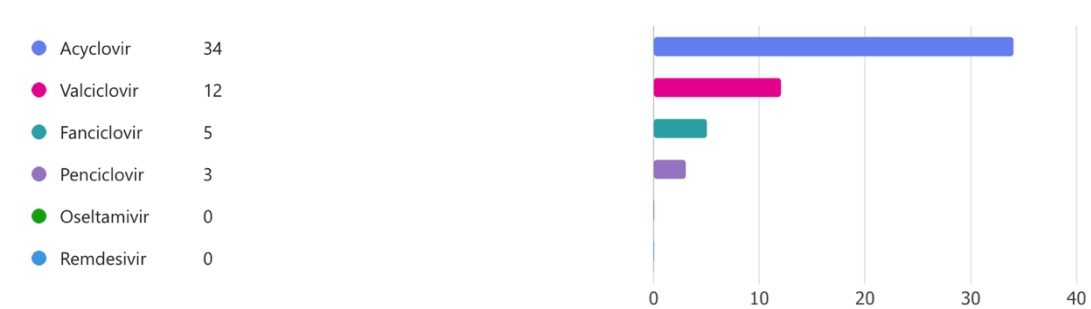


Fig.10

Data: Acyclovir (34) | Valacyclovir (12) | Famciclovir (5) | Penciclovir (3) | Oseltamivir/Remdesivir (0)

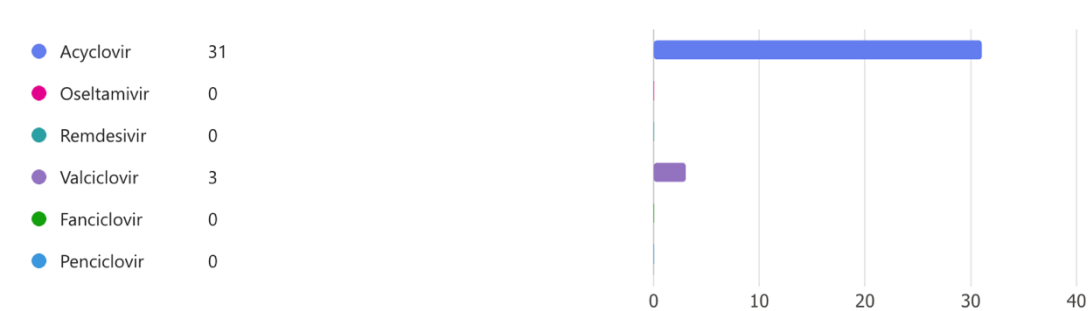


Fig.11

Data: Acyclovir (31) | Valacyclovir (3) | Others (0)



Fig.12

Data: 1 to 5 days (47%) | 6 to 10 days (47%) | More than 10 days (6%)

5. DISCUSSION

In this study, we observed that approximately 84% of the participating dentists encounter acute oral viral infections in their daily practice, with 50% seeing them occasionally. These results prove that viral pathologies are a common clinical reality in dental offices. However, unlike studies on antibiotics or steroids, there is a relative scarcity of recent literature specifically focusing on the frequency of antiviral prescriptions in private dental practice, which makes our findings particularly relevant for mapping current trends(17).

The first objective of this study was to identify the most common viral infections seen by practitioners. Our results show that Herpes Simplex Virus Type 1 (HSV-1) remains the primary viral pathology, with 31 respondents reporting recurrent labial herpes. This matches with studies published in other countries (17,18) confirming that HSV-1 is endemic and the most frequent viral infection of the oral cavity. More interestingly, 40.5% of our dentists reported seeing Oral HPV, a figure that reflects a growing clinical awareness and a possible increase in the prevalence of HPV-related oral lesions, as noted in recent oncological literature (19).

Regarding therapeutic management, 55% of our participants lean toward symptomatic treatment (pain relief and hydration) as their first choice. This conservative approach matches with international clinical guidelines (19) which suggest that for immunocompetent patients, many oral viral infections are self-limiting. However, it is not surprising that 76% of dentists have prescribed antivirals at least once, showing that they are capable of identifying cases where clinical severity requires pharmacological intervention.

When comparing specific drug choices, our research revealed that Acyclovir (81%) is the most frequently prescribed antiviral in Spanish dental offices. This matches with global dental studies (20,21) in the treatment of herpetic infections.

