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Assessing dental surgeons' understanding of bisphosphonates: Implications for patient health in oral surgery

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ABSTRACT

Objectives: This study aimed to analyze the knowledge of dental surgeons concerning the pharmacological effects of bisphosphonates (BP) and their impact on the health of patients undergoing oral surgery treatment.

Materials and methods: A quantitative study was conducted with professionals in the Cariri region of Ceará, Brazil. The data were collected using a semi-structured questionnaire to interview the dental surgeons who met the inclusion criteria. The data were analyzed by Chi-square and Fischer's Exact tests using the SPSS program version 22.0.

Results: The results indicated that most interviewed subjects have no experience with the dental treatment of individuals under treatment with bisphosphonates. When a sample of the medication was presented, a significant number of the participants (65.3%) did not recognize the drug. Among those who recognized it, 66.5% did not know how to treat bisphosphonate-using patients in the clinical routine. However, 95.1% of the professionals who recognized the need to discontinue these drugs admitted contacting the prescriber to establish the best dental conduct. Our results also showed that recently graduated professionals better understood the need to stop BP use before invasive treatment, although they did not know the protocol.

Conclusion: In conclusion, a better knowledge of the pharmacological effects of BP is crucial for conducting adequate anamnesis, requesting additional tests, and performing medical monitoring, which has a significant impact on the clinical practice of dental surgeons.

1. Introduction

Bone volume maintenance is a dynamic process involving bone resorption, formation, and remodeling. Pathological alterations in this process result in bone diseases such as osteoporosis, osteogenesis imperfecta, and fibrous dysplasia. Evidence has shown that bisphosphonates (BPs), due to their effects on calcium metabolism, impair bone

resorption and remodeling, leading to altered formation of new bone structures and stimulating the development of osteonecrosis (Meneghini et al., 2017).

Osteonecrosis of the jaws (ONJ) is rarely associated with administering corticosteroids, which are more commonly associated with osteonecrosis of long bones such as the femur. However, the concomitant use of resorptive agents and corticosteroids has contributed to

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developing medication-related jaw osteonecrosis (MRONJ) (Bermúdez-Bejarano et al., 2017).

Osteonecrosis is a multifactorial bone pathology. Among the main etiological factors, the following stand out: trauma resulting from inflammatory and infectious processes; systemic diseases such as osteoporosis and diabetes; pharmacotherapy with anti-resorptive agents such as bisphosphonates and monoclonal antibodies; use of antiangiogenic agents and chemotherapy for malignant diseases and head and neck tumors. Inadequate tissue repair in areas with poor healing in the oral cavity can result in both the formation and exposure of necrotic bone. This condition is diagnosed by visualizing oral areas with bone exposure unrelated to radiotherapy for more than eight weeks. At an initial stage, osteonecrosis does not present painful symptoms. However, secondary infections or trauma in these patients can result in painful episodes with significant clinical relevance (Bagan et al., 2017).

According to the American Association of Oral and Maxillofacial Surgeons (AAOMS), MRONJ is defined and characterized as follows: Presence of exposed bone in the maxillofacial region that does not heal in eight weeks after identification by a health professional; Exposure to anti-resorptive or antiangiogenic agent, and no history of radiation therapy to the craniofacial region (Khan et al., 2015).

Bisphosphonate-Related Osteonecrosis of the Jaw (BRONJ) and Medication-Related Osteonecrosis of the Jaw (MRONJ) are rare, yet severe conditions associated with the use of medications like bisphosphonates and denosumab to treat bone diseases and cancer. Both involve the death of the jawbone, resulting in painful symptoms and impaired wound healing after dental procedures. These conditions pose significant clinical management challenges and substantially affect patients' quality of life. Early diagnosis and careful dental monitoring are crucial for mitigating the risks associated with these rare conditions, ensuring oral health and patient safety during antiresorptive medication treatment (Marx et al., 2007; Ruggiero et al., 2014; Fiorillo et al., 2022).

The knowledge of Brazilian dentists regarding the use of bisphosphonates by patients is of paramount importance, especially considering the limited research available on this topic. Often prescribed to treat bone diseases, these medications can have severe implications for oral health, such as bisphosphonate-related jaw osteonecrosis. Well-informed dentists are essential in identifying risks, making appropriate clinical decisions, and educating patients about necessary precautions, which not only enhances dental care but also contributes to patients' overall health, preventing unwanted complications. Therefore, promoting continuous education and updates for dental professionals on bisphosphonate use is crucial to ensure Brazil's patients' well-being. Therefore, considering BPs as highly prescribed and readily available drugs associated with the development of severe side effects, it is fundamental that dental surgeons know the potential risks of their use, especially concerning the development of BRONJ or MRONJ, in order to ensure the appropriate treatment of patients using these drugs.

