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ORIGINAL ARTICLE

Uncertainty managing patients treated with antiresorptive drugs: a cross-sectional study of attitudes and self-reported behavior among dentists in Sweden

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ABSTRACT

Objective: To evaluate the level of knowledge and attitudes among Swedish general dentists regarding the behavior and management of patients treated with bisphosphonates and denosumab

Materials and Methods: A questionnaire was sent to 656 dentists. The web-based survey included questions on demographics, risk perception of osteonecrosis of the jaws (ONJ), the experience of managing patients treated with bisphosphonates and denosumab and requests to acquire new knowledge. Independence and associations were tested using Fisher's exact test and the chi-square test function.

Results: The overall response rate was 57.6%. Most of the dentists, 69.7%, had been in the profession for more than 5 years. The criteria for ONJ were not known by 43.2% and 86.9% did not feel comfortable with their current level of knowledge when managing the patients in question. The rest of the respondents felt uncertain and more than 70% were unaware of the different stages of ONJ, when to refer a patient to a specialist and when to prescribe antibiotics.

Conclusion: Dentists practicing in Sweden express a strong need for an improved level of knowledge when managing patients treated with bisphosphonates and denosumab. The results demonstrate a need for the necessary advancement of education and clinical training at dental schools in order to prepare dentists to provide safe, modern care within the healthcare sector.

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Introduction

Osteonecrosis of the jaw (ONJ), a condition first reported in 2003 [1,2] related to treatment with bisphosphonates and denosumab [3,4], can present clinically with severe pain, one or several areas of exposed necrotic bone or fistulas in the jaws. Most patients treated with bisphosphonates and/or denosumab for the prevention of bone resorption have osteoporosis or cancer, but recently support for fracture prevention in women with osteopenia alone has also been presented [5]. Further indications for treatment with bisphosphonates and denosumab in combination with other anticancer and anti-inflammatory medications will impose greater demands on healthcare and future demands for improved education to ensure safe care. Scandinavian men and women run the highest risk worldwide of experiencing fragility fractures [6] and, with an aging population, the indications for antiresorptive (AR) treatment will increase. Higher doses, longer duration of the treatment and the high potency of the agent will place more patients at risk of developing ONJ.

Patients are concerned about the risk of developing ONJ when treated with bisphosphonates and denosumab. Studies of ONJ and published photos of lesions worry and frighten patients and consequently, in some situations, unfortunately, non-compliance with medication. Oral symptoms, including swelling, pus and sequesters, may appear and they require a safe and matched way of managing affected patients [7]. Incoming referrals and calls from general dental practitioners (GDPs) to departments of oral and maxillofacial surgery demonstrate a lack of knowledge and uncertainty regarding the principles of caring for patients with ongoing or previous treatment with bisphosphonates and denosumab.

The purpose of the study was to evaluate risk perception, awareness and experience among Swedish GDPs when meeting osteoporosis patients treated with AR agents. Most of these patients run a low risk of developing ONJ and should be managed within primary dental care. Since reports have been published since 2003, ONJ is expected to be widely known among most dentists. The hypothesis is that, due to the lack of knowledge regarding the literature and guidelines, many dentists choose to manage the patients incorrectly and, for example, to refer them to specialist care, just in case.

ONJ is defined as an area of exposed bone, or bone that can be probed through an intraoral or extraoral fistula, that persists for more than 8 weeks in a patient currently or

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previously treated with antiresorptive or antiangiogenic agents, with no history of radiation therapy to the jaws [8,9]. Amino-bisphosphonates reduce bone resorption by inhibiting osteoclasts and preventing fractures in patients with osteoporosis [10], with osteopenia [5] and as part of cancer treatment [11]. Denosumab, a fully human monoclonal antibody to the receptor ligand RANKL, inhibiting the developmental pathway and activity of osteoclasts and thereby decreasing bone resorption, is also used for the prevention of fractures in osteoporosis patients [12] and as a part of cancer treatment [13,14].

The risk of ONJ developing in osteoporosis patients with enteral bisphosphonates and no other risk factors is extremely rare and the prevalence ranges from 0.001 to 0.05%. The risk of ONJ is higher for oncology patients treated with iv bisphosphonates and ranges from 0.9 to ~10.0% [7,15], but, in a prospective study by Walter et al. [16], it was reported that almost 19% of the cancer patients developed ONJ related to bisphosphonate treatment.