The table below compares our findings with the general medical prescription trends for antivirals:

Antiviral Agent	Current Study (Spanish Dentists)	General Medical / International Trends
Acyclovir	81% (34 respondents): The undisputed primary choice.	Most frequent agent for herpetic oral infections globally due to cost-effectiveness.
Valacyclovir	28.5% (12 respondents): Used by a portion of modern practitioners.	Gaining ground internationally due to superior bioavailability and simpler dosing.
Famciclovir	11.9% (5 respondents): Limited use in Spanish dental clinics.	Recognized as a viable clinical alternative for herpesvirus management.
Penciclovir	7.1% (3 respondents): Rarely prescribed.	Primarily restricted to topical formulations in dental contexts.
Oseltamivir / Remdesivir	0%: No recorded use in this study.	Reserved for specialized medical treatment of systemic viruses (e.g., Influenza, COVID-19).

Although the classic antiviral used in dentistry remains Acyclovir (due to its cost-effectiveness and proven efficacy), in recent years, Valacyclovir has started to gain ground in some international studies (21) due to its superior bioavailability and simpler dosing schedule. In our results, it represents the second position (28.5%), which shows that a portion of Spanish dentists are updating their protocols toward more modern molecules.

Finally, a notable finding was the preference for topical administration over systemic pills. While 43% prescribe topical antivirals occasionally, 37% "never" prescribe systemic antivirals. This highlights a cautious approach among dental practitioners, likely to avoid systemic side effects, reserving pills for severe or immunocompromised cases (22). This

finding suggests that further pharmacological training during the bachelor period could be beneficial to ensure all dental students feel confident using systemic antivirals when clinically indicated(22).

6. CONCLUSIONS

1. To fulfill the main objective of evaluating antiviral prescription in Spain, we observed that 84% of dentists encounter acute viral infections in their clinics, confirming that these drugs are a relevant component of modern dental practice.
2. The main indications for prescribing or considering antiviral therapy are Herpes Simplex Virus Type 1 (HSV-1), which remains the most prevalent, and Oral HPV, which was reported by a significant 40.5% of the participants.
3. Regarding prescribing habits, Spanish dentists show a conservative profile; 55% prioritize symptomatic treatment, although a vast majority (76%) are prepared to prescribe antivirals when the clinical situation demands it.
4. The general prescribing habits are characterized by a strong preference for Acyclovir (81%) as the drug of choice and a higher frequency of topical/local administration compared to systemic (pill) treatments.

7. SUSTAINABILITY

Sustainability in the context of this study focuses on pharmacological stewardship and the long-term viability of oral healthcare. A fundamental pillar of this approach is the fight against antimicrobial resistance, a major public health challenge that includes the growing threat of antiviral resistance. The results of this research demonstrate a conservative prescribing profile among practitioners, with 55% of Spanish dentists prioritizing symptomatic treatments such as hydration and analgesia for self-limiting viral infections. This responsible model is a key sustainability strategy, as it limits the selective pressure exerted on viral strains and ensures that first-line molecules, like Acyclovir (chosen by 81% of respondents), remain effective therapeutic tools for future generations.

Furthermore, the study highlights a significant clinical awareness of Oral HPV, identified by 40.5% of participants, which directly supports a sustainable preventive healthcare model. The early diagnosis of these lesions allows for intervention before the development of oncological complications, significantly reducing clinical and economic costs for the national health system while minimizing the environmental impact associated with medical waste and the energy consumed during invasive hospital treatments. Finally, fostering continuous pharmacological education ensures professional resilience in the face of emerging viral threats. By refining their differential diagnosis, dentists can avoid the inappropriate or "reflexive" use of antibiotics for pathologies of viral origin, which is a documented issue in Spain. This scientific rigor fully integrates dentistry into the global "One Health" framework, thereby guaranteeing the long-term quality of patient care and the preservation of the global pharmaceutical arsenal.

