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Bisphosphonate Risks: Knowledge and Attitudes Among Dentists in Ecuador

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Abstract

Bisphosphonates are pharmacological agents used in patients with bone disorders, as they inhibit the activity of cells responsible for bone resorption, thereby contributing to the strengthening of bone tissue. Despite their benefits, their use involves risks that may impact dental practice. This study aims to determine the level of knowledge and attitudes of dentists in the city of Portoviejo, Ecuador, regarding the risks associated with patients undergoing bisphosphonate treatment. The sample consisted of 148 dentists from Portoviejo, Ecuador, selected through non-probability convenience sampling. A validated questionnaire was applied, with a content validity measured by Aiken's V coefficient of 0.98 and a Cronbach's alpha reliability of 0.874. More than half of the dentists (50.7%) demonstrated a high level of knowledge. Attitudes were generally favorable, particularly concerning the avoidance of invasive surgical procedures. A discrepancy between self-reported knowledge and clinical practice was observed. Specialized training and recent continuing education had a positive influence on the results. Continuous education is recommended to be reinforced.

Keywords: Bisphosphonates, Knowledge, Attitude, Dentists, Bisphosphonate-Related Osteonecrosis of the Jaw.

Introduction

Bisphosphonates are recognized agents and among the primary pharmacological treatments used for bone-related diseases such as osteoporosis, Paget's disease, and bone metastases associated with cancer (Ebetino et al., 2022). They are rapidly incorporated into the bone matrix and remain there for extended periods due to their prolonged half-life (Dioguardi et al., 2023). Despite their effectiveness in reducing the risk of fractures and the progression of metastatic bone lesions (Ullah et al., 2024; Joy Park & Wong, 2022; Van Broekhoven et al., 2023; Schwartz et al., 2022), prolonged use has been linked to severe complications in dental practice (Dioguardi et al., 2023).

These drugs can adversely affect bone and surrounding tissue by inhibiting the formation of new

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blood vessels, reducing cell viability and proliferation, slowing cell migration, and causing apoptosis. This has negative effects as it hinders bone renewal, reduces blood supply, and impairs repair after injury, promoting the onset of osteonecrosis, especially in the jaws (Srivichit et al., 2022). This condition, characterized by persistent bone exposure in the jaws (Ruggiero et al., 2022), represents a significant challenge for dental practice, particularly following invasive procedures such as tooth extractions or oral surgeries (Jelin-Uhlig et al., 2024).

However, several studies have highlighted significant deficiencies in the knowledge and attitudes of dentists regarding the management of patients treated with bisphosphonates (Al-Eid et al., 2020; Tešlak et al., 2021; Ozkan et al., 2021; Arnaud et al., 2022). These shortcomings not only compromise patient safety but also limit the professional's ability to make informed decisions, implement preventive measures, and provide comprehensive care—an issue of particular concern in settings where access to specialized care may be limited (Al-Taie & Khattak, 2024). In this context, the role of the dentist is fundamental in the prevention and detection of risks associated with patients receiving antiresorptive medications such as bisphosphonates.

Therefore, the objective of this study was to determine the level of knowledge and attitudes of dentists practicing in the city of Portoviejo regarding the risks involved in treating patients undergoing bisphosphonate therapy.

Methods

Study Design

This study was conducted using a quantitative, descriptive, and cross-sectional approach with a non-experimental design.

The sample consisted of 148 dentists actively practicing in the city of Portoviejo, Ecuador. Participants were selected through non-probability convenience sampling.

Inclusion criteria considered general dentists and specialists engaged exclusively in clinical practice or those combining clinical work with teaching (Khattak et al., 2014). Availability to complete the questionnaire and voluntary acceptance through informed consent were also required.

Conversely, professionals not involved in clinical care or teaching, as well as those with physical or cognitive conditions limiting effective participation in the study, were excluded.