This study aimed to analyze dental surgeons' knowledge concerning bisphosphonates' pharmacological effects and their impact on the health of patients undergoing oral surgery treatment.

2. Methodology

2.1. Sampling

This study was conducted in Juazeiro do Norte, located in Ceará, Brazil. The selection of this specific location for the research was motivated by several crucial reasons. Firstly, Juazeiro do Norte holds significance in the dental landscape of Ceará, with a substantial number of dental professionals practicing in the region. Furthermore, the city's choice also considered the availability of resources and infrastructure necessary for conducting the research. Juazeiro do Norte offers logistical conveniences such as access to research facilities, personnel training, and data collection logistics.

This background provided a broad and representative base for

selecting the sample of 598 dentists, as provided by the Regional Dentistry Council of Ceará (CRO-CE). From the sample calculation, the minimum sample was defined as 235 dentists, considering an error of 5% and a reliability of 95%. An additional 20% of the minimum sample was included for data collection in view of possible dropouts and losses due to exclusion. Thus, the final sample was defined as 245 participants.

2.2. Inclusion and exclusion criteria

For participant selection, a comprehensive set of inclusion and exclusion criteria was employed to ensure the precision and reliability of the study's participant pool.

The inclusion criteria were rigorously designed to target professionals actively employed within the Cariri region of Ceará. These individuals were required to possess a valid and up-to-date enrollment with the Regional Dentistry Council of Ceará (CRO-CE), essential to establish their professional status and eligibility for the study. In addition, their expressed consent to actively participate in the research and their thorough completion of the questionnaire were fundamental prerequisites for their inclusion in the study. These criteria were crucial to ensure that participants were qualified and willing to contribute to the research.

Conversely, the exclusion criteria were meticulously defined to address situations where individuals failed to meet the abovementioned inclusion criteria. This encompassed instances where professionals did not hold current employment within the Cariri region, had incomplete or invalid enrollment with the CRO-CE, declined to participate in the research, or provided incomplete or inaccurate responses within the questionnaire. The precision in delineating these exclusion criteria was aimed at maintaining the integrity of the participant pool by excluding individuals who did not meet the essential requirements for participation.

2.3. Data collection

Data collection in this study involved a meticulous process to comprehensively understand the participants' professional profiles and their clinical performance related to bisphosphonates.

A printed, self-administered questionnaire was utilized as the primary data-gathering tool. This questionnaire was thoughtfully designed to include objective questions to capture specific details regarding the participants' professional backgrounds. These details encompassed aspects such as the duration of their training, any specialization they had pursued, and the type and location of their current workplace. This comprehensive profiling was integral to establishing a baseline understanding of the dentists participating in the study.

Subsequently, the data collection process extended to collecting clinical performance data related to the research subjects, which entailed a four-fold approach:

- i. Approach to Bisphosphonates Use in Anamnesis: Dentists were assessed on their approach to incorporating inquiries about using bisphosphonates into their patient history-taking process. This step aimed to evaluate how effectively they identified patients taking these medications.
- ii. Prior Care of Patients Using Bisphosphonates: Dentists' practices concerning the care and management of patients already using bisphosphonates were examined, which included assessing their understanding of the potential oral health risks associated with bisphosphonate use.
- iii. Knowledge of Special Procedures: The knowledge of specialized procedures required for patients using bisphosphonates was scrutinized. This encompassed their familiarity with protocols and interventions necessary to mitigate potential complications.
- iv. Ability to Manage These Patients: The ability to effectively manage patients using bisphosphonates was evaluated,

considering their competence in providing the appropriate care and guidance required for this specific patient group.

This multi-faceted approach to data collection ensured a comprehensive assessment of the participant’s knowledge, practices, and capabilities related to bisphosphonate use in dental care, providing a robust foundation for the research’s findings and conclusions.

2.4. Data presentation

The data were tabulated using the Microsoft Excel program for Windows® (2010) and separated into two items: i) profile of the research participants and ii) knowledge of the research participants about bisphosphonates. After tabulation, the data of item 1 were expressed in the form of graphs, while the data referring to item 2 were submitted for statistical analysis.