8. REFERENCES

1. Kausar S, Said Khan F, Ishaq Mujeeb Ur Rehman M, Akram M, Riaz M, Rasool G, et al. 1 A review: Mechanism of action of antiviral drugs. *Int J Immunopathol Pharmacol*. marzo de 2021;35:20587384211002621. doi:10.1177/20587384211002621
2. Dommisch H, Schmidt-Westhausen AM. 2 The role of viruses in oral mucosal lesions. *Periodontol 2000*. octubre de 2024;96(1):189-202. doi:10.1111/prd.12553
3. Boopathi S, Poma AB, Kolandaivel P. 3 Novel 2019 coronavirus structure, mechanism of action, antiviral drug promises and rule out against its treatment. *J Biomol Struct Dyn*. 30 de abril de 2020;1-10. doi:10.1080/07391102.2020.1758788
4. fiveable. 4 classes of antiviral drugs and their mechanism of action [Internet]. 2025. Disponible en: Fiveable. (2024, August 1). 15.1 Classes of antiviral drugs and their mechanisms of action – Virology. <https://fiveable.me/virology/unit-15/classes-antiviral-drugs-mechanisms-action/study-guide/ieFrSSVWyWsiANkB>
5. Ryan O'Hanlon 1 2, , Megan L Shaw 3, ry. 5 Baloxavir marboxil: the new influenza drug on the market [Internet]. enero de 2019. Disponible en: <https://www.sciencedirect.com/science/article/abs/pii/S1879625718301299?via%3Dihub>
6. US Brand. 6 Acyclovir (oral route, intravenous route) [Internet]. 1 de diciembre de 2025. Disponible en: <https://www.mayoclinic.org/drugs-supplements/acyclovir-oral-route-intravenous-route/description/drg-20068393>
7. david clinic. 7 Antiviral [Internet]. 07_23 de 2024. Disponible en: <https://my.clevelandclinic.org/health/treatments/antivirals>
8. 8 Drug prescribing for dentistry: dental clinical guidance. 2nd ed. Dundee: SDCEP; 2011.
9. Cunningham A, Griffiths P, Leone P, Mindel A, Patel R, Stanberry L, et al. 9 Current management and recommendations for access to antiviral therapy of herpes labialis. *J Clin Virol*. enero de 2012;53(1):6-11. doi:10.1016/j.jcv.2011.08.003
10. julio alvarez. 10 Survey of Spanish dentists on the prescription of antibiotics and antiseptics in surgery for impacted lower third molars [Internet]. enero de 2016. Disponible en: <https://pubmed.ncbi.nlm.nih.gov/26615502/>
11. Domínguez-Domínguez L, López-Marrufo-Medina A, Cabanillas-Balsera D, Jiménez-Sánchez MC, Areal-Quecuty V, López-López J, et al. 11 Antibiotics Prescription by Spanish General Practitioners in Primary Dental Care. *Antibiotics*. 11 de junio de 2021;10(6):703. doi:10.3390/antibiotics10060703
12. Farzinnia G, Anvari Y, Siqueira MF. 12 Antimicrobial Resistance in Oral Healthcare: A Growing Concern in Dentistry. *Dent J*. 28 de agosto de 2025;13(9):391. doi:10.3390/dj13090391
13. Domínguez-Domínguez L, López-Marrufo-Medina A, Cabanillas-Balsera D, Jiménez-Sánchez MC, Areal-Quecuty V, López-López J, et al. 13 Antibiotics Prescription by Spanish General Practitioners in Primary Dental Care. *Antibiotics*. 11 de junio de 2021;10(6):703. doi:10.3390/antibiotics10060703

14. Vázquez-Cancela O. 14 Understanding dentists' antibiotic prescribing behaviour in Spain: a focus group study.
15. Brauer R, Ruigómez A, Downey G, Bate A, Garcia Rodriguez LA, Huerta C, et al. 15 Prevalence of antibiotic use: a comparison across various European health care data sources. *Pharmacoepidemiol Drug Saf.* marzo de 2016;25(S1):11-20. doi:10.1002/pds.3831
16. Salatino A. 16 Perspectives for Uses of Propolis in Therapy against Infectious Diseases. *Molecules.* 19 de julio de 2022;27(14):4594. doi:10.3390/molecules27144594
17. Harfouche M. 17 herpes zoster evidence decision [Internet]. 19 de mayo de 2025. Disponible en: https://cdn.who.int/media/docs/default-source/immunization/position_paper_documents/herpes_zoster/herpes_zoster_evidence_decision_table.pdf?sfvrsn=1ee71acd_2
18. Devan Vaghela. 18 guideline for the herpes [Internet]. 2021. Disponible en: <https://jcadonline.com/guideline-management-herpes-simplex-1-cosmetic/>
19. Iraqui A, Safia A, Mahameed M, Abd Elhadi U, Merchavy S. 19 Global Prevalence and Modifiers of Human Papillomavirus Positivity in Oral Cavity Cancer: A Systematic Review and Meta-Analysis of Prevalence (1995–2024). *Cancers.* 31 de agosto de 2025;17(17):2870. doi:10.3390/cancers17172870
20. Thappa D, Rajalakshmi R, Kumari R. 20 Acyclovir versus valacyclovir. *Indian J Dermatol Venereol Leprol.* 2010;76(4):439. doi:10.4103/0378-6323.66577
21. pearl team. 21 Dentist workforce statistics [Internet]. 9 de marzo de 2026. Disponible en: <https://hellopearl.com/blog/dentist-workforce-statistics-2026-trends-and-insights-pearl-ai>
22. Topbaş C, Atav A, Ergen M. 22 Knowledge, Attitudes, and Practices Toward Infectious Diseases Among Dental Students and Dentists in the Post-COVID Era: A Cross-Sectional Survey. *COVID.* 31 de marzo de 2026;6(4):61. doi:10.3390/covid6040061

9. ANNEXES

Annex 1:



Comisión de Investigación

Villaviciosa de Odón, 19 de enero de 2026

Estimado/a investigador/a,

La Comisión de Investigación de la Unidad de Investigación, una vez revisada la documentación e información, remitida por el investigador responsable con fecha , relativa al proyecto abajo indicado, autoriza su desarrollo en la Universidad Europea.

