U.PORTO

**FACULDADE DE
MEDICINA DENTÁRIA
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DENTIGEROUS CYST
The Prevalence in a Portuguese Population

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DENTIGEROUS CYST

The Prevalence in a Portuguese Population

Scientific area: Oral Surgery and Oral Pathology

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Sentir tudo de todas as maneiras,
Viver tudo de todos os lados,
Ser a mesma coisa de todos os modos possíveis ao mesmo tempo,
Realizar em si toda a humanidade de todos os momentos,
Num só momento difuso, profuso, completo e longínquo.

Fernando Pessoa

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ABSTRACT

Introduction: Odontogenic cysts are pathological cavities, lined with odontogenic epithelium. They are classified as developmental or inflammatory. The dentigerous cyst is the most common developmental cyst. It arises from the dental follicle of an unerupted tooth, surrounding it. It occurs most frequently in the posterior mandible, it is mostly associated with third molars and it is more common in individuals between 10 and 30 years old. Radiographically, it is a radiolucent lesion and its differential diagnose is made with ameloblastoma, keratocyst and dental follicle. Therefore, it is mandatory to perform an anatomopathological analysis to establish a correct diagnosis.

Objectives: To assess the prevalence of the dentigerous cyst in a Portuguese population, as well as its characteristics such as location and predominant sex. It is also intended to study the concordance rate between clinical and histological diagnosis of the cases analysed.

Methodology: Clinical records of the last 23 years (2000-2023) of patients attending Oral Surgery and Oral Medicine appointments in the Faculty of Dental Medicine of the University of Porto were consulted. We selected the biopsies information of patients with bone pathology as well as their demographic information such as sex, age and its anatomic location. All non-pathological cases were excluded. It was also calculated the concordance rate between clinical and histological diagnosis, dividing the cases into three groups – totally concordant, partially concordant and incongruous. Descriptive analysis was performed and statistical analysis of the results was conducted using Chi-Square tests with a significance level of 0.05.

Results: This study found a prevalence of the dentigerous cyst within bone pathology of 10.50%. It is more prevalent in male patients (68%) than in female patients (32%) with no statistical significance (p>0.05). The average age of patients with dentigerous cysts was 36.9 $\pm$ 13.5 years old. 56% of the cases were associated with unerupted teeth, 28% were not related with inclusion and 16% had no information about that. 33.33% were associated with third molars, 2 of them were associated with maxillary third molars and 5 of them were associated with mandibular third molars. Only 4.76% were associated with supernumerary tooth. 57% were in the mandible and 43% in the maxilla with no statistical significance (p>0.05) and 38.89% of dentigerous cysts were in the fourth quadrant. Of all the

biopsies of bone pathology, 44.80% presented a clinical diagnosis in complete agreement with the histological diagnosis, 17.65% were in partial agreement and 37.55% had discordant clinical and histological diagnoses.

Conclusion: The results of this study were similar to studies of other populations regarding the dentigerous cyst, its prevalence, location and demographic information. It was also proven the importance of good and complete clinical records about the lesions such as its anatomopathological analysis to reach a correct diagnosis.

Keywords: "dentigerous cyst", "prevalence", "odontogenic cyst", "anatomopathological analysis", "clinical analysis", "bone pathology", "biopsy".

RESUMO

Introdução: Os cistos odontogénicos são cavidades patológicas, revestidas por epitélio odontogénico. São classificados em dois grupos: de desenvolvimento ou inflamatórios. O cisto dentígero é o cisto de desenvolvimento mais comum. Surge a partir do folículo pericoronário de um dente não erupcionado, circundando-o. Este cisto ocorre mais frequentemente na região posterior da mandíbula, está mais associado aos terceiros molares e é mais comum em indivíduos entre 10 e 30 anos de idade. Radiograficamente, é uma lesão radiolúcida e o diagnóstico diferencial é feito com o ameloblastoma, queratocisto odontogénico e folículo pericoronário. É necessária a realização de um exame anatomopatológico para estabelecer um diagnóstico correto.

Objetivos: Avaliar a prevalência do cisto dentígero numa população portuguesa, bem como as suas características como a localização e o sexo predominante. Pretende-se também estudar a taxa de concordância entre o diagnóstico clínico e histológico dos casos analisados.

Metodologia: Foram consultados os registos clínicos dos últimos 23 anos (2000-2023) dos pacientes atendidos nas consultas de Cirurgia Oral e Medicina Oral da Faculdade de Medicina Dentária da Universidade do Porto. Foram selecionadas as informações das biópsias dos pacientes com patologia óssea, bem como as suas informações demográficas (sexo e idade) e a sua localização anatómica. Foram excluídos todos os casos não patológicos. Foi também calculada a taxa de concordância entre o diagnóstico clínico e histológico, dividindo os casos em três grupos - totalmente concordantes, parcialmente concordantes e incongruentes. Foi efetuada uma análise descritiva e a análise estatística dos resultados foi realizada através de testes de Qui-Quadrado com um nível de significância de 0,05.

Resultados: O presente estudo encontrou uma prevalência do cisto dentígero, dentro da patologia óssea, de 10,50%. É mais prevalente em pacientes do sexo masculino (68%) do que em pacientes do sexo feminino (32%), sem significância estatística (p>0,05). A média de idade dos pacientes com cisto dentígero foi de 36,9 ± 13,5 anos. 56% dos casos estavam associados a dentes inclusos, 28% não estavam relacionados com uma inclusão e 16% não tinham informação sobre o dente associado. 33,33% estavam associados a terceiros molares, 2 deles associados a terceiros molares superiores e 5 a terceiros molares inferiores. Apenas

4,76% estavam associados a dentes supranumerários. 57% estavam localizados na mandíbula, 43% na maxila, sem significância estatística (p>0,05) e 38,89% dos cistos dentígeros estavam localizados no quarto quadrante. De todas as biópsias de patologia óssea, 44,80% apresentaram diagnóstico clínico totalmente concordante com o histológico, 17,65% concordaram parcialmente e 37,55% tiveram um diagnóstico clínico e histológico discordante.