2.5. Statistical analysis

The data in item 2 were analyzed using descriptive and inferential statistics, using the SPSS program (Statistical Package for Social Sciences) for Windows®, version 22.0. The descriptive procedures were presented in frequencies of absolute and percentage values. Statistical significance was determined by Chi-square and Fisher’s exact tests, with a 95% confidence interval. Results with a p-value below 0.05 were considered significant.

The statistical analysis assessed through corrections the inferring aspects of dentists’ knowledge about bisphosphonates and the appropriate therapeutic approach for patients using these drugs.

2.6. Ethical aspects

This study followed the Guidelines and Regulatory Norms for Research Involving Humans of the National Health Council (Resolution 466/12). The project was approved by the Research Ethics Committees of both Instituto Leão Sampaio de Ensino Universitário Ltda (protocol number 2,680,662 and CAAE: 53640416.9.0000.5048) and Faculdade São Leopoldo Mandic (protocol number 2,705,992 and CAAE: 53640416.9.3001.5374). Participants were recruited through invitations via email, SMS, and their social networks. All study subjects were adequately advised about the research, agreed with the data collection, and signed an informed consent term.

3. Results

The present research characterized the profile of the study population concerning the following aspects: sex, age, time since graduation, specialization, professional area, and surgical procedures. The data were tabulated and expressed as a percentage of the total sample. The survey included individuals of both sexes, with a predominance (66.1%) of female professionals. As shown in Fig. 1, most respondents (58.8%) were aged between 21 and 30. Among the research participants, there was a predominance (58.8%) of recently graduated professionals with up to 5 years of experience (Fig. 2), without specialization in any area of dentistry (52.2%).

Fig. 3 shows the environment/sector in which the professionals interviewed work. The results show a predominance of work in the private sector, which may be related to the short time of professional work since most professionals are recent graduates. When asked about performing invasive procedures, it was established that 36.3% of professionals performed such procedures in routine clinical care, and 63.7% did not perform invasive interventions on their patients. For this question, the title of specialist in the related area was not considered, but the performance in the clinical area involved some activity that performs invasive surgical procedures.

Following the professional profile characterization, a statistical

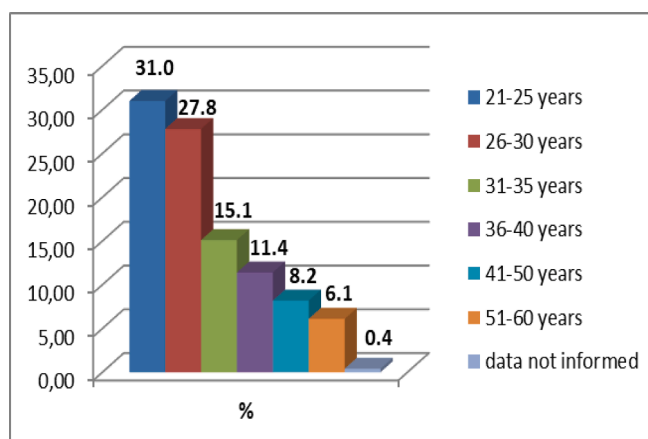


Fig. 1. Distribution of the study population according to the age range. Data are represented as a percentage of the total population.

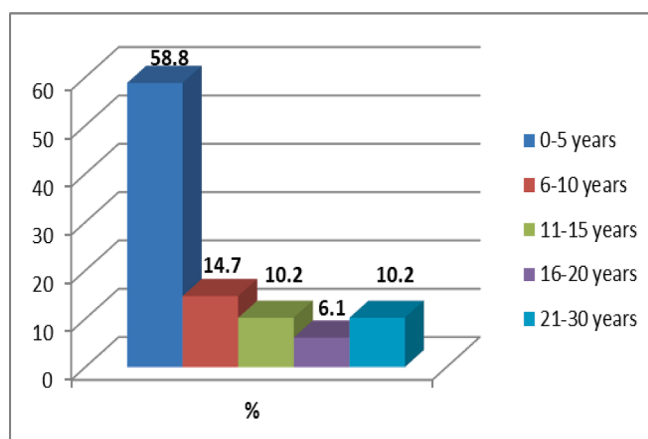


Fig. 2. Distribution of the study population according to the time since graduation. Data are represented as a percentage of the total population.