Different hypotheses regarding the pathophysiology of ONJ have been presented, but it is still unclear whether ONJ precedes or follows infection. Infection, an impaired immune response to infection, inflammation, affected monocyte and macrophage function, as well as the suppression of bone remodeling, the impaired healing of the oral mucosa and the inhibition of angiogenesis, are presented as part of the explanation of the development of ONJ [17–24]. Precipitating events for the development of ONJ include tooth extraction, periodontal disease, local suppuration and the use of dentures [25]. A recently published animal study shows that tooth extraction per se is not essential for ONJ to occur [26]. Several published studies suggest that infection may play a crucial role in the etiopathogenesis of ONJ and highlight the importance of infection control for resolution [26–29].

In Sweden, there are about 120,000 fragility fractures a year [30]. The number of fragility fractures has increased in the industrialized countries over the past 50 years and a similar trend is expected in the developing countries [31]. For this reason, the use of antiresorptive drugs is expected to increase in a growing number of countries and patients. According to the National Board of Health and Welfare, 100,700 patients were using bisphosphonates or denosumab in Sweden, in 2018 [32].

Different surveys from Brazil, Canada, Spain, the UK and the USA, within dental care, regarding knowledge levels when managing patients undergoing antiresorptive treatment, reveal uncertainty, confusion and a need for and interest in further education [33–38]. Tanna et al. demonstrated that 90% of the GDPs in Great Britain were unaware of antiresorptive and antiangiogenic medications other than bisphosphonates related to the development of ONJ [38]. Irrespective of the knowledge level, the majority (85%) of dentists in Texas were concerned about ONJ [36]. Among dental students in Italy, 99% had knowledge of bisphosphonates, but only 26.9% of 4th-year and 34.8% of 6th-year students knew the correct definition of ONJ [39]. All the studies confirmed the need for further improvement and research in the area and the need for the clarification and implementation of guidelines in clinical practice.

The objective of this study was to investigate the self-reported knowledge level, attitude, behavior and knowledge acquisition among GDPs regarding the management of patients undergoing antiresorptive treatment. To the authors' knowledge, this is the first study of the attitudes among GDPs in Sweden when managing patients with previous or ongoing treatment with bisphosphonates and/or denosumab.

Materials and methods

A cross-sectional survey was conducted in Sweden in Region Västra Götaland, with a population of 1,690,782 inhabitants by 31 December 2017, according to Statistics Sweden (SCB). The participants were GDPs working within the public dental service in the area. The study was approved by the board of the public dental service in Västra Götaland, Sweden. Five months prior to the dispatch of the questionnaire, a PP presentation (four images) with information about the questionnaire was used to inform the clinical managers ($n = 56$) at the public dental clinics ($n = 111$) and for subsequent information to all co-workers ($n = 656$). At first, an original version of the web-based questionnaire was pilot-tested on five GDPs. A few clarifications were made before the final questionnaire was sent to all 656 GDPs by e-mail, with a link to an online interface (esMaker NX3, Entergate, Halmstad, Sweden). The email addresses were obtained from the Department of Human Resources, Folktandvården Västra Götaland. Five E-mails bounced back due to vacation or maternity leave. The questionnaire and three additional reminders were sent out, starting in the middle of November 2016, and were available for a total of 5 weeks (Figure 1).

Study design

The questionnaire comprised 26 questions divided into five different parts: Demographics, ONJ – knowledge and risk assessment, Fictive case questions, Experience of managing ONJ patients and Knowledge acquisition. Twenty-three of the questions were multiple-choice questions (tables) with the opportunity to check one or more boxes. It was possible to add additional information for some of the questions. The questions and *response options* were as follows:

Demographics

1. For how many years have you been practicing dentistry? *<1, 1–2, 2–5, 6–10, >10 years*.
2. Where did you do your dental undergraduate training? *See* Table 1.
3. State the current main clinic where you practice.
4. How many dentists work at your clinic? *1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or >10.*