Conclusão: Os resultados deste estudo foram semelhantes aos de estudos realizados noutras populações no que diz respeito à prevalência do cisto dentígero, localização e informações demográficas. Foi também comprovada a importância da obtenção de bons e completos registos clínicos sobre as lesões, bem como a realização de um exame anatomopatológico para se chegar a um diagnóstico final correto.

Palavras-chave: "cisto dentígero", "prevalência", "cisto odontogénico", análise anatomopatológica", "análise clínica", "patologia óssea" e "biópsia".

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INTRODUCTION

Odontogenic cysts and tumours are an important aspect of oral and maxillofacial pathology. Odontogenic cysts are relatively commonly found in dental practice. Odontogenic tumours, in contrast, are uncommon lesions. Cysts are pathological cavities, lined with an odontogenic epithelium. They are classified as developmental or inflammatory and can have their onset at any age and remain asymptomatic, being undetected for long periods of time. Their genesis is closely related to dental ontogeny. Most of them are formed from odontogenic epithelium or its embryonic remnants, however, in the majority, their aetiology is still unknown. (1-3)

The dentigerous cyst is the most common developmental odontogenic cyst. (1, 4, 5) It arises from the dental follicle of an unerupted tooth, surrounding it and connecting to it by the cementoenamel junction. Its pathogenesis is not fully understood, however, it is thought to develop due to the accumulation of fluid between the crown of the tooth and the enamel epithelium. (1) Dentigerous cysts occur most frequently in the posterior maxilla and posterior mandible. (5) Although it can affect any tooth, it is most associated with third molars and mandibular second premolars. It can also be related to supernumerary teeth or odontomas. It can appear at any age, nevertheless it is more common in individuals between 10 and 30 years of age, with a slight predominance of males and caucasians. (1, 6)

These cysts are mostly recognised during a routine radiological examination or after noticing the absence or the delayed eruption of a tooth or even tooth crowding due to tooth displacement caused by the pressure exerted by the cyst. (5, 7)

Clinically, they are slow-growing and asymptomatic, except when infected. Their evolution may lead to several clinical complications such as displaced teeth, ectopic eruption, root resorption of adjacent teeth, occlusal problems, facial asymmetry due to bone cortical expansion and even malignancy. (8)

Radiographically, the dentigerous cyst appears as a radiolucent lesion with well-defined margins, unilocular, involving the crown of a tooth. (5, 9, 10) It presents varieties in relation to the tooth that originated it. In the central variety, the crown is enveloped symmetrically by the cyst. In the lateral variety, associated with mesioangulated mandibular third molars, the cyst grows and moves along the root

1

surface of adjacent teeth, partially involving the crown of the originating tooth, the peri-coronal follicle dilates only on one aspect of the crown. In the circumferential variety, the cyst surrounds the crown and a significant part of the root. (1, 5, 9, 11)
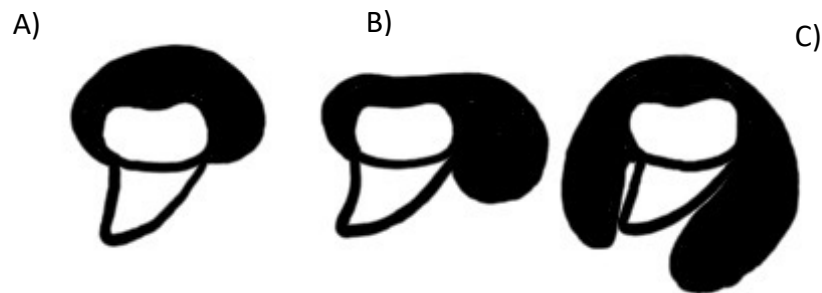
A)   B)   C)

Figure 1 -Adapted diagram illustrating radiographic variations of the dentigerous cyst. A) central variety; B) lateral variety; C) circumferential variety.

The dentigerous cyst can also be identified and analysed by complementary examination such as Magnetic Resonance Imaging having a more efficient performance, it has an important role in the diagnosis of the lesion. (12) However, these imaging methods aren't enough to obtain a complete and correct diagnosis, being always necessary an anatomopathological analysis because its image may generate doubts and, relying solely on radiographic and clinical features, could lead to a mistaken diagnosis. (3, 5) The differential diagnosis of smaller ones includes dental follicle or hyperplastic dental follicle, and it is difficult to distinguish them even with radiographic imaging. (13) Larger ones make differential diagnosis with unicystic ameloblastoma and odontogenic keratocyst. Therefore, it is mandatory to perform a histological analysis of the lesions to establish a correct diagnosis. (14)

Histologically, the dentigerous cyst presents a loosely arranged fibrous tissue capsule, lined by non-keratinised stratified pavement epithelium, with two layers of cubic epithelial cells. In case of inflammation, the capsule is more keratinized (1), and may contain a mononucleated inflammatory infiltrate and small islands or cords of remnants of odontogenic epithelium. (15, 16) The content of the cyst is a haemorrhagic or serous exudate, containing epithelial and inflammatory cells. Its dimensions, location, the teeth and structures involved, age and health status of the patient are fundamental criteria in the treatment decision process. The most common approaches are marsupialization and enucleation. (8) The most common approach consists of enucleation and extraction of the unerupted tooth. (17) However, if the eruption of the involved tooth is considered possible, it can be left in place after

partial removal of the cyst capsule. Marsupialisation is indicated in larger cysts, so that decompression occurs and, consequently, reduction in size and bone defect, facilitating subsequent enucleation using a less traumatic surgery.