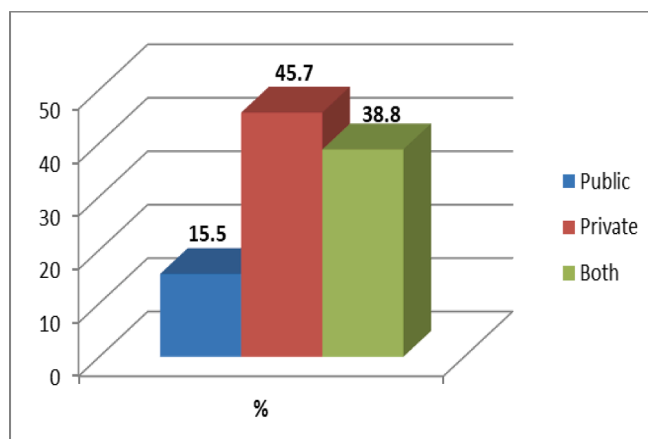


Fig. 3. Distribution of the study population according to the work sector. Data are represented as a percentage of the total population.

analysis was performed to correlate these data with the knowledge of the dental surgeons about the use of bisphosphonates, which was assessed through the following question: “In your opinion, is it necessary to stop using a bisphosphonate in order to safely perform an invasive procedure on a patient who uses this medication orally? Yes or No”.

As shown in Fig. 4A, it was found that 78.4% of the professionals

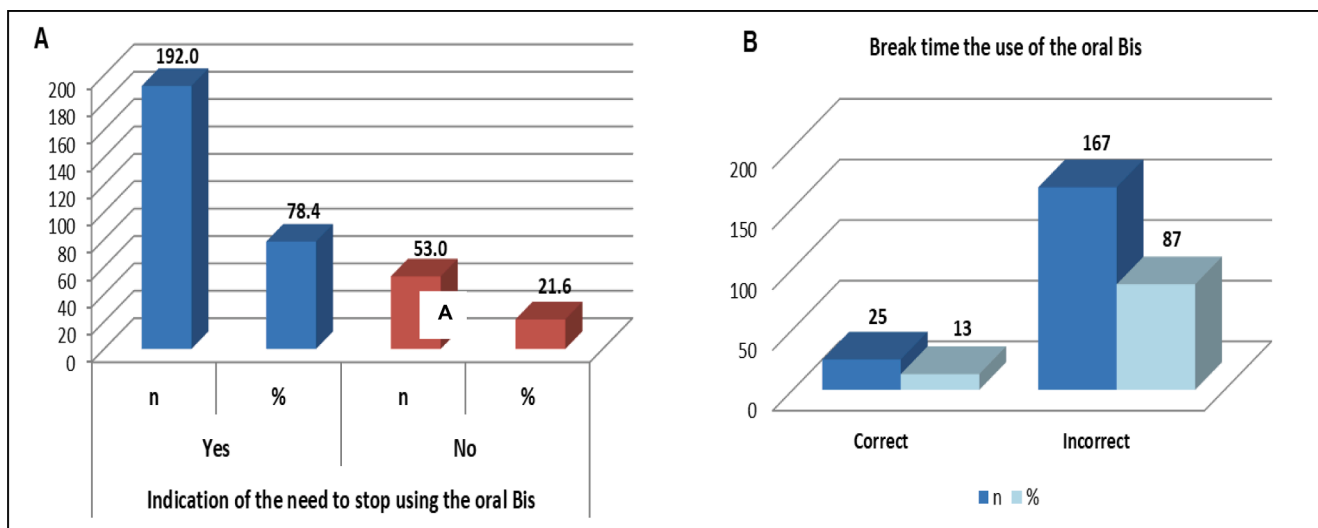


Fig. 4. Answers of the participants about the need to interrupt the oral use of bisphosphonates (A) and the adequate time for interruption (B).

agree with the need to stop the oral use of bisphosphonates before performing invasive procedures. These interviewees were questioned about the right time to interrupt the treatment. To this end, we used a multiple-choice question whose correct answer is “3 times the period of pharmacotherapy if this period does not exceed 4 years”. It was found that only 13% of those who agreed with the need to interrupt the treatment knew the correct way to perform it (Fig. 4B).

After assessing the profile of the participants, we correlated their knowledge of the use of BP and the ability to conduct clinical procedures in patients using these drugs, which was investigated through multiple variables. However, for most correlations, no statistical significance was observed (Table 1).