Ethical Considerations

This research was approved by the Human Research Ethics Committee of Universidad San Gregorio de Portoviejo (CEISH-USGP), under registration code CEISH-USGP-OBS-ODO-2025-009. The autonomy and confidentiality of participants were prioritized at all times, adhering to international ethical principles, including the guidelines of the Nuremberg Code and the Declaration of Helsinki. The collected information was handled exclusively for academic and research purposes, following protocols that ensured participant anonymity.

Data Collection

To measure the variables, a psychometric questionnaire developed by Chang C. (2017) was used to assess the level of knowledge and attitudes regarding the risks involved in treating patients receiving bisphosphonate therapy in dental procedures. The instrument demonstrated strong

quality indicators: reliability determined by Cronbach's Alpha coefficient ($\alpha = 0.874$), content validity established through Aiken's V scale (0.98), construct validity confirmed via factor analysis, and criterion validity verified through a test-retest method with a Pearson correlation coefficient of 0.995.

In-person visits were conducted to dentists working in both public and private clinics to invite them to participate in the study sample. Dentists who agreed to participate completed the questionnaire via a digital form hosted on the Google Forms platform, accessed through a QR code scan. The first section of the form was dedicated to informed consent.

The questionnaire consisted of 16 questions divided into two dimensions: knowledge and attitudes. The knowledge dimension included 11 multiple-choice questions, which allowed for classification into three levels. A low level was defined as 0–3 correct answers, a medium level as 4–7 correct answers, and a high level as 8–11 correct answers. The attitudes dimension comprised 5 questions assessed on a Likert-type scale. The response options “strongly agree” and “agree” were considered favorable (scores of 5 and 4), while “strongly disagree,” “disagree,” and “neutral” were considered unfavorable (scores of 1, 2, and 3, respectively). The sum of the selected responses allowed attitudes to be classified as favorable (20–25 points) or unfavorable (0–19 points).

Additionally, the following sociodemographic data were collected: gender, specialty, years of practice, and type of professional activity, with the aim of describing the sample and exploring possible associations with the study variables.

Statistical Analysis

Data were processed and analyzed using IBM SPSS Statistics software version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistical methods were employed, including frequency, percentage, and the creation of tables and graphs to present the results. Additionally, inferential statistical methods were applied, including the chi-square test to examine associations between categorical variables. The level of statistical significance was set at $p < 0.05$.

Results

Variable		N	%
Sex	Male	41	27.7
	Female	107	72.3
Years of professional practice	Up to 10 years	104	70.3
	More than 10 years	44	29.7
Specialty	With Specialty	41	27.7
	Without Specialty	107	72.3
Type of activity	Clinical	131	88.5
	Clinical and teaching	17	11.5

Table 1. Description of the Sample of Dentists (n=148).

The sample consisted of 148 dentists. Women predominated, with 107 professionals (72.3%), and the majority had less than 10 years of professional practice (70.3%). It was observed that 72.3% of the participants did not have a specialization, and most (n = 131; 88.5%) were exclusively engaged in clinical practice (Table 1).

Variable		N	%
Bisphosphonates are:	Incorrect	29	19.6
	Correct	119	80.4
Belongs to the bisphosphonate family:	Incorrect	32	21.6
	Correct	116	78.4
These are commercial names of bisphosphonates:	Incorrect	35	23.6
	Correct	113	76.4
Physicians commonly prescribe bisphosphonates to:	Incorrect	32	21.6
	Correct	116	78.4
A patient treated with bisphosphonates may present with:	Incorrect	88	59.5
	Correct	60	40.5
The bone in which bisphosphonates accumulate in the greatest proportion is:	Incorrect	44	29.7
	Correct	104	70.3
The main risk associated with performing dental treatments in patients undergoing bisphosphonate therapy is:	Incorrect	22	14.9
	Correct	126	85.1
A patient treated with bisphosphonates is at higher risk of:	Incorrect	102	68.9
	Correct	46	31.1
Patients treated with bisphosphonates may experience complications in dental treatments such as: Before patients begin bisphosphonate therapy, it is necessary to perform:	Incorrect	5	3.4
	Correct	143	96.6
	Incorrect	53	35.8
	Correct	95	64.2
An auxiliary test that helps determine the level of bisphosphonate concentration is:	Incorrect	94	63.5
	Correct	54	36.5

Table 2. Dentists' Knowledge about the Risks of Bisphosphonates in Dental Treatment

80.4% of the participants correctly identified what bisphosphonates are. Additionally, 96.6% acknowledged that patients may experience dental complications. However, only 31.1% recognized the increased risk associated with bisphosphonate medication (Table 2).