Despite being non-neoplastic, the dentigerous cyst has a neoplastic potential, so in case it goes unnoticed and no treatment is carried out or when it is not completely removed, there is the possibility that its epithelial lining starts the development of benign tumours, namely ameloblastoma, or malign tumours. (2, 5) Adequate treatment has an excellent prognosis and recurrence of the lesion is rare. (15)

It is therefore very important to reach a correct clinical diagnosis in order to establish the best treatment plan as well as to collect all the relevant information about the pathology. (1, 18, 19) However, these lesions are radiographically very similar, so it is mandatory to perform an anatomopathological examination to establish a final correct diagnosis. (5)

OBJECTIVE

This investigation aimed to assess the prevalence of the dentigerous cyst in the population with bone pathology who attended the Oral Surgery and Oral Pathology Master's Degrees at the Faculty of Dental Medicine, University of Porto, between 2000 and the current date (2023). Additionally, it was intended to characterize demographically the pathology and to investigate the potential association between the dentigerous cyst and sex and the dentigerous cyst and its location using Chi-Square tests.

It was also intended to study the concordance rate between clinical and histological diagnosis of the cases analysed of bone pathology.

MATERIALS AND METHODS

<u>Bibliographic Research:</u>

This investigation was based on a refined literature search in the Pubmed database in March 2023. The words used were "dentigerous cyst" and "prevalence" with the Boolean operator "AND". The time interval was restricted to the last 10 years (2013-2023). Language filters were also applied, accepting only articles in Portuguese and in English. These filters led us to 71 results. One was excluded since it was a study on animals, 12 were excluded for having restricted access, 24 were excluded by the title and 12 were excluded after reading the abstract. Thus, we remained with 22 articles. The same filters were applied in Scopus database adding the filter "open access". There was a total of 42 articles and 9 of them were repeated, 1 was excluded since it was about animals, 10 were excluded due to the title and 7 were excluded after reading the abstract. Eleven articles were interesting by the abstract but couldn't be downloaded, so we only selected 4 articles.

Based on the articles selected, a further 6 articles and thesis were chosen as well as an Oral Pathology book.

<u>Data collection:</u>

This investigation was based on the analysis of the anatomopathological reports (n=263) of patients with bone pathology more specifically odontogenic cysts and tumours, as well as on the comparison between their clinical and histological diagnosis. The data was consulted from the archives of the Oral Surgery and Oral Pathology Master's Degrees of the Faculty of Dental Medicine, University of Porto, from the year 2000 to the current date (2023).

It was calculated the prevalence of the dentigerous cyst among the odontogenic cysts and tumours. Of all the anatomopathological analyses, only the bone pathology cases were considered for the calculations of this investigation. All soft-tissue and non-pathological cases were rejected. The data collected comprised age, sex, anatomic location such as maxilla or mandible and quadrant as well as inclusion association of the cyst and the associated tooth. The cases that did not have the information about each of these variables were excluded and not considered in their calculation of the percentages for the group in question.

It was also calculated the concordance rate between clinical and histological diagnosis. All cases in which clinical information was missing or was too wide-ranging not specifying differential diagnoses, were excluded. Only the cases that presented an appropriate clinical diagnosis, with one or more differential diagnosis of the pathology in question, were considered. Each case was subsequently classified into one of three groups. Totally concordant in which the clinical diagnosis matched exactly the histological diagnosis. Partially concordant in which the histological diagnosis was one of the options considered in the clinical diagnosis and incongruous when the clinical diagnosis did not match with the histological diagnosis.

Statistical analysis

Descriptive analysis was performed to calculate the prevalence of the dentigerous cyst, as well as its distribution per age, sex, location, associated tooth and inclusion-association. Furthermore, the concordance rate between the clinical and histological diagnosis was also measured. Data was collected using Microsoft® Excel® (Microsoft Office 365 ProPlus, 2002 version) software.

The statistical analysis of the results was also conducted using IBM® SPSS Statistics (version27). The Pearson's Chi-Square independence test was used with a significance level of 0.05 when no cells had the expected count less than 5 to determine the association between the dentigerous cyst and the patient's sex and between the dentigerous cyst and its location with the null hypotheses defined as "The variable 'dentigerous cyst' is independent of the variable 'sex'" and "The variable 'dentigerous cyst' is independent of the variable 'location'", respectively. The expected counts for each cell in the crosstabulation were calculated by dividing the product of the column's total frequency and the row's total frequency by the total sample size.

ETHICAL CONSIDERATIONS

Throughout the research process, the anonymity of all participants was maintained. The research was authorized by the Health Ethics Committee of the Faculty of Dental Medicine of the University of Porto, with the process number 22/2022.

RESULTS

Post data collection, 263 histological results of hard tissue biopsies were obtained. There were 139 from males, 123 from females and 1 from a person with unknown gender. Of the 263, 25 cases were excluded since they corresponded to non-pathological changes, such as the pericoronal membrane, granulation and fibrous tissue, scar tissue and dental follicle. Thus, this leaves 238 cases of bone pathology. Of these 238 cases, 25 corresponded to dentigerous cysts, equivalent to 10.50% of all cases of bone pathology. One hundred and sixty-one cases were odontogenic cysts, making the prevalence of the dentigerous cyst in this group 15.5%.

Considering the sex of the patients, of the 25 cases of dentigerous cysts, 68% were male and the remaining 32% were female, with a male/female ratio of 2.1:1. The potential association between the dentigerous cyst and sex was investigated using Chi-Square tests. The results of these calculations reflect each cell's expected value, assuming the null hypothesis "The variable 'dentigerous cyst' is independent of the variable 'sex'" is correct. The p value was 0.121 greater than 0.05, meaning that there is no statistically significance between the two variables.