Título del proyecto:	Prescripción de antivirales en las consultas dentales españolas
Tipo de proyecto:	TFG
Investigador/a responsable:	PINTOR HOLGUIN- EMILIO
Código CI:	2026-49
Código OTRI:	Sin especificar
Código Departamento:	OD.013/2526
Dictamen:	APROBADO

Atentamente,

Dra. Ruth Muñoz Risueño
Directora de Investigación



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Prescripción de antivirales en las consultas dentales españolas

* Obligatoire

1. El presente cuestionario forma parte del Trabajo de Fin de Grado en Odontología de la Universidad Europea de Madrid titulado **PRESCRIPCION DE ANTIVIRALES EN LAS CONSULTAS DENTALES ESPAÑOLAS: ESTUDIO TRANSVERSAL** y dirigido por el Profesor Dr. Emilio Pintor Holguín. El propósito del presente trabajo es **conocer la prescripción de antivirales en las consultas dentales españolas: su frecuencia, las indicaciones así como los fármacos más utilizados, sus vías de administración y la duración del tratamiento** y la información será recogida a través de una breve encuesta. Su participación en este estudio es de carácter libre y voluntario, pudiendo solicitar ser excluido del mismo, sin justificación previa ni perjuicio para usted. La información recogida será confidencial y no se usará para ningún otro propósito fuera de esta investigación y derivados de la divulgación investigativa. Los datos recogidos serán completamente anónimos. No se solicitarán datos personales identificativos. Los datos que se recojan en la encuesta se tratarán de acuerdo con lo establecido en la Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales. A los efectos de lo dispuesto en el reglamento de la Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales, queda informado y es expresamente consiente de la utilización de los datos proporcionados en la encuesta, con los fines anteriormente indicados. El presente consentimiento se otorga sin perjuicio de todos los derechos que le asisten en relación con normativa anteriormente citada, existiendo la posibilidad de acceder a la información proporcionada, rectificación, cancelación y oposición en cualquier momento que lo desee. Para ello debe dirigirse por escrito al tutor Prof. Emilio Pintor Holguín (emilio.pintor@universidadeuropea.es).

¿Da su consentimiento de participación en la encuesta como voluntario/a para que los resultados en la encuesta se utilicen en el Trabajo Fin de Grado titulado PRESCRIPCION DE ANTIVIRALES EN LAS CONSULTAS DENTALES ESPAÑOLAS: ESTUDIO TRANSVERSAL ? *

☐ Sí

☐ No

2. Sexo del dentista

☐ Varón

☐ Mujer

☐ Prefiero no contestar

3. Edad del dentista

4. Años de experiencia clínica como dentista

5. Especialidad dental que ejerce (elige una o varias respuestas si es necesario)

- ☐ Dentista generalista
- ☐ Periodontista
- ☐ Implantólogo
- ☐ Ortodontista
- ☐ Dentista pediátrico
- ☐ Endodontista
- ☐ Cirujano oral
- ☐ Medicina oral

6. ¿Ve en su consulta dental pacientes que sufren infecciones virales agudas en la boca? *

- ☐ Si
- ☐ No

7. ¿Cuál de las siguientes infecciones virales que pueden afectar a la cavidad oral ha visto usted alguna vez en su consulta dental?

- ☐ Herpes simplex virus-1 : primoinfección
- ☐ Herpes simplex virus-1 : reinfección (herpes labial)
- ☐ Varicella zoster virus
- ☐ Epstein Barr virus (mononucleosis infecciosa)
- ☐ Virus del papiloma (verrugas orales)
- ☐ Otras

8. ¿ Con qué frecuencia ve usted infecciones virales en su consulta ?

- ☐ Frecuentemente
- ☐ Ocasionalmente
- ☐ Rara vez
- ☐ Nunca

9. Ante una infección oral viral, usted habitualmente prescribe?

- ☐ Tratamiento sintomático
- ☐ Tratamiento antiviral
- ☐ Ambos

10. ¿ Ha prescrito usted alguna vez antivirales a sus pacientes ?

- ☐ Si
- ☐ No

11. Si en la anterior pregunta ha contestado Si, ¿Con qué frecuencia receta antivirales TÓPICOS/LOCALES en la cavidad bucal en su consulta dental?

- ☐ Frecuentemente
- ☐ Ocasionalmente
- ☐ Rara vez
- ☐ Nunca

12. ¿Con qué frecuencia receta antivirales SISTÉMICOS (comprimidos) en su consulta dental?