Table 2 presents a detailed examination of the correlations between knowledge about bisphosphonates (BPs) and various dental health variables labeled as A through E. Bisphosphonates are medications widely used to treat conditions like osteoporosis and certain bone cancers, but they can also have implications for oral health. This analysis sheds light on how much a dentist’s knowledge about BPs correlates with factors related to dental health.

Table 2A shows the significant correlation between the questioning chosen to ascertain knowledge and the questioning related to anamnesis, with questions elaborated to evaluate the use of medications to treat bone disorders. It was observed that individuals who recognize the need to identify the previous use of these substances do specific anamnesis seeking to identify the bisphosphonates among them (p = 0.043). Thus, we found a correlation with 78.4% of the sample that refers to the need to suspend the oral use of bisphosphonates to institute some invasive treatment to the patient.

Considering the absolute number of 192 participants who recognize the need to discontinue oral use of bisphosphonates, 181 of these professionals also considered it necessary to suspend the administration of these drugs by the parenteral route, which characterizes unrecommended conduct, since the patient would have no benefits. Besides, some individuals (n = 23) mistakenly do not recognize the need for oral bisphosphonate interruption and understand that interruption is necessary when used parenterally, which incurs double misunderstanding, data presented in Table 2B.

Given the general scenario considered in the present research, it can be noted that the participants have some degree of knowledge on the topic since 192 of the 245 participants stated that it is essential to stop using bisphosphonates orally before proceeding with some invasive dental treatment. However, given the complexity of the subject and the possible complications that can be triggered in the patient using bisphosphonates, it can be seen that among the participants, 76.7%

Table 1

Correlation between the knowledge about the oral use of bisphosphonates and variables concerning the professional profile without statistical significance (p > 0.05).

Variable	KNOWLEDGE ON THE ORAL USE OF BIPHOSPHONATES				Total (%)	p
	Yes		No			
	N	%	N	%		
	192	78.4	53	21.6		
Time since graduation						
0–5 years						
> 5 years	117	47.75	27	11.02	58.77	0.191
	75	30.61	26	10.61	41.22	
Dental Specialization						
Yes						
No	91	37.1	26	10.6	47.8	0.830
	101	41.2	27	11.0	52.5	
Work with invasive procedures						
Yes	70	28.6	19	7.8	36.3	0.935
No	122	49.8	34	13.9	63.7	
Has treated patients using BF						
Yes	60	24.5	13	5.3	29.8	0.344
No	132	53.9	40	16.3	70.2	
Recognized a BF pharmaceutical form						
Yes	67	27.3	18	7.3	34.7	0.899
Did not	125	51	35	14.3	65.3	
Requested the correct exams						
Yes	36	18.0	5	2.5	20.5	0.358
No	130	65.0	29	14.5	79.5	
Identified risk procedures for osteonecrosis						
Yes	91	37.1	21	8.6	45.7	0.315
No	101	41.2	32	13.1	54.3	
Knows the protocol treating patients who develop osteonecrosis						
Yes	67	27.3	15	6.1	33.5	0.368
No	125	51.0	38	15.5	66.5	

stated that they did not feel confident enough to conduct treatments in patients who use this medication, as shown in Table 2C.

Table 2D shows a positive correlation between the number of participants who claim that there is a need to suspend the use of bisphosphonates orally and the request for additional laboratory tests to investigate the development of MRONJ. Moreover, it can be seen with the number of professionals who request medical monitoring to treat bisphosphonate-using patients, as shown in Table 2E. This correlation suggests greater professional attention to the need to perform special

Table 2
Correlation between knowledge about bisphosphonates and variables of dental importance (A-E).