Variable		Low	Medium	High	Total	p-Value
Sex	Male	2 (4.9%)	17 (41.5%)	22 (53.7%)	41 (100.0%)	0.89
	Female	5(4.7%)	49 (45.8%)	53 (49.5%)	107 (100.0%)	
Years of professional practice	Up to 10 years	2(1.9%)	47 (45.2%)	55 (52.9%)	104 (100.0%)	0.04
	More than 10 years	5(11.4%)	19 (43.2%)	20 (45.5%)	44 (100.0%)	
Specialty	With Specialty	3 (7.3%)	11(26.8%)	27 (65.9%)	41 (100.0%)	0.02
	Without	4 (3.7%)	55	48	107	

	Specialty		(51.4%)	(44.9%)	(100.0%)	
Type of activity	Clinical	4 (3.1%)	61 (46.6%)	66 (50.4%)	131 (100.0%)	0.02
	Clinical and teaching	3 (17.6%)	5 (29.4%)	9 (52.9%)	17 (100.0%)	

Table 3. Association between Knowledge Level and Sociodemographic Variables.

No statistically significant differences were found based on gender ($p = 0.89$). A high level of knowledge was significantly greater among dentists with up to 10 years of experience ($p = 0.04$), those with a specialty ($p = 0.02$), and those who combine teaching and clinical practice ($p = 0.02$) (Table 3).

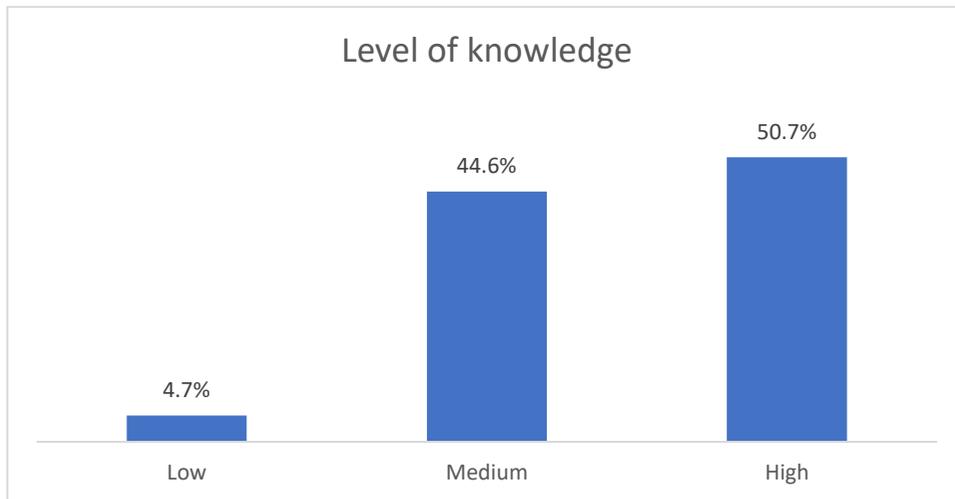


Figure 1. Knowledge Level of the Included Participants

More than half of the dentists evaluated (50.7%) achieved a high level of knowledge; however, 49.3% exhibited medium or low levels, highlighting a significant educational gap in a considerable proportion of professionals (Figure 1).