Table 1 - Crosstabulation showing the observed and expected counts for the variables "dentigerous cyst" and "sex".

Dentigerous Cyst * Sex Crosstabulation

			Sex female	Sex male	Total
Dentigerous Cyst	yes	Count	8	17	25
		Expected Count	11.7	13.3	25.0
	no	Count	103	110	213
		Expected Count	99.3	113.7	213.0
Total		Count	111	127	238
		Expected Count	111.0	127.0	238.0

Table 2 - Chi-Square tests for the variables analyzed in table 1. Given that no cells had an expected count less than 5, the Pearson Chi-Square value was used to determine the independence of the variables.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.405[a]	1	.121		
Continuity Correction[b]	1.793	1	.181		
Likelihood Ratio	2.468	1	.116		
Fisher's Exact Test				.141	.089
Linear-by-Linear Association	2.395	1	.122		
N of Valid Cases	238				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.66.

b. Computed only for a 2x2 table

Still on the 25 dentigerous cyst cases, 3 had no information regarding the age (12%). 12% of the cases corresponded to paediatric patients, 20% were included in the age range 19 to 30 years old, 20% belonged to the group 31 to 40 years old, another 20% corresponded to patients between 41 and 50 years old, 12% of the cases were patients in the range 51 to 60 years old, and, finally, 4% corresponded to patients between 61 and 70 years old. No one of the patients were older than 71 years old. The average age of patients with dentigerous cysts was 36.9 ± 13.5 years old.
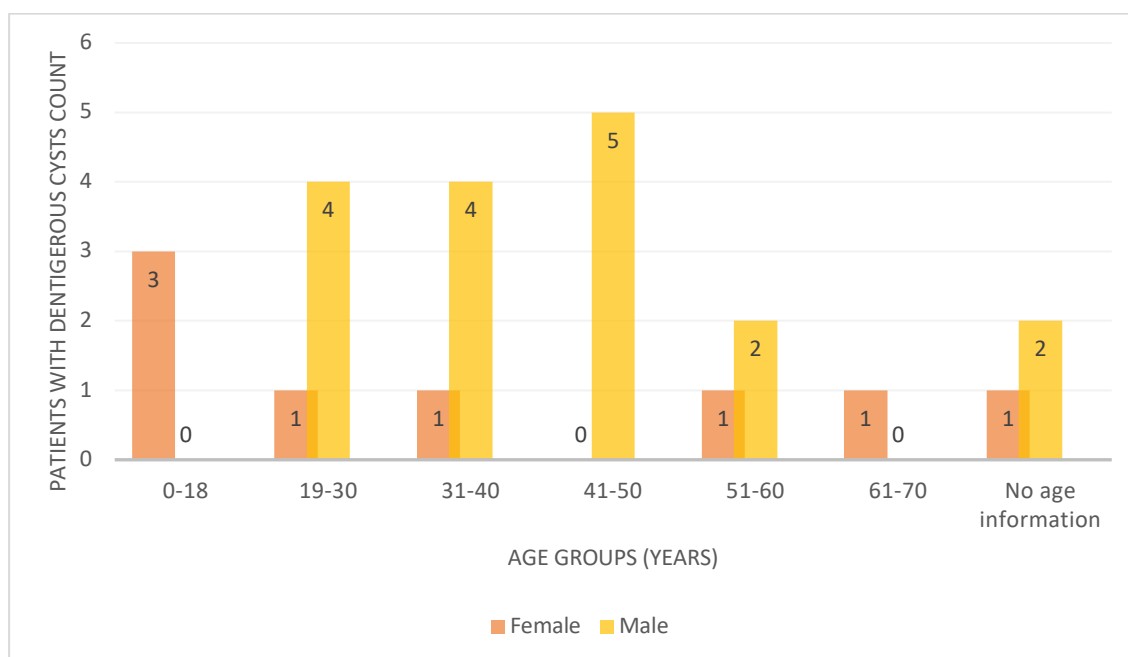
Figure 2 - Age and sex distribution of the patients with the dentigerous cyst.

Also, regarding to the dentigerous cyst, 56% of the cases were associated with unerupted teeth, 28% were not related with inclusion and 16% had no information about that.
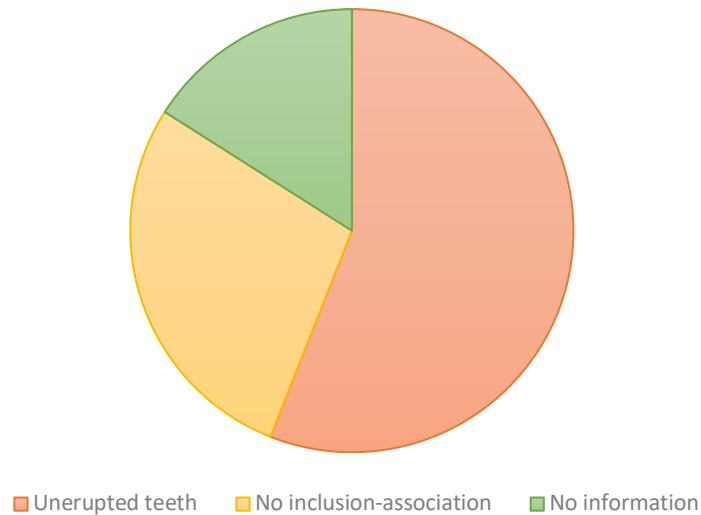
Figure 3 - Association of the dentigerous cyst with inclusion.