A. Correlation between anamnesis and the knowledge about the oral use of bisphosphonates.						
Variable	KNOWLEDGE ON THE ORAL USE OF BISPHOSPHONATES				Total (%)	P
	Yes		No			
	N	%	N	%		
	192	78.4	53	21.6		
Assessment of the use of DABM* during anamnesis						
Yes	140	57.1	31	12.7	69.8	0.043
No	52	21.2	22	9.0	30.2	
B. Correlation between the knowledge about the oral use of bisphosphonates and the need to interrupt their parenteral use.						
Variable	KNOWLEDGE ON THE ORAL USE OF BISPHOSPHONATES				Total (%)	P
	Yes		No			
	N	%	N	%		
	192	78.4	53	21.6		
Need to interrupt the parenteral use of BF						
Yes	181	73.9	23	9.4	83.3	<0.001
No	11	4.5	30	12.2	16.7	
C. Correlation between the knowledge about the oral use of bisphosphonates and the confidence to conduct treatments in patients using these drugs.						
Variable	KNOWLEDGE ON THE ORAL USE OF BISPHOSPHONATES				Total (%)	P
	Yes		No			
	N	%	N	%		
	192	78.4	53	21.6		
Fell confident to conduct treatments in patients using BF						
Yes	37	15.1	20	8.2	23.3	0.005
No	155	63.3	33	13.5	76.7	
D. Correlation between the knowledge about the oral use of bisphosphonates and the request for additional laboratory tests.						
Variable	KNOWLEDGE ON THE ORAL USE OF BISPHOSPHONATES				Total (%)	P
	Yes		No			
	N	%	N	%		
	192	78.4	53	21.6		
Requests additional laboratory exams for patients using BF						
Yes	166	67.8	34	13.9	81.6	<0.001
No	26	10.6	19	7.8	18.4	
E. Correlation between the knowledge about the oral use of bisphosphonates and the request for medical monitoring of patients using BF.						
Variable	KNOWLEDGE ON THE ORAL USE OF BISPHOSPHONATES				Total (%)	P
	Yes		No			
	N	%	N	%		
	192	78.4	53	21.6		
Requests medical monitoring						
Yes	187	76.3	46	18.8	95.1	0.002
No	5	2.0	7	2.9	4.9	

*DABM: Drugs affecting bone metabolism.

dental procedures in these patients. Thus, both the former (n = 116 of 245 participants) and the latter (n = 187 of 245 participants) results showed significant correlations (p less than 0.05). In the two results, it is still verified that most of the participants stated that medical monitoring is necessary, as well as requesting additional tests, even though they do not believe it is necessary to interrupt the medication to subject the individual to some invasive treatment.

4. Discussion

The finding that a significant number of the professionals interviewed in this study has no specialization (47.8%) could lead to the hypothesis that this group of dental surgeons would be more likely to institute inappropriate dental treatment for individuals who use bisphosphonates. However, the correlation analysis with the corresponding variables did not show statistical significance (p = 0.935).

In this context, the study realized by Lima *et al.* indicated that dental surgeons obtained significant knowledge concerning using BP during graduation. Accordingly, evidence has indicated that specialists in oral and maxillofacial surgery demonstrate more significant knowledge of using BP compared to other specialists and general clinicians (Lima *et al.*, 2015). The mastery of this topic was also greater among professionals with a working time of up to 5 years (Yoo *et al.*, 2010; López-Jornet *et al.*, 2010). However, the percentage of professionals who presented satisfactory knowledge (35.2%) was significantly lower than those obtained in the present study (81.25%), considering professionals who recognized the need to stop using bisphosphonates before oral surgery procedures.

A study correlating knowledge about bisphosphonates and the age of the dental surgeons indicated that professionals with less than 30 years had a higher level of knowledge on the topic when compared to professionals with older age, which, in turn, may be related to the updating of knowledge in recently graduated professionals, corroborating the data of the present work (Hajmohammadi *et al.*, 2015).

A significant percentage (36.3%) of the study participants stated that they work in areas of Dentistry that perform invasive procedures. This finding reinforces the need to identify patients who suffer from some metabolic bone disorder and are treated with BP. Accordingly, consistent evidence demonstrates that invasive therapies such as tooth extractions and bone surgery are at high risk for bisphosphonate users (Hadaya *et al.*, 2019; Kishimoto *et al.*, 2019; Al-Hamed *et al.*, 2019).

Since BP significantly influences the results of dental procedures, special attention should be given to performing invasive treatment in these patients. Thus, this work evaluated some points that could help to define the capacity of dental surgeons to assist patients using bisphosphonates, such as previous assistance to bisphosphonate users, the ability to recognize bisphosphonates in their usual commercial presentation, the recognition of procedures that constitute risk factors for the development of ONM in bisphosphonate users, and the requisition of adequate tests to assess the risk and conduct the appropriate treatment for the individual who has developed osteonecrosis of the jaws, based on the knowledge of protocols published in international literature (Kishimoto *et al.*, 2019; Raj *et al.*, 2016).