Variable		N	%
In my clinical practice, when treating a patient, I am aware that they are receiving bisphosphonate therapy.	Strongly disagree	6	4.1
	Disagree	11	7.4
	Neutral	13	8.8
	Agree	49	33.1
	Strongly agree	69	46.6
Knowing that I am treating a patient medicated with bisphosphonates, do I inquire about this medication.	Strongly disagree	1	0.7
	Disagree	5	3.4
	Neutral	5	3.4
	Agree	25	16.9
	Strongly agree	112	75.7
I avoid performing surgical treatments	Strongly disagree	3	2.0

(e.g., tooth extraction, implants, apicoectomy) in patients undergoing treatment with bisphosphonates.	Disagree	7	4.7
	Neutral	6	4.1
	Agree	41	27.7
	Strongly agree	91	61.5
I consult with the physician when treating a patient medicated with bisphosphonates who requires surgical treatment (e.g., tooth extraction, implants, apicoectomy).	Strongly disagree	1	0.7
	Disagree	3	2.0
	Neutral	1	0.7
	Agree	29	19.6
I discontinue bisphosphonates in the patient before performing surgical treatments (e.g., tooth extraction, implants, apicoectomy).	Strongly agree	114	77.0
	Strongly disagree	25	16.9
	Disagree	26	17.6
	Neutral	3	2.0
	Agree	48	32.4
	Strongly agree	46	31.1

Table 4. Dentists' Attitudes Toward the Risks of Bisphosphonates in Dental Treatment.

79.7% expressed a favorable attitude by agreeing or completely agreeing with the need to know if the patient is medicated with bisphosphonates at the time of care. 92.6% reported inquiring about its use upon learning that the patient is medicated. Regarding behavior toward oral surgical treatments, 89.2% agreed or completely agreed with avoiding these procedures, and only 63.5% discontinued the medication before surgical procedures (Table 4).

Variable		Unfavorable	Favorable	Total	p-value
Sex	Male	7 (17.1%)	34 (82.9%)	41 (100.0%)	0.81
	Female	20 (18.7%)	87 (81.3%)	107 (100.0%)	
Years of professional practice	Up to 10 years	14 (13.5%)	90 (86.5%)	104 (100.0%)	0.02
	More than 10 years	13 (29.5%)	31 (70.5%)	44 (100.0%)	
Specialty	With Specialty	4 (9.8%)	37 (90.2%)	41 (100.0%)	0.09
	Without Specialty	23 (21.5%)	84 (78.5%)	107 (100.0%)	
Type of activity	Clinical	23 (17.6%)	108 (82.4%)	131 (100.0%)	0.54
	Clinical and teaching	4 (23.5%)	13 (76.5%)	17 (100.0%)	

Table 5. Association Between Attitude Level and Sociodemographic Variables.

Significant differences were observed ($p = 0.02$) regarding years of professional practice; professionals with up to 10 years of experience showed a favorable attitude at 86.5%. No significant differences were found by gender, specialty, or type of activity (Table 5).

Discussion

The findings reflect an overall adequate knowledge about bisphosphonates, although critical

gaps persist in specific clinical aspects. While 80.4% of dentists correctly identify what bisphosphonates are and 96.6% recognize potential complications, only 31.1% understand the particularly increased risks, reflecting a limited clinical understanding. This gap is reinforced by recent studies such as the one conducted in Saudi Arabia, where only 35% could define medication-related osteonecrosis, and only 19% identified the duration of intravenous bisphosphonate treatment as a risk factor (Al-Eid et al., 2020). Similarly, in Turkey, 38% of dentists with specialization and 30% without specialization have a considerable perception of the risks associated with these medications (Soylu et al., 2024).

The association between variables such as greater knowledge and fewer years of professional practice suggests that younger dentists, or those with more recent academic training, tend to be more up to date. Similarly, specialization stands out as a factor that enhances both knowledge and attitudes in the clinical setting. This aligns with previous research findings that showed better knowledge among younger professionals and those with specialization. For example, a study conducted in France demonstrated that recently graduated dentists achieved significantly higher scores (Arnaud et al., 2022). Another study carried out in Brazil revealed comparable results, with recent graduates showing a better understanding of bisphosphonate discontinuation in invasive situations, despite a limited comprehension of detailed protocols (Cortez et al., 2024).