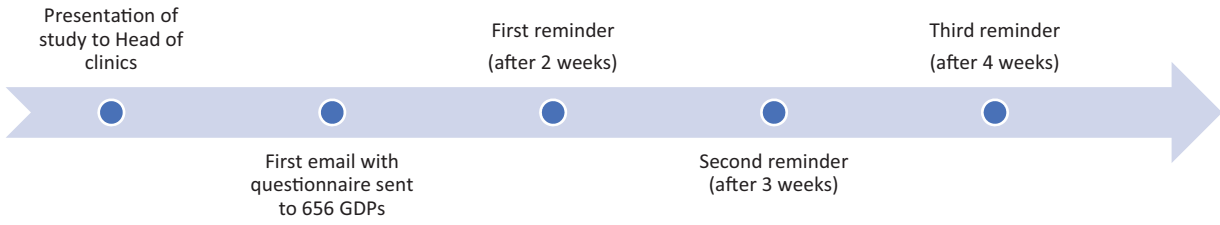

Figure 1. Timeline of the survey process.

Table 1. Dental training sites and number of respondents.

Location	No. of respondents (%)
Stockholm	29 (7.8)
Gothenburg	247 (66)
Malmö	17 (4.5)
Umeå	20 (5.3)
Outside Sweden*	61 (16.3)
Total	374 (100)

*Czech Republic, Croatia, France, Germany, Holland, Hungary, Iran, Iraq, Ireland, Italy, Latvia, Mexico, Norway, Peru, Poland, Portugal, Romania, Russia, Spain, Syria and the United Arab Emirates.

Table 2. Risk assessment; uncertainty prior to different interventions (MCQ).

Intervention	No. of respondents (%)
Simple extraction	174 (48.9)
Complicated extraction	265 (74.4)
Surgical extraction	262 (73.6)
Implant surgery	242 (68.0)
Periodontal surgery	199 (55.9)
Endodontic surgery	211 (59.3)
Other	22 (6.2)
Total	1375

5. From your team of dentists/dental hygienists, who mainly performs the regular check-ups? *Dentist, oral hygienist, every other time dentist/oral hygienist, other.*

ONJ – knowledge and risk assessment

6. How many patients, undergoing treatment with antiresorptive agents, do you see each month? *0, 1, 2–5, 6–10, >10.*
7. ONJ was first reported in 2003. Do you know the criteria for ONJ? *Yes, No.*
8. Do you feel uncertain about risk assessment for the patients undergoing treatment with antiresorptive agents prior to any of the following treatments? Table 2.
9. Are you worried that your patients will develop ONJ after a tooth extraction or other invasive dental treatments? *Scale from 'not worried' to 'very worried'.*
10. Do you know how many of the patients undergoing treatment with antiresorptive agents develop ONJ after invasive dental treatment? *0–0.1%, 0.2–5%, >6%, don't know.*
11. How would you assess your own knowledge level when it comes to the risk assessment and dental treatment of patients undergoing treatment with antiresorptive agents? *Scale from 'low' to 'high'.*
12. What do you do if you suspect that one of your patients has developed ONJ? *Manage myself according to guidelines, consult a colleague at my clinic, consult a specialist or refer to a specialist.*

Fictive case questions

13. Woman, 65-years-old, with a bad lower left molar root with apical periodontitis. No symptoms. No other bad teeth. Good oral hygiene. Currently undergoing treatment with alendronate for 3 years. No other medication. How would you take care of this patient? *See* Table 3.
14. The patient from the previous question had the bad root extracted through regular, non-surgical extraction, with no antibiotics and no planned follow-up. After 5 weeks, the patient contacts the clinic due to some daily aching and tenderness from the area. Clinically, there are no pathological signs, the area looks well-healed with no fistula. How would you take care of this patient? *See* Table 4.
15. Woman, 61-years-old, with a bad upper left first molar due to periodontitis with extraction as the only treatment option. Poor oral hygiene. Currently undergoing treatment with alendronate for 3 years. She is obese and suffers from high blood pressure, rheumatoid arthritis, diabetes type 2. She medicates with several blood pressure medicines, methotrexate, cortisone and metformin. She smokes about 10 cigarettes a day. How would you take care of this patient? *See* Table 3.
16. The patient from the previous question had the bad tooth extracted through regular, non-surgical extraction, with antibiotics, but no planned follow-up. After 5 weeks, she returns to the clinic with diffuse local symptoms from the area. Clinically, poor healing can be seen with no full soft tissue covering, where you can probe into the bone and there is suppuration from the area when probing and palpating. How would you take care of this patient? *See* Table 4.