- ☐ Frecuentemente
- ☐ Ocasionalmente
- ☐ Rara vez
- ☐ Nunca

13. ¿Cuál de los siguientes antivirus ha recetado alguna vez?

- ☐ Acyclovir
- ☐ Valciclovir
- ☐ Fanciclovir
- ☐ Penciclovir
- ☐ Oseltamivir
- ☐ Remdesivir

14. ¿Cuál de los siguientes antivirales se ha recetado con más frecuencia?

- ☐ Acyclovir
- ☐ Oseltamivir
- ☐ Remdesivir
- ☐ Valciclovir
- ☐ Fanciclovir
- ☐ Penciclovir

15. ¿Cuándo receta un antiviral a sus pacientes? ¿Cuál es la duración habitual del tratamiento?

- ☐ De 1 a 5 días
- ☐ De 6 a 10 días
- ☐ Más de 10 días

16. Si hubiera cursos de actualización en el diagnóstico y tratamiento de infecciones virales en la cavidad oral, ¿le interesaría?

- ☐ Sí
- ☐ No

17. Gracias por su participación

Strategic Advisory Group of Experts (SAGE) on Immunization Evidence to recommendations framework¹

Question: Should herpes zoster vaccination vs no vaccination or placebo be used in healthy adults 50 years and over to prevent herpes zoster?

Population: Healthy adults aged 50 years and older

Intervention: Vaccination with herpes zoster vaccine

Comparison(s): Placebo/ no vaccination

Outcome: Clinical or laboratory-confirmed herpes zoster

Background: Endemic worldwide, varicella-zoster virus (VZV) is a highly contagious herpes virus which causes both varicella (chickenpox) and herpes zoster (shingles). Herpes zoster (HZ) results from the reactivation from latency and subsequent replication of VZV in ganglionic neurons.

The incidence and severity of HZ disease increases with age-related decline in cell-mediated immunity or immunosuppression. Relatively rare, HZ also occurs in children. Among adults who reach 85 years of age, it is estimated that approximately half will have suffered at least one episode of HZ.¹ Available epidemiological data on the burden of disease due to HZ from high-income countries report age-adjusted HZ incidence in the total population ranging from 3.4 to 5.0 per 1000 person-years, and 8 to 11 per 1000 person years over the age of 65 years.³

Shingles vaccination is the only way to protect against shingles and its most common complication, postherpetic neuralgia (PHN). In 2006, the U.S. Food and Drug Administration (FDA)¹ and European Medicines Agency (EMA)² licensed a single-dose live-attenuated VZV vaccine (Zostavax® by Merck) for immunocompetent adults aged 50 years and older. The manufacturer has now discontinued this vaccine. About a decade later, a two-dose adjuvanted VZV recombinant zoster vaccine (Shingrix® by GlaxoSmithKline) was licensed by the FDA and EMA for adults 50 years or older and immunocompromised adults over the age of 18 years.

The previous position paper on varicella and herpes zoster (HZ) vaccines³, published in June 2014, did not offer any recommendation concerning the routine use of HZ vaccine. At the time, data on the duration of protection provided by the live-attenuated HZ vaccine were limited and burden of HZ was largely unknown in most countries.⁴ In 2024, WHO established a technical consultation to revisit the evidence and propose updated recommendations on the use of herpes zoster vaccination. These recommendations are reflected in the current paper which supersedes the 2014 vaccine position paper.

¹ [Zostavax | FDA](#)

² [Zostavax | European Medicines Agency \(europa.eu\)](#)

³ See No. 25, 2014, 89, 265–288

⁴ World Health Organization. [Varicella and herpes zoster vaccines: WHO position paper, June 2014](#). Wkly Epidemiol Rec. 2014;89:265–88.

Article

Antibiotics Prescription by Spanish General Practitioners in Primary Dental Care

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Abstract: The aim of this study was to analyze the antibiotics prescription habits, both prophylactically and therapeutically, of Spanish general dental practitioners in the management of endodontic infections in primary care. Two hundred Spanish general dental practitioners were asked to respond to a survey on indications for antibiotics prescription in the treatment of endodontic infections, being 190 general dentists (95%) included in the study. Data were analyzed using descriptive statistics and the chi-square test. The average duration of antibiotics therapy was 6.5 ± 1.0 days. In patients without medical allergies, most of them (97%) selected amoxicillin as the antibiotic of the first choice, alone (51.1%) or associated with clavulanic acid (45.8%); in patients with penicillin allergies, the drug of choice was clindamycin 300 mg (70%). For cases of symptomatic irreversible pulpitis, 44% of the respondents prescribed antibiotics, in the scenario of prophylactic antibiotic prescription, up to 27% of the general dentists prescribe according to non-current guidelines (1 g 1 h before or 1 g 1 h before and 1 g 1 h after) in non-indicated cases (16% in patients taking oral bisphosphonates). It is necessary to improve the antibiotic prescription habits of Spanish general dentists in endodontics.