The results show that 50.7% of dentists have a high level of knowledge; however, there is a significant educational gap, with just over 49.3% falling into medium or low levels. This finding aligns with the report by Semanate Cajas (2017), who found that within the Faculty of Dentistry at the Central University of Ecuador, there are deficiencies in knowledge about bisphosphonates and their complications.

Although 79.7% of dentists believed that knowing whether a patient was medicated with bisphosphonates was important information, and 92.6% stated that they routinely inquired about it, only 63.5% discontinued the medication before surgical procedures. This finding highlights variations in attitudes toward clinical management, which has also been reported in recent studies emphasizing the lack of consensus regarding the effectiveness of so-called “medication holidays.”

A 2022 systematic review indicates that there is insufficient evidence to routinely recommend discontinuation of bisphosphonates before dental surgical procedures, especially in patients receiving oral administration and at low risk of osteonecrosis (Liu et al., 2022). Similarly, current clinical guidelines advise individualizing each case and focusing preferably on conservative surgical interventions rather than treatment interruption, due to the limited preventive effectiveness of the latter and the systemic risks that could arise from medication discontinuation (Ruggiero et al., 2022).

The fact that there are no differences by gender, but there are by years of experience, highlights the need for updating strategies specifically targeted at professionals with more than ten years of experience, who may not have received specific training on patients treated with bisphosphonates during their university education.

The attitudes of the surveyed professionals were largely positive, particularly in avoiding invasive surgical procedures and in coordinating consultations with the treating physician when patients undergoing bisphosphonate therapy are identified. These practices align with the latest international guidelines endorsed by organizations such as AAOMS, ADA, MASCC/ISOO/ASCO, JSOMS, and KSBMR/KAOMS (Ruggiero et al., 2022; Hellstein et al.,

2011; Bedogni et al., 2024; Yarom et al., 2019; Kishimoto & Moridera, 2024), which recommend a conservative clinical approach with these patients to prevent additional severe complications such as medication-related osteonecrosis of the jaws.

Among the study limitations, first, the cross-sectional design does not allow for establishing causal relationships between the analyzed variables, so the inference has been restricted to the associations observed at a specific point in time.

On the other hand, the non-probabilistic convenience sampling limited to dentists practicing in the city of Portoviejo may limit the representativeness of the findings and their generalization to all professionals in Ecuador. Similarly, voluntary participation may have led to the inclusion of professionals with a greater interest or awareness of the topic, which could have introduced selection bias.

Third, the data collection instrument is self-reported and has only been validated once in a previous study on knowledge and attitudes, which suggests the possibility of social desirability bias or overestimation of actual clinical competencies. Without situational assessments or real-life clinical cases, the objectivity of competency measurement is limited.

Finally, a more detailed analysis of background variables related to prior training in bisphosphonates, the percentage of patients treated under bisphosphonate therapy, and the clinical guidelines used could not be performed to determine whether any of these factors might explain some of the identified gaps in knowledge and attitude.

These limitations highlight the need to conduct multicenter studies in the future, with probabilistic sampling and inclusion of other clinical variables, to provide a broader and more representative national perspective on this phenomenon.

Conclusions

This research shows that, although most dentists working in Portoviejo have satisfactory knowledge about bisphosphonates and their potential complications, there is a gap between their knowledge and the clinical assessment of risk. This gap is reflected in heterogeneous practices when recommending or suspending surgical procedures in patients undergoing antiresorptive therapy.

The results highlight the benefits of postgraduate courses and academic teaching activities in updating pharmacological competencies. They also emphasize the urgent need to strengthen the active role of continuing education in dental pharmacovigilance and to develop standardized clinical protocols to guide decision-making in this field.

Specific training programs and intervention studies are recommended to evaluate the impact of these measures in terms of reducing complications and promoting safe, standardized clinical practices.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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