Experience of managing ONJ patients

17. Do you have any experience of your own of treating patients undergoing treatment with antiresorptive agents? *Yes, No.*
18. If yes, which kind of treatment have you performed? *See* Table 5.
19. Do you have any experience of your own of patients developing ONJ after your treatment? *Yes, No.*

Table 3. Fictitious case 1 and 2: response options for treatment after the first visit.

Treatment	No. of respondents (%) Patient 1	No. of respondents (%) Patient 2
Non-surgical extraction with no follow-up	13 (3.5)	6 (1.6)
Non-surgical extraction with follow-up	101 (27.0)	42 (11.3)
Non-surgical extraction with antibiotics and follow-up	16 (4.3)	32 (8.6)
Surgical extraction with no follow-up	0 (0)	2 (0.5)
Surgical extraction with follow-up	57 (15.2)	12 (3.2)
Surgical extraction with antibiotics and follow-up	15 (4.0)	15 (4.0)
Referral to specialist	110 (29.4)	216 (58.1)
Other	62 (16.6)	47 (12.6)
Total	374 (100)	372 (100)

Table 4. Fictitious case 1 and 2: response options for treatments 5 weeks after the first visit.

Treatment choice	No. of respondents (%) Patient 1	No. of respondents (%) Patient 2
Prescribe analgesics and follow-up in 1 week	131 (35.2)	7 (1.9)
Prescribe antibiotics, analgesics and follow-up in 1 week	22 (5.9)	30 (8.0)
Referral to specialist	139 (37.4)	303 (81.0)
Other	80 (21.5)	34 (9.1)
Total	372 (100)	374 (100)

Table 5. Own experience of managing patients – overview of interventions (MCQ).

Intervention	Own experience of treating patients on AR drugs. No. of respondents (%)	Own experience of treating patients developing ONJ. No. of respondents (%)
Simple extraction	200 (86.2)	17 (53.1)
Complicated extraction	52 (22.4)	4 (12.5)
Surgical extraction	12 (5.2)	303 (81.0)
Implant surgery	7 (3.0)	0 (0)
Periodontal surgery	0 (0)	0 (0)
Endodontic surgery	1 (0.4)	0 (0)
Other	34 (14.7)	12 (37.5)
Total	356	372

20. If yes, which kind of treatment did you perform? *See* Table 5.

Knowledge acquisition

21. How do you currently stay up to date regarding dentistry and associated science? (MCQ) *Internet browsing; Occasionally viewing technical literature; Regularly reading technical literature; Regularly reading international scientific literature, Other.*
22. Where did you first hear about ONJ? *I have no knowledge of ONJ, undergraduate training, through internship, internet, scientific meeting, postgraduate training, scientific literature, other.*
23. Do you feel comfortable with your current level of knowledge when meeting and treating a patient undergoing treatment with antiresorptive agents? *Yes, I feel comfortable, no, I feel a bit uncertain, no, I don't feel comfortable at all.*
24. In 2014, a staging of ONJ was published. It divides ONJ into five stages: at risk, 0, 1, 2 and 3. At what stage should you refer your patient to a specialist? *At risk, 0, 1, 2, 3.*
25. In which way would you prefer to learn more about ONJ? *DVD/video, recurrent meetings, web-based education, courses, position papers, have no need for further learning, other.*
26. Is there anything you would like to add?

Statistical method

Statistical analyses were performed with the R statistical package, version 3.4.2 (R Core Team (2017), R: A language and environment for statistical computing, R Foundation for Statistical Computing, Vienna, Austria, URL: https://www.r-project.org/). Intervals for percentages were calculated with the prop.test function in the stats package using large sample approximations. Clopper–Pearson intervals were used when the number of observations was small, using the binom.test in the stats package. Tests of independence in cross-tables were analyzed using Fisher's exact test. Since the number of possible permutations of entries in the tables is extremely large, simulations were used.

The number of replicates was 10^7. The fisher.exact function in the stats package with the simulate.p.value argument was used. Confidence intervals for *p*-values are given if the accuracy of the *p*-value is affected. In order to obtain some indication of the deviations of the observed number from the expected numbers, standardized Pearson residuals were also calculated. They should, however, be interpreted with care, since the number of observations in some of the cells was fewer than 5. The chisq.test function in the stats library was used.