Keywords: antibiotic; antibiotics resistance; dentistry; general practitioner; endodontics; prescription habits; primary care

1. Introduction

One of the most serious threats to Spanish and global public health is the emergence of infections caused by bacterial strains resistant to treatment with antibiotics. A key factor in the emergence of bacterial resistance to antibiotics is the misuse of antimicrobial agents by healthcare workers. Approximately 10% of antibiotics dispensed in primary care are prescribed by dentists [1,2]. Currently, there is clear evidence that dentists in their daily clinical practice prescribe mainly painkillers and antibiotics, and their antibiotic prescribing habits are often unnecessary and inadequate [1,3]. Although these inadequate prescription patterns in dentists have been identified worldwide [4], it is worth noting that in Spain, they have been identified not only in dentists with clinical practice [5,6] but also in students in their final year of the Degree in Dentistry [3]. Inappropriate use of antibiotics is not only associated with increased antibiotic resistance but also with an increased risk of potentially fatal anaphylactic reactions, thus exposing people to unnecessary side effects [3]. Therefore, there is a lack of public and professional awareness of the risks of inappropriate antibiotic use, both in dentistry and in other aspects of health care [7].

Endodontic infections are very prevalent, being characterized by a polymicrobial microbiota, involving a combination of facultative Gram-positive, Gram-negative, and strictly anaerobic bacteria [1,8]. They are usually characterized by a rapid onset and a short



Review

Antimicrobial Resistance in Oral Healthcare: A Growing Concern in Dentistry

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Abstract

One of the most significant public health issues of the twenty-first century is antimicrobial resistance (AMR), which is responsible for thousands of deaths each year and undermines the efficacy of commonly used antibiotics. In dentistry, the frequent and sometimes inappropriate use of antibiotics, combined with the complexity of the oral microbiome, creates a high-risk environment for the development and spread of antimicrobial-resistant microorganisms. Although clinical infections have received most of the attention, dental unit waterlines, dentures, and orthodontic appliances are three reservoirs that play an important but underestimated role in this global crisis. These environments provide perfect conditions for biofilm formation and, further, the survival and growth of resistant microorganisms. This review aims to discuss the origins and mechanisms of AMR, the unrecognized role of these three reservoirs in dental settings, and their contribution to the AMR issue. It also highlights the necessity of strict infection control procedures and targeted antimicrobial stewardship strategies to overcome this growing threat.

Keywords: biofilms; dental unit waterlines; dentistry; dentures; drug resistance; microbial; orthodontic appliances



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1. Introduction

Antimicrobial resistance (AMR) has arisen as one of the most concerning public health concerns of the 21st century. AMR poses a threat to the effective treatment and prevention of a growing number of infections caused by bacteria, parasites, viruses, and fungi that are no longer susceptible to the antibiotics [1]. AMR was directly responsible for 1.27 million deaths in 2019 and was linked to approximately 5 million deaths globally [2]. According to one systematic analysis in 2022, the highest mortality rates are in western sub-Saharan Africa and South Asia, and the lowest in Australasia [3]. *Escherichia coli*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Streptococcus pneumoniae*, *Acinetobacter baumannii*, and *Pseudomonas aeruginosa* caused nearly three-quarters of attributable deaths, mainly from lower respiratory, bloodstream, and intra-abdominal infections [3]. Resistance to β -lactams and fluoroquinolones accounted for over 70% of the burden, with the greatest impact in low-resource settings [3]. The UK government-commissioned review concluded that AMR may kill 10 million people annually by 2050 [4,5]. According to WHO and academic literature, AMR is a serious issue that must be addressed with a coordinated and worldwide plan [1,6–8].

In dental practice, antibiotics are typically prescribed to treat both non-odontogenic and odontogenic infections, as well as prophylactically in high-risk patients, such as those

Understanding dentists' antibiotic prescribing behaviour in Spain: a focus group study

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Background: Dentists are responsible for 10% of all antibiotic prescriptions. It is estimated that, in certain situations, up to 80% of antibiotic prescriptions in dentistry may be inappropriate. The aim of this study was to explore Spanish dentists' attitudes, perceptions, and contextual factors influencing antibiotic use and misuse in clinical practice.