As for location, of the 25 cases of dentigerous cyst, 4 had no clinical information and were therefore excluded. Of the remaining 21 cases, 33.33% were associated with third molars, 2 of them were associated with maxillary third molars and 5 of them were associated with mandibular third molars. Only 4.76% were associated with supernumerary tooth.

Figure 4 - Distribution of the dentigerous cyst per tooth.

Nine dentigerous cysts were in the maxilla and 12 in the mandible.
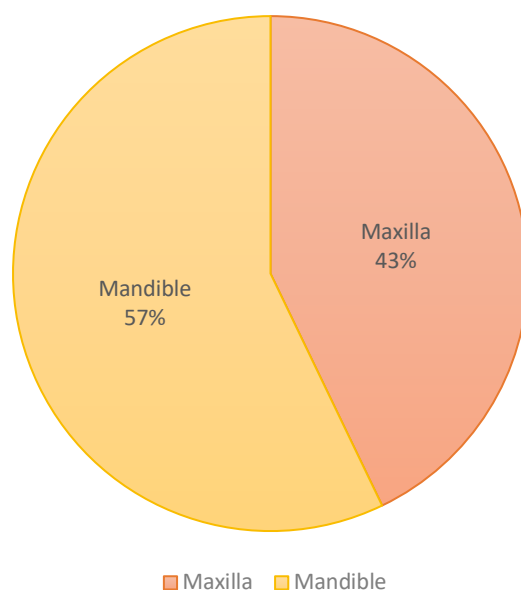
Figure 5 - Distribution of the dentigerous cyst per maxilla and mandible.

It was also investigated the potential association between the dentigerous cyst and location using Chi-Square tests among the 188 cases which were well documented. The results of these calculations reflect each cell's expected value, assuming that the null hypothesis "The variable 'dentigerous cyst' is independent of the variabl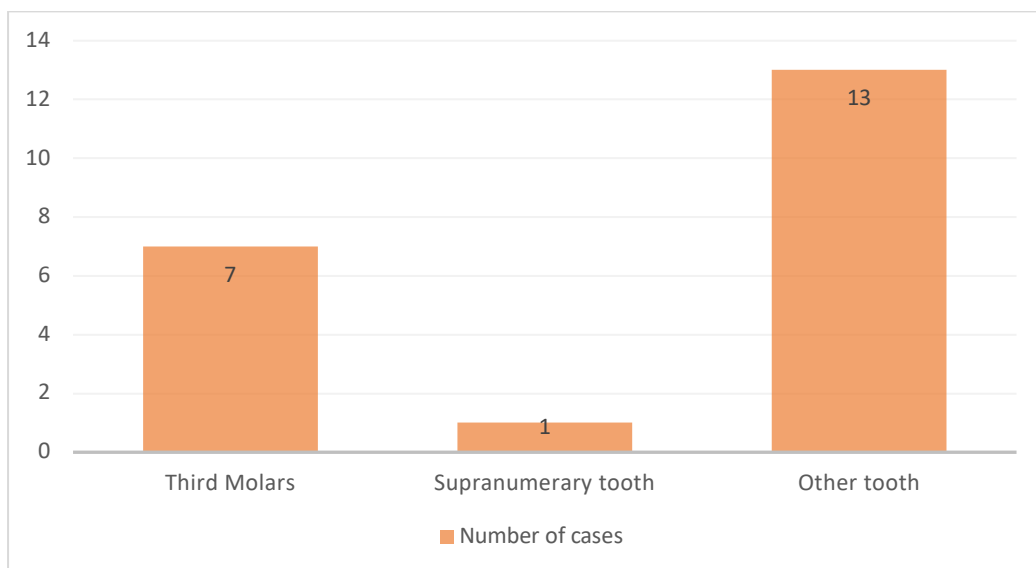e 'location'" is correct. The p value was 0.289, greater than 0.05, meaning that there is no statistically significance between the two variables.

Table 3 - Crosstabulation showing the observed and expected counts for the variables "dentigerous cyst" and "location".

Location * Dentigerous Cyst Crosstabulation

			Dentigerous Cyst		
			yes	no	Total
Location	Maxilla	Count	9	92	101
		Expected Count	11.3	89.7	101.0
	Mandible	Count	12	75	87
		Expected Count	9.7	77.3	87.0
Total		Count	21	167	188
		Expected Count	21.0	167.0	188.0

Table 4 - *Chi-Square tests for the variables analyzed in table 3. Given that no cells had an expected count less than 5, the Pearson Chi-Square value was used to determine the independence of the variables.*

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.123[a]	1	.289		
Continuity Correction[b]	.685	1	.408		
Likelihood Ratio	1.120	1	.290		
Fisher's Exact Test				.355	.204
Linear-by-Linear Association	1.117	1	.291		
N of Valid Cases	188				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.72.