Results

The results are presented as percent, followed by a confidence interval of 95% within parentheses. The overall response rate was 57.6% (53.7–61.4%), but no question was responded to by all participants. A total of 535 GDPs opened the first e-mail with the questionnaire. Fifty-eight GDPs

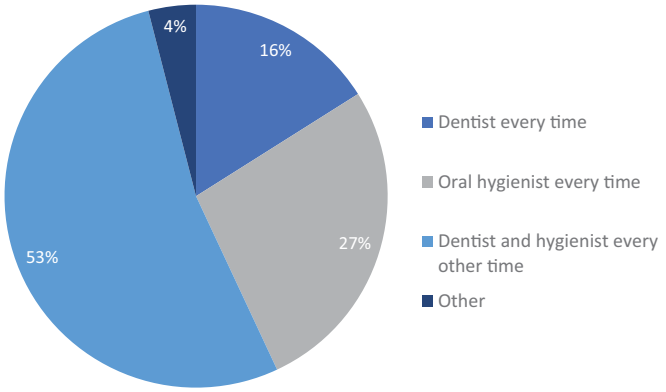

Figure 2. Distribution of dental check-ups between dentists and oral hygienists.

started the survey but did not finish it, while 102 GDPs did not open any of the E-mails that were sent.

Demographics

The demographic questions related to the participants' education (year and location) and the number of dentists at the workplace. Most of the GDPs, 69.7% (64.4–74.5%), had been in the profession for more than 5 years and 51.4% (45.8–56.8%) for more than 10 years. Sixty-six percent (61.0–70.8%) of the respondents were trained at the Institute of Odontology, Gothenburg, Sweden, and 16.3% (12.8–20.5%) had completed the dentistry program outside Sweden, Table 1. Most of the clinics had 6 dentists, 19.2% (14.6–22.8%). Regular check-ups were made by dentists and oral hygienists every other time, by oral hygienists solely or by dentists solely, or a more individual assessment to determine whether the patient should be examined by a dentist or an oral hygienist (Figure 2).

ONJ – knowledge and risk assessment

Among the GDPs, 24.3% (20.1–29.0%) stated that they never see patients undergoing treatment with bisphosphonates or denosumab. The number of dentists that estimate that they see 1–10 of these patients a month was 74.9% (70.2–79.2%) and, of these, 47.7% (42.6–52.9%) say that they see 1 patient a month. The criteria for the ONJ diagnosis were recognized by 56.8% (51.6–61.8%). However, only 12.3% (9.26–16.2%) knew the prevalence of developing ONJ after treatment with AR drugs for an osteoporosis indication. When it came to identifying ONJ according to the different clinical stages, 0–3, 70.7% (65.7–75.2%) had no knowledge of when to refer the patient to a specialist or when to treat the patient him– or herself. In the case of suspected ONJ, only 1.9% (0.8–3.8%) of the GDPs treated the patient according to current guidelines. There was a large variation in knowledge level between dentists educated in different areas and large uncertainty regarding risk assessments for different surgical interventions including simple tooth extraction Table 2. Before treating the patient, 52.4% (47.2–57.5%) consulted a specialist, while 45.7% (40.6–50.9%) immediately referred the patient to a specialist. On a scale from 1 to 10, the mean value among all respondents regarding concerns about the development of ONJ was more than 6. Among all participants, the mean value of their own knowledge level was below average, with a score of 4 on a 10-grade scale.

Fictive case questions

Two fictitious osteoporosis patients with different medical histories, status and dentition were presented to the participants, asking for their treatment of choice. Among the more experienced dentists (>10 years of working experience) 48% chose to refer a patient with low risk, diffuse and scarce symptoms, compared to 13% for less experienced dentists ($p = .0001$) (Figure 3). On the other hand, of the inexperienced dentists (<1 year of working experience) only 52% referred a patient with high risk, presenting with symptoms suggesting a developing ONJ, compared to 86% for more experienced dentists ($p = .0073$) (Figure 4).