Methods: From July to December 2022, we conducted focus groups with 31 dentists from Spain. Data were analysed using thematic analysis with a pragmatic orientation to address the research objectives. Inclusion criteria required participants to be dentistry graduates or oral medicine specialists (stomatologists) and actively working as dentists. The sample was selected through key informants and the snowball method. We ensured methodological quality by adhering to the COREQ checklist.

Results: We formed seven synchronous online focus groups with 31 participants. Dentists acknowledged the problem of antibiotic resistance, identifying fear, working conditions and burnout and patient trust as factors contributing to inappropriate prescribing. Despite this awareness, dentists did not see themselves as key agents of change in combating antibiotic resistance. However, they expressed interest in further education on the topic.

Conclusions: These findings underscore the need for educational interventions that highlight dentists' role in antimicrobial stewardship. By situating these interventions within the One Health framework, dentists can be empowered to translate their leadership in oral health into active participation in the prudent use of antibiotics. Strengthening this role has practical implications for multidisciplinary strategies to combat antimicrobial resistance.

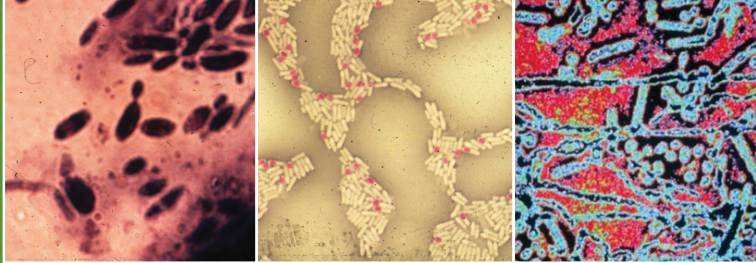
Introduction

Antimicrobial resistance is currently one of the greatest threats to world health, food security and development.^{1,2} Since 2015, the World Health Organization (WHO) has led to the Global Action Plan on Antimicrobial Resistance, which aims to promote coordinated strategies and actions that would resolve this problem.^{3,4} One of its main strategic objectives is to reduce the inappropriate prescription and use, while fostering responsible prescribing practices of assured quality.^{5,6}

Spain is one of the European countries with the highest levels of antibiotic use, reporting 23.22 defined daily doses per 1000

inhabitants in 2022.⁷ Dentists remain a relatively understudied group, with most research focusing on primary care physicians and veterinary surgeons.^{8,9} The limited evidence available on dentists in Spain suggests that antibiotic prescribing may be inappropriate in more than 28.6% of cases, depending on the clinical situation.¹⁰

Despite the limited indications for antibiotics in dental care,^{11,12} an estimated that 80% of dentist prescriptions do not meet established accuracy standards.¹³ Furthermore, some research indicates that dentists themselves acknowledge prescribing antibiotics more frequently than clinically required, often as a precautionary measure.^{14,15}



Antimicrobial Prescribing in Dentistry

Good Practice Guidelines

3rd Edition

Review

Perspectives for Uses of Propolis in Therapy against Infectious Diseases

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Abstract: Propolis has gained wide popularity over the last decades in several parts of the world. In parallel, the literature about propolis composition and biological properties increased markedly. A great number of papers have demonstrated that propolis from different parts of the world is composed mainly of phenolic substances, frequently flavonoids, derived from plant resins. Propolis has a relevant role in increasing the social immunity of bee hives. Experimental evidence indicates that propolis and its components have activity against bacteria, fungi, and viruses. Mechanisms of action on bacteria, fungi, and viruses are known for several propolis components. Experiments have shown that propolis may act synergistically with antibiotics, antifungals, and antiviral drugs, permitting the administration of lower doses of drugs and higher antimicrobial effects. The current trend of growing resistance of microbial pathogens to the available drugs has encouraged the introduction of propolis in therapy against infectious diseases. Because propolis composition is widely variable, standardized propolis extracts have been produced. Successful clinical trials have included propolis extracts as medicine in dentistry and as an adjuvant in the treatment of patients against COVID-19. Present world health conditions encourage initiatives toward the spread of the niche of propolis, not only as traditional and alternative medicine but also as a relevant protagonist in anti-infectious therapy. Production of propolis and other apiculture products is environmentally friendly and may contribute to alleviating the current crisis of the decline of bee populations. Propolis production has had social-economic relevance in Brazil, providing benefits to underprivileged people.

Keywords: CAPE; COVID-19; flavonoids; microbial pathogens; plant resins; *Staphylococcus aureus*



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1. Introduction

“Healing with medicinal plants is as old as mankind itself” [1]. During most of the Paleolithic period, the use of plants for medicinal purposes probably was instinctive, as also has been with animals. Archeological findings have shown that plants were deliberately used to treat health problems [2]. In present day, human groups in traditional societies, for example, in New Guinea, still rely on pharmaceutical knowledge based on hundreds of species from 99 plant families, which have been used deliberately for medicinal purposes [3].