A study involving doctors, pharmacists, and dentists showed a higher percentage of dentists (38%) who identified bisphosphonate users during care compared to the results of this study (24.5%), corroborating the data obtained by Lima and collaborators (Lima *et al.*, 2015; Raj *et al.*, 2016). The study also identified a higher percentage (76%) of professionals who recognize MRONJ as a potential complication after dental therapies, compared with the results obtained in our research (45.7%) (Raj *et al.*, 2016).

Previous studies observed that a significant number of dentists failed to identify BP in the composition of branded drugs, which corroborates the findings of this study since most participants did not recognize any medication containing BP as an active ingredient. Furthermore, identifying patients using bisphosphonates is separate from the routine of the dental surgeon, which can be significantly related to the lack of knowledge about these drugs (Lima *et al.*, 2015; Rosella *et al.*, 2017).

We recognized the possibility of investigating, through complementary tests using biomarkers, the risk of developing MRONJ. In the present study, 81.6% of the participants recognized the need to conduct treatments for bisphosphonate users with greater safety (Moraschini *et al.*, 2019). However, only 20.5% of them can recognize CTX (type I collagen carboxyterminal telopeptide) as the most appropriate

laboratory test, even though recent evidence has recognized that this method has limitations concerning its efficiency in predicting the development of osteonecrosis (Moraschini et al., 2019; Ruggiero et al., 2014).

Different studies have reported using variable treatment strategies according to the stage of the disease for everyone who presents bisphosphonate-related osteonecrosis of the jaws (BRONJ). However, promising results still need to be discovered, reflecting the lack of consensus on an effective protocol to address this problem (Kishimoto et al., 2019; Ruggiero et al., 2014; Magremanne and Reychler, 2014; Flores et al., 2016; Heifetz-Li et al., n.d.; Ristow et al., 2019). A study performed by Nisi et al. showed the feasibility of conservative treatment for patients in early-stage BRONJ due to the oral use of BP for the treatment of osteoporosis. In their study, patients were treated with antibiotics and removal of bone sequestration with little or no extension (Nisi et al., 2018). This modality proved very efficient over 24 months of treatment, with a healing rate of 91.8%. However, patients with more advanced BRONJ staging and the presence of rheumatoid arthritis were negative indications for the success of this therapy. On the other hand, divergent results regarding conservative therapeutic effectiveness in BRONJ stage 1 were obtained, with a success rate of less than 10%. However, it is necessary to consider that this study was conducted with patients using BP for cancer treatment when BP is commonly used intravenously, which can result in more potent effects (Ristow et al., 2019; Nisi et al., 2018).

Promising results have already been presented with the use of platelet concentrate in the healing of the mucosa and the resolution of BRONJ, as well as in other conditions, such as osteoradionecrosis, traumatic extractions, and oral mucosal communications. Therefore, a more superficial treatment modality may be an option with a higher success rate in managing patients with BRONJ (Al-Hamed et al., 2019).

Our study showed that 69.8% of dentists said they investigated the use of drugs for bone disorders as a routine during anamnesis, which was significantly correlated with knowledge about the use of BP. As for any clinical procedure, anamnesis is fundamental in treating people who use bisphosphonates (Bermúdez-Bejarano et al., 2017; Lima et al., 2015; Ruggiero et al., 2014). The importance of anamnesis in the context of our study is emphasized by evidence demonstrating that there is a risk of developing BRONJ even with the oral use of low doses of BP (Kishimoto et al., 2019).

Investigating the use of BP by patients under dental treatment, especially those involving invasive procedures, is essential (Lima et al., 2015). Since BPs are increasingly used in treating disorders of bone metabolism, a complete anamnesis identifying the use and duration of treatment with BP can contribute significantly to the best treatment plan. This level of awareness is increasing among researchers in the field.

In the present study, 69.8% of professionals stated that they carry out anamnesis directed to drugs that are used in the treatment of bone disorders, which is more than double the value found in previous studies (Yoo et al., 2010), suggesting a growing interest in the identification of risk factors to achieve more significant safety and therapeutic effectiveness in patients using BP for the treatment of bone disorders (Yoo et al., 2010; Ruggiero et al., 2014; Ristow et al., 2019).