Experience of managing ONJ patients

The majority, 62.3% (57.2–67.2%), of GDPs claimed experience of both surgical and non-surgical extractions in patients undergoing antiresorptive treatment. A total of 8.3% (5.8–11.7%) have had patients of their own that developed ONJ after dental treatment. The majority of these were caused by non-surgical, simple tooth extractions. Information regarding tooth diagnosis or the difficulty level prior to removal is not presented.

Knowledge acquisition

To stay up to date in the profession in general, technical literature and internet browsing were preferred. Most dentists had obtained their first-time knowledge of ONJ on the undergraduate dental training, post-graduate courses and scientific meetings. Only 13.1% (9.9–17.0%) stated that they felt comfortable with their current level of knowledge concerning the management of patients treated with AR agents, while the rest of the respondents felt uncertain and uncomfortable. More than 70% were unaware of the different ONJ stages and when to refer a patient to a specialist. Full- or half-day courses were preferred by the majority to increase their level of knowledge of ONJ, while 26.4% (22.1–31.2%) preferred web-based courses instead.

Discussion

The number of patients with ONJ related to antiresorptive treatment is increasing globally and poses a challenge to the healthcare system. Some systemic and local risk factors have been identified and patient history information is decisive for risk assessment, treatment planning and care. The present web-based questionnaire was produced to assess the knowledge and attitudes of Swedish general dentists regarding behavior and managing patients being treated with bisphosphonates and denosumab and to estimate the need

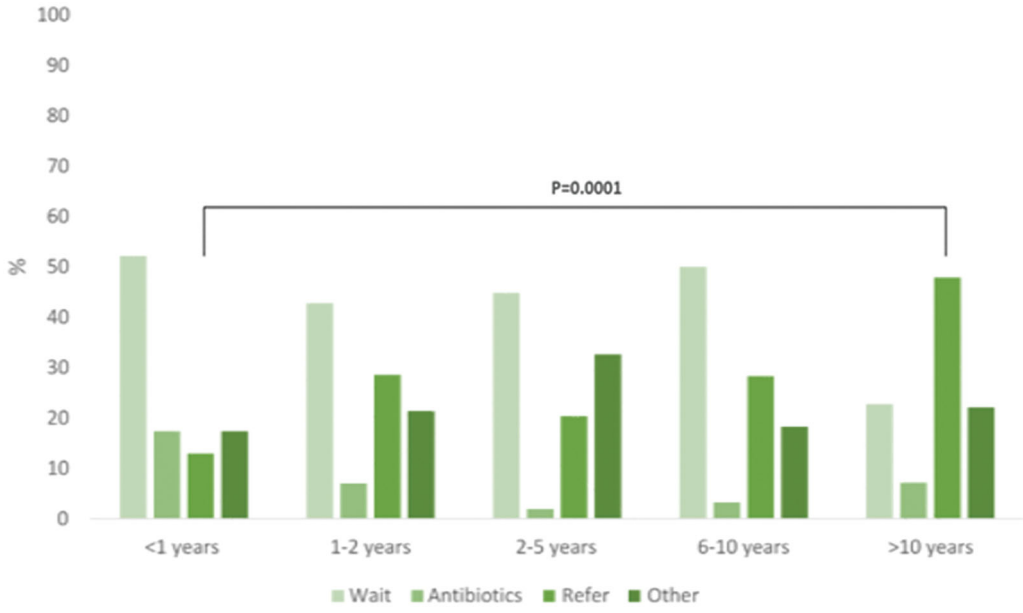

Figure 3. Low risk patient (Case 1, 2nd visit): Experienced dentists (>10 years of working experience) refers a patient with low risk and diffuse symptoms more often than inexperienced dentists (<1 year of working experience).