Despite the advancements in chemical synthesis and its application in the production of synthetic drugs, a considerable proportion of substances used to date in modern medicine are plant derived. It is estimated as 35% proportion of modern medicines originated directly or indirectly from natural products, most of them from plants (25%) and microorganisms (13%).

Propolis (or bee glue) is a sticky product with a resinous flavor, used by honeybees to repair damages in the nest, avoid abrupt changes in temperature in the nest, and protect the hive against predators and microorganisms. It is a complex product containing resins collected from plants, which are mixed with beeswax and salivary enzymes [4]. Medicinal uses of propolis can be traced back to 13,000 BCE [5]. A decline in the medicinal use of propolis occurred during the last century, concomitant with the rise of the use of drugs in

Review

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Current management and recommendations for access to antiviral therapy of herpes labialis

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Abstract

Herpes labialis is a common skin infective condition, worldwide, which is primarily caused by HSV-1. Recurrent episodes of herpes labialis, also known as cold sores, can be frequent, painful, long-lasting and disfiguring for infected patients. At present, there are two types of antivirals for the treatment of herpes labialis, topical and oral, which are available over the counter or as prescription-only. The aim of antiviral therapy is to block viral replication to enable shortening the duration of symptoms and to accelerate healing of the lesions associated with herpes labialis. This review examines the evidence for the effectiveness of current topical and oral antivirals in the management of recurrent episodes of herpes labialis. In most countries, oral antivirals for herpes labialis are available as prescription-only. However, in early 2010, the oral antiviral famciclovir was reclassified from prescription-only medicine to pharmacist-controlled status in New Zealand. The benefits and risks associated with moving an antiviral therapy for herpes labialis from prescription-only to pharmacist-controlled status are reviewed here, and the implications for patients, general physicians and pharmacists are considered.

Keywords

Herpes labialis; Coldsore; Famciclovir; Aciclovir; Valaciclovir; HSV-1

Herpes labialis is a common condition worldwide. The primary cause is HSV-1, but the epidemiology has changed dramatically in recent decades. HSV-1 infection was traditionally acquired in childhood and adolescence through non-sexual contact but is now becoming the

Drug Prescribing For Dentistry

Dental Clinical Guidance

Second Edition



REVIEW ARTICLE

The role of viruses in oral mucosal lesions

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Abstract

The mucosa of the oral cavity is exposed to a large number of different microorganisms such as archaea, bacteria, fungi, parasites, and viruses. Among those, viruses cause specific infections, which can easily be transmitted from one person to another. The infectious route may not only include patients and their relatives but also the dental professional team. Thus, a wide knowledge regarding specific viral infections is crucial for the daily routine. Signs and symptoms of oral viral infections can be completely absent or develop into a pronounced clinical picture, so that early detection and information determine the further course of the infection and its influence on other inflammatory diseases, such as periodontitis, as well as the safety of family members and the social environment. As the clinical manifestation of viral infections may be highly variable leading to heterogeneous mucosal lesions it is, in most cases, mandatory to differentiate them by specific microbiological tests in addition to clinical examination procedures. This article will give an overview of the role of viruses infecting the oral mucosa, and in addition, describe their clinical manifestation and management.

KEYWORDS

condyloma acuminatum, COVID-19, cytomegalovirus, Epstein–Barr virus, focal epithelial hyperplasia, herpes simplex virus, human herpes virus, human papillomavirus, Monkeypox, oral mucosa, Sars-COV-2, varicella zoster virus, virus

1 | INTRODUCTION

Various viruses, such as the well-known human herpes viruses (HHV), but also recently discovered viruses, such as Sars CoV-2, can infect the oral mucosa resulting either in disease manifestation or in the spread of viruses through, for example, saliva.¹ The clinical manifestation of viral infections of the oral mucosal tissues ranges from small inconspicuous spots, redness, swelling, blistering, and ulcerations to hyperkeratotic changes which may complicate the clinical diagnosis by sole clinical examination. Thus, an accurate diagnosis of viral diseases is usually only possible with the aid of additional laboratory tests, and therewith, the actual validation of the causative microorganism.²

For the affected patients, clinical signs and symptoms can vary tremendously. Similar to the clinical appearance, some patients perceive no symptoms directing to an infectious disease, whereas others may experience severe pain and physical disabilities. In this context, patients may be extremely worried, and hence, an adapted medical-psychological advice could be necessary. While some viral infections may even disappear spontaneously, others are recurrent, and therewith, affect the patient lifelong. Those patients require a specific education regarding potential complications and risks associated with the virus infection as well as with the potential viral tissue damage. In some cases, patients need additional advice regarding their nutritional behavior. In the same

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