b. Computed only for a 2x2 table

Among the 21 cases, 3 had no information about the quadrant and were therefore excluded. Of the remaining 18, 11.11% of the cases were located in the first quadrant, 22.22% were in the second quadrant, 27.78% were in the third quadrant and the remaining 38.89% of dentigerous cysts were in the fourth quadrant.
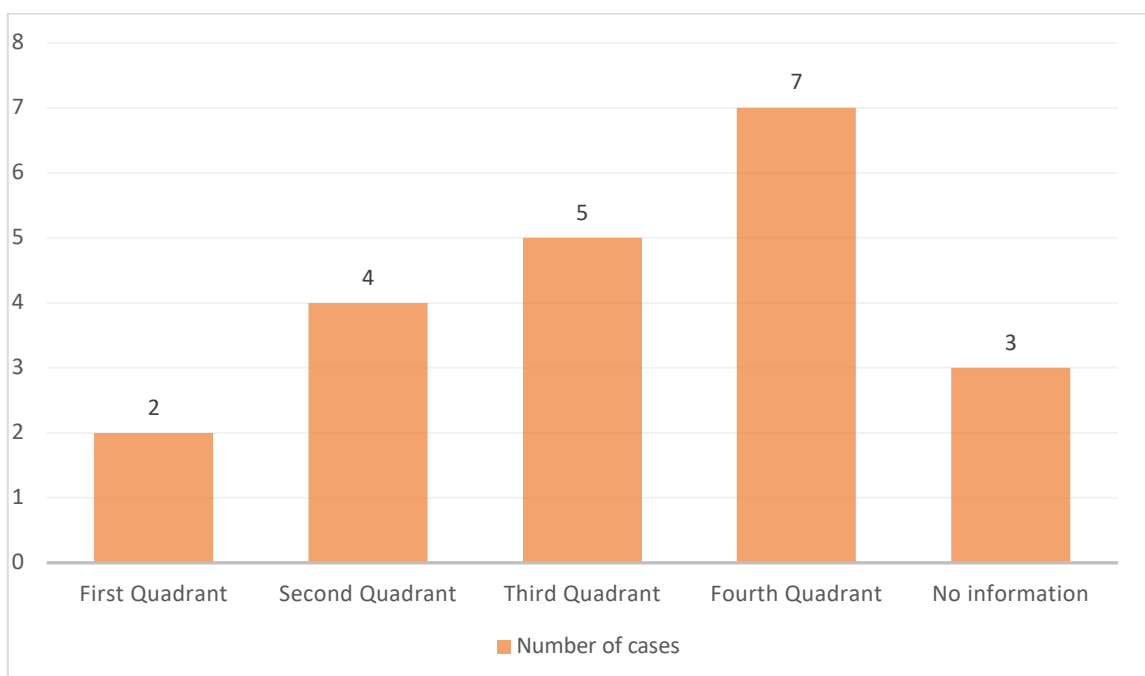
Figure 6 - Distribution of the dentigerous cyst per quadrant.

To calculate the concordance rate between clinical and histological diagnosis, of the 263 biopsies taken of bone pathology, 42 were excluded due to lack of clinical

information pertinent to a diagnosis, thus reducing our sample to 221 biopsies. Of these 221 biopsies, 44.80% presented a clinical diagnosis in complete agreement with the histological diagnosis, 17.65% were in partial agreement, which means that the clinical diagnosis presented several differential diagnoses, one of which corresponded to the diagnosis given by the histological examination. The corollary being that a total of 62.45% of the biopsied cases had a correct suspicion of the final diagnosis of bone pathology. The remaining 37.55% had discordant clinical and histological diagnoses.

Figure 7 - Concordance rate between clinical and histological diagnosis.

DISCUSSION

Bone pathology is very common in the oral cavity, and within hard tissue pathology dentigerous cyst was highlighted with a prevalence of 10.5%.

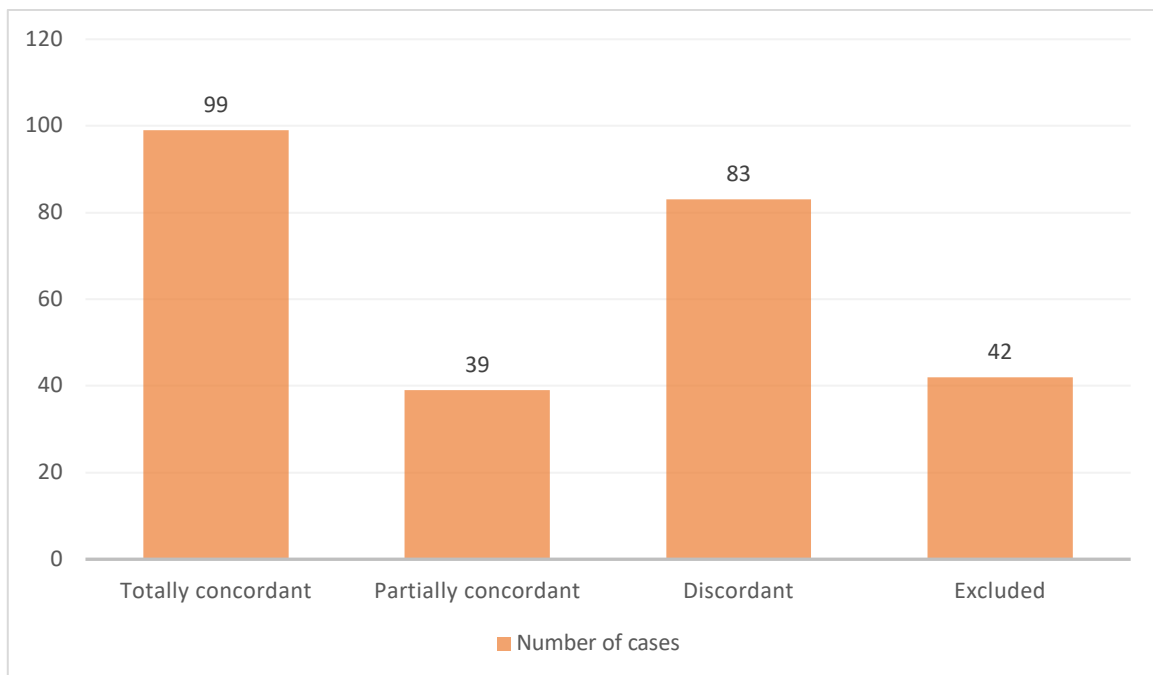Taking into consideration all biopsied cases of developmental and inflammatory odontogenic cysts, the dentigerous cyst reached a prevalence of 15.5%. This value was similar to the one found in a South Indian population (13.4%) (20), as well as to the value found in the investigation made by Pedro Vitali Kammer and collaborators (14.04%) (21). Paris Tamiolakis and co-workers also reached a dentigerous cyst prevalence of a similar value (14.5%) through the retrospective study of demographic and clinical analysis of jaw cysts. (22) However, the value slightly increased in some studies, such as in an Italian population where the value rose to 23.4% (23), as well as in two different Turkish populations where the prevalence reached between 26.6% and 26.9% (2, 24), in an Indonesian population being 25.5% (25) and in two Brazilian populations varying between 26% (26) and 27.5%. (27)

A prevalence of only 1.8% was also found in an investigation in a Lebanese population (5), however, the value was substantially lower due to the fact that the prevalence was calculated in a random population treated at Lebanese Army Dental Departments, including healthy individuals and individuals with pathologies. It was calculated in total and not only considering the individuals with odontogenic cysts or some kind of bone pathology.

Extending further the literature search, investigations with higher prevalence values of dentigerous cyst were found, reaching 41% in a Mexican population. This may be related to a higher rate of impactation of third molars in this population. (3) In a Brazilian paediatric population, the value was 42%, justified by the fact that only patients up to 14 years of age were included in the investigation, thus decreasing the high number of radicular cysts, which are less expressed in a younger population, unlike in the adult population, in which they outnumber the dentigerous cysts. (1, 28) Furthermore, the prevalence was calculated within the whole biopsied oral pathology and not only taking into consideration odontogenic cysts. The same happened with another Brazilian paediatric population from Rio de Janeiro, where the prevalence reached 44%. (29) Finally, at Kuwait University a prevalence of 35.3% was obtained, justified by the fact that the prevalence of periapical pathology, such as radicular

cysts, may be underestimated, since it is not always submitted to histopathological analysis. (30)

In this investigation, it was concluded that the dentigerous cyst is more prevalent in male patients, 68% of the cases were in males and 32% appeared in females. The same was corroborated by the literature, in which a predilection for males over females was almost always confirmed. This was verified in the investigations carried out in Italians (M:F ratio of 2:0) (23), Lebanese (58.7% were males and 41.3% were females) (5), Mexicans (61.8% were male patients and 38.1% female patients) (3) and the Turkish population (54.1% male and 45.9% female) (2). This was also confirmed in the study carried out in a South Brazilian population (21), as well as in the investigation done in the University of Kocaeli (60.4% male patients and 39.6% female patients) (31) and in the investigation elaborated by Tamiolakis and collaborators (M:F ratio of 1.8:1) (22). In a Canadian population, there was also a predilection for males, in which the M:F ratio was 1.6:1 (14). It is suggested that this happens due to a reduced jaw size and a greater tendency for prophylactic third molar extraction in women, leading to lower development and prevalence of dentigerous cysts.

The same was not proven in a Brazilian paediatric population where the M:F ratio was 1:1. (28)

It was also investigated the association between the presence of the dentigerous cyst and sex using Chi-Square tests with a p-value (0.121) greater than the significance level (0.05), meaning that no evidence was found that these two variables were not independent. Therefore, there are no significant differences to suggest that sex is associated with the dentigerous cyst and the null hypothesis was accepted.

The mean age of our patients diagnosed with dentigerous cyst was 36.9 $\pm$ 13.5 years old with more cases appearing in between 19 and 50 years, with the frequency decreasing with age. In other investigations, the highest prevalence occurred between the second and third decade of life as in an Iranian population (32), in British Columbia, Canada (35 $\pm$ 17 years) (14), in a Mexican population (3), in a Lebanese population, where the mean age was 28.3 $\pm$ 16.3 years (5) and in Indonesia with a mean age of 20.3 $\pm$ 34.0 (25). In a Turkish population, there was a higher incidence of dentigerous cysts in the third decade of life (2). As well as in a

Brazilian population, with a mean age of 23.77 ± 11.91, since the highest prevalence of dentigerous cysts appears in young adults, during the period of eruption of the third molars (27). In the study carried out at the University of Kocaeli, the mean age increased to 40.61 ± 15.41 years. (31)

Regarding the location and associated teeth, 56% were associated with unerupted teeth. Of those with sufficient clinical information, 4.76% were associated with supernumerary teeth (only 1 case, the same happened in a Lebanese population (5)) and 33% were associated with third molars, mainly the mandibular third molar. The same premise is corroborated by several studies such as those carried out in a Mexican population (3), in a Lebanese population (5), in a Turkish population (2) and in a population of British Columbia, Canada (14), where 77% of the cases are associated with mandibular third molars. It was also established that there is a predilection for the mandible, with 57% of the diagnosed dentigerous cysts found in the mandible and 43% in the maxilla. This was also borne out by the literature. In the Canadian cases, 82% were in the mandible (14), in the study carried out by the Kuwait university, 62.5% were in the mandible (30), as well as in the Brazilian epidemiological studies (26, 27). In the Kocaeli University investigation (31), there was more predominance of the dentigerous cyst in the lower jaw. In the Lebanon investigation (5), 71.5% of the cases were located in the mandible, the same was also validated in the Italian (23) and Turkish populations (2). In this investigation, it was also concluded that there was a higher prevalence of dentigerous cysts in the mandible, more specifically in the fourth quadrant (38.89%), followed by the third quadrant with 27.78% of the cases. The association between the presence of the dentigerous cyst and its location (maxilla or mandible) using Chi-Square tests with a p-value (0.289) greater than the significance level (0.05), means that no evidence was found that these two variables were not independent. Therefore, there are no significant differences to suggest that location is associated with the dentigerous cyst and the null hypothesis was accepted.

Another approach in this investigation was based on the calculation of the concordance rate between the clinical diagnosis of bone pathology and the histological diagnosis after anatomopathological analysis. In 44.80% of the cases, the clinical and histological diagnoses were totally concordant with each other, which provides a reasonable percentage of diagnostic accuracy. 17.65% of the cases were

partially concordant, meaning that the histological diagnosis was included in the list of differential diagnoses presented in the clinical diagnosis. This means that in 62.45% of the cases there was a correct suspicion of the final diagnosis of the pathology. In 37.55% of the cases there was disagreement between the clinical and histological diagnoses, which corresponds to a reasonably high error rate. This may be explained by the fact that there were multiple dentists defining the clinical diagnosis of different patients, not all diagnoses were made by the same person and, consequently, there was no rigid standardization of procedures. Furthermore, the diagnoses were not carried out only by teachers with a PhD and specialists in Oral Surgery and Oral Medicine, but also dentists in the process of training in the area to a specialist degree, which may transmit some insecurity and a higher error rate at the time of diagnosis, since experience and clinical practice in this field may be more reduced. Another justification to the high value is due to the similarity of the cyst with its differential diagnoses, which leads to many dentists to know that it is mandatory to do a histological analysis and be careless, leaving the diagnosis only for the anatomopathologist to do.

It is important to bear in mind that a 100% concordance rate was not expected, as pathologies may have similar appearances when observed through clinical examination and imaging. (33) In addition, there is always an expected percentage of error since we are taking in consideration that the diagnoses are made by human beings. These rates demonstrate the need to carry out an anatomopathological analysis in order to reach a correct diagnosis of bone pathology, excluding the various differential diagnoses, as well as to define a treatment plan.

Another aspect to have in mind is that 25 cases which went through histological analyses were excluded due to the fact of being non-pathological changes such as dental follicle or cicatricial tissue, although it was thought to be pathological tissue. This enhances the importance of the anatomopathological exam to establish a correct diagnosis. The number of excluded cases is not surprising and should not be considered a mistake since all surgically extracted tissues should proceed to an analysis so that there would always be a diagnosis confirmation.

The possible limitations of this study are that the data collected corresponds to an extended period of time (23 years) and there was no uniformity of criteria in the diagnosis of pathologies, as it was done by different professionals. Furthermore, this

is a conditioned study group and not a randomized population, as they are patients referred to the Oral Surgery and Oral Medicine Master's Degree appointments, who are assumed to already have an associated condition that leads them to these areas.

In addition, due to the lack of information of the pathology location and its associated teeth, it was not possible to proceed to a statistical analysis with Chi-Square tests associating the dentigerous cyst and its location for all the bone pathology cases, investigating the association only in 188 cases and not in the total sample of 238 because of insufficient clinical records.

For a future investigation, instead of a retrospective study, it would be interesting to do a prospective study with strict rules to carry out anamnesis, biopsies, clinical and histological diagnoses and all procedures. The population should not be restricted to those who attend the appointments of the Oral Surgery and Oral Medicine Master's degrees, yet it should consist in all patients who attend the FMDUP clinic appointments, a totally randomized population.

It is imperative to have good and complete information regarding the clinical diagnoses before sending it to an anatomopathological exam. Information about the patient, clinical history, and anamnesis, as well as information regarding the lesion such as its anatomic location and associated teeth should be sent to the anatomopathologist alongside the orthopantomography.

Another interesting approach would be to select X-Rays of the dentigerous cyst and its differential diagnoses such as keratocyst, ameloblastoma or dental follicle and show them to different dentists (oral surgeons, generalists and even dentistry students) and make them guess the diagnosis based only in the image. It would be interesting to analyze the results, either correct or not, thus confirming or not the importance of having an anatomopathological analysis.

CONCLUSION

The prevalence of the dentigerous cyst within bone pathology in the population who attended the appointments of the Masters' degrees in Oral Surgery and Oral Pathology of the Faculty of Dental Medicine of the University of Porto, between 2000 and the current year was 10.50%. It was more prevalent in male patients and it was predominantly located in the mandible. Although it affected patients of all ages, it had a higher incidence between 19 and 50 years of age.

The concordance rate between clinical and histological diagnosis was 62.45%, a value that, despite being high, can and should be improved.

This investigation also proves the importance of a correct and complete collection of clinical information, in addition to the need to perform an anatomopathological analysis of the lesions for confirmation of the diagnosis.

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ATTATCHMENTS

U.PORTO
FACULDADE DE
MEDICINA DENTÁRIA
UNIVERSIDADE DO PORTO

DECLARAÇÃO
Mestrado Integrado em Medicina Dentária

Monografia/Relatório de Estágio

Identificação do autor

Nome completo _Margarida Pinho e Melo Anna Cura_

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Identificação da publicação

Dissertação de Mestrado Integrado (Monografia) ☒   Relatório de Estágio ☐

Titulocompleto

Dentigerous cyst – The prevalence in a Portuguese
population

Orientador _Prof. Dr. Pedro Manuel Vasconcelos Mesquita_

Coorientador _Nada a assinalar_

Palavras-chave "dentigerous cyst" "prevalence"; "bone pathology"; "clinical analysis" "odontogenic cyst"
"anatomopathological analysis"; "biopsy"

Autorizo a disponibilização imediata do texto integral no Repositório da U.Porto: _X_ (x)

Não Autorizo a disponibilização imediata do texto integral no Repositório da U.Porto :   ____ (x)

Autorizo a disponibilização do texto integral no Repositório da U.Porto, com período de embargo, no prazo de:

6 Meses:_____ ; 12 Meses:_____ ; 18 Meses:_____ ; 24 Meses:_____ ; 36 Meses:_____ ; 120 Meses:_____ .

Justificação para a não