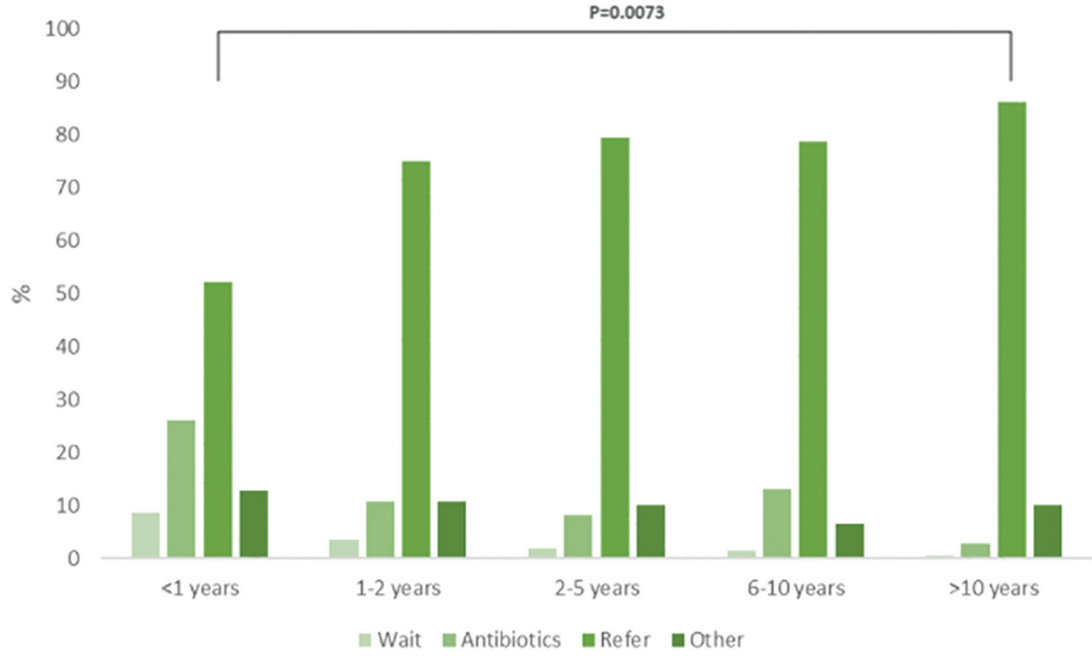

Figure 4. High risk patient (Case 2, 2nd visit): Inexperienced dentists (<1 years of working experience) refers a patient presenting with symptoms suggesting a developing ONJ more seldom than more experienced dentists (>10 years of working experience).

for education. The results show an alarming level of uncertainty among dentists when assessing, planning and taking care of patients treated with AR agents.

In the Swedish public dental organization in Region Västra Götaland, the aim is to have the same number of dentists and oral hygienists employed at each clinic, whenever possible. According to 27% of the respondents, oral hygienists perform all the regular check-up examinations. At most clinics, however, the regular check-ups are divided into seeing a dentist every other time and an oral hygienist every other time, as reported by 53% of the respondents. Oral hygienists do not have the educational background and expertise of risk assessment and diagnosing early signs of ONJ. As a result, the examination of patients treated with AR agents by the oral hygienist may be unpredictable and may lead to delays in appropriate treatment.

In Sweden, the 5-year dental undergraduate training takes place at four different universities in Stockholm, Gothenburg, Malmö and Umeå. In this study, 15% of the participants were trained outside Sweden, within or outside the EU, representing 21 different countries. It was not possible to identify the responses from the foreign-trained dentists, but it is likely that the experience of managing patients on antiresorptive agents is lower outside Sweden and Scandinavia since the incidence of osteoporosis and osteoporosis treatment in Sweden and Scandinavia is among the highest in the world.

Table 6. Choice of treatment: a patient with a high risk of developing ONJ.

	Experience <1 year	Experience 1–2 years	Experience 2–5 years	Experience 6–10 years	Experience >10 years
Prescribe analgesics and follow-up in 1 week	2 (9)	1 (4)	1 (2)	1 (2)	1 (1)
Prescribe antibiotics, analgesics and follow-up in 1 week	6 (26)	3 (11)	4 (8)	8 (13)	5 (3)
Referral to specialist	12 (52)	21 (75)	39 (80)	48 (79)	145 (86)
Other	3 (13)	3 (12)	5 (10)	4 (7)	17 (10)

χ^2-test ger p-värde = 0.003821 (χ^2 = 29.09, df = 12). Number of respondents based on dental working experience: No (%).

We found the comparison of responses from a professional experience (working years) point of view to be the most interesting since it can provide information on whether there is a difference in behavior and attitude between dentists with and without working experience. This information can be used to plan improved undergraduate or postgraduate training programs in different ways, or perhaps for both. The results from the two different fictive case-patients' questions, both with osteoporosis, show that longer working experience predicts a better assessment of when to refer a patient to a specialist, Table 6. This is astounding since it is expected that the newly trained dentists would be the most updated, with the latest and most updated level of knowledge. Could this be a sign of poor undergraduate education, or can it simply be explained by a lack of clinical experience?

More than 62% of the respondents had experience of treating patients with previous or ongoing treatment with AR agents, the majority by simple tooth extractions, followed by complicated tooth extractions. Regarding the criteria for ONJ, [7,9], 57% claimed to know the correct criteria for the definition, but no knowledge control question was included to show this and this figure should, therefore, be treated with caution. Yoo et al. reported that only 30.2% of Korean dentists were aware of bisphosphonates as medication for osteoporosis and their relationship to osteonecrosis [40]. Even more surprisingly, de Lima et al. reported in 2015 that 59.6% of Brazilian dentists did not recognize ONJ as an oral side-effect of bisphosphonates [35].

Even though most of the dentists working in Sweden have experience and are aware of the condition, more than 50% feel uncertain when assessing the risk of simple tooth extraction and about 75% feel uncertain about assessing the risk of complicated or surgical tooth extraction for patients treated with AR drugs. The results show that postgraduate training, both theoretical and practical, in the risk assessment of patients using antiresorptive medication, is required for the safe management of patients. Dental extractions are identified as one of the most important local risk factors for the development of ONJ and, as a result, many general dentists and specialists avoid removing teeth, despite odontogenic infections and a poor prognosis. In addition, tooth extraction procedures and concurrent wound debridement with subsequent wound closure may not be performed thoroughly in many situations. Infection and inflammation play a significant role in the development of ONJ [20,23,41] and the suppression of the repair and remodeling capacity after tooth extractions by bisphosphonates and denosumab may contribute to the development of ONJ.

Many of the participants in our study, 55%, were confident about planning and performing a tooth extraction, surgically or non-surgically, in osteoporosis patients treated with AR agents and with no other risk factors. In the UK, Tanna et al. reported that 58% of British GDPs did not feel comfortable carrying out a non-surgical tooth extraction on an osteoporotic patient who had been taking oral bisphosphonates for 1 year [38]. The participants in our study (59.2%), like the Ontario dentists reported by Alhussain et al. (51.2%), preferred to learn more about ONJ at full- or half-day seminars or courses [33].

One limitation of the study is that interest mainly focused on osteoporosis patients compared with similar studies with a wider approach, including other groups of patients. This may have caused some confusion among some of the participants and should have been clarified within the questionnaire.

When analyzing the results of the two different fictive case questions, the treatment choices were weighted, related to patient history and risk assessment. In the first osteoporosis case, the expected answer was to prescribe analgesics and follow up after 1 week, while, in the second case, the osteoporosis patient with identified risk factors, the expected answer was to refer the patient. It was noted that 2% of the dentists chose to wait for a week before following up the second high-risk patient. Among the 2%, the majority had recently received their degree. On the other hand, the results show that the dentists with more experience (>10 years) referred the patient in the first low-risk case.

The study suggests that, at small clinics (<2 dentists), fewer patients are examined solely by dentists and more often by oral hygienists than at larger clinics. There was, however, no statistical significance to support this. Interestingly, newly trained/educated dentists are less educated with regard to ONJ compared with more experienced dentists.

Conclusion

The results indicate that most GDPs are uncertain when it comes to risk assessments in patients treated with AR agents and that most of the GDPs are worried about the development of ONJ when treating osteoporosis patients, despite the extremely low risk of ONJ. Very few GDPs use the available guidelines and half the GDPs immediately refer the patients to specialists, which points to the need for further education in the area to help dentists manage patients appropriately. A better knowledge level among GDPs may contribute to a reduction in the incidence of ONJ and the

improved management of patients in primary dental care with fewer referrals. There is a general lack of knowledge of when to refer patients to a specialist related to the ONJ stages. The results of this study may help employers and course organizers to identify the need and plan for further education, especially within surgical training. Hopefully, the results of the survey will contribute to open discussions regarding structures within healthcare organizations, risk assessments and the implementation and clarification of using existing guidelines.

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors. For this type of study, formal consent is not required.

Disclosure statement

The authors declare that they have no conflict of interest.

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