Although the vast majority of professionals interviewed in this research have correctly recognized the need to discontinue the use of bisphosphonates before invasive procedures, only 10% of them answered the correct form of interruption, according to what is established in the study performed by Ruggiero et al. (Ruggiero et al., 2014). Studies have reported that the oral use of bisphosphonates has a low risk of osteonecrosis, although there are cases reported in the literature (Kishimoto et al., 2019). Nevertheless, there is evidence that the duration of pharmacological treatment with these drugs is decisive, considering that there is no benefit in suspension when the treatment exceeds 3 years of continuous use (Santos et al., 2016; Mendes et al., 2019).

The data obtained in this study demonstrate that most dental

surgeons understand the need for an interdisciplinary approach in collaboration with the prescribing physician to adopt the best treatment strategy for bisphosphonate users. On the other hand, studies indicate that even physicians may have insufficient knowledge to minimize problems related to BP (Raj et al., 2016; Osta et al., 2015; Kim et al., 2016). Given the circumstances, when feasible, it is recommended to delay the initiation of drug therapy until the objective of mitigating the risks associated with the development of BRONJ (bisphosphonate-related osteonecrosis of the jaw) is achieved (Kishimoto et al., 2019; Nicolatou-Galitis et al., 2019). Through knowledge, planning, and establishing appropriate criteria, it is possible to implement safe and effective dental therapies for individuals undergoing treatment with bisphosphonates (Lima et al., 2015; Kishimoto et al., 2019; Ferreira et al., 2017; Nicolatou-Galitis et al., 2019).

The study “ASSESSING DENTAL SURGEONS’ UNDERSTANDING OF BISPHOSPHONATES: IMPLICATIONS FOR PATIENT HEALTH IN ORAL SURGERY” has some notable limitations. Firstly, the sample size may be limited, affecting the representativeness of the results. Additionally, the research focuses on a specific geographical location, which may only partially reflect the diversity of dental practices in other regions. The authenticity of dentists’ responses, collected through self-administered questionnaires, may also be questioned. Uncontrolled variables, such as differences in educational background and treatment practices, can act as confounding factors.

Furthermore, the self-reported nature of the information may introduce biases. The research may not capture changes over time and may primarily focus on dentists’ knowledge, neglecting other contextual factors. The findings may need to be more generalizable to other populations or geographic locations. Despite these limitations, the research provides valuable insights into dentists’ understanding of bisphosphonates and their relationship with patient health in oral surgery. It is essential for researchers to acknowledge these limitations when interpreting the results and to be transparent about their constraints.

5. Conclusion

The data derived from the current study provide evidence that individuals who have undergone recent training exhibit a more comprehensive understanding of the potential risks linked to bisphosphonates (BP) utilization in patients undergoing invasive dental procedures.

While most professionals practiced anamnesis as a way of identifying patients who use drugs that act on bone metabolism, they do not know the proper protocol for stopping the use of these drugs, in addition to demonstrating insecurity to care for these patients, which was verified both for general practitioners and specialists. On the other hand, most professionals are aware of the need for laboratory tests, as well as contact with the prescriber, which can represent an essential tool in managing patients using bisphosphonates and preventing BRONJ or MRONJ.

In conclusion, a better knowledge of the pharmacological effects of BP is crucial for conducting adequate anamnesis, requesting additional tests, and performing medical monitoring, which significantly impacts dental surgeons’ clinical practice.

Ethical statement

This study was carried out following the Guidelines and Regulatory Norms for Research Involving Humans of the National Health Council (Resolution 466/12). The project was approved by the Research Ethics Committees of both Instituto Leão Sampaio de Ensino Universitário Ltda (protocol number 2,680,662 and CAAE: 53640416.9.0000.5048) and Faculdade São Leopoldo Mandic (protocol number 2,705,992 and CAAE: 53640416.9.3001.5374). All study subjects were adequately advised about the research, agreed with the data collection, and signed a term of informed consent.

CRedit authorship contribution statement

Wilson Rocha Cortez Teles de Alencar: Conceptualization. **Marcília Ribeiro Paulino:** Conceptualization. **Inês Andrea Luna Martinis de Alencar:** Investigation. **Jaime Ribeiro-Filho:** . **Ana Valéria de Oliveira Braz:** Investigation. **Edinardo Fagner Ferreira Matias:** Supervision. **João Paulo Martins de Lima:** Investigation. **Sloana Giesta Lemos Florencio:** . **Henrique Douglas Melo Coutinho:** Project administration. **Antônio Marcos Montagner:** Supervision.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.sdentj.2023.09.011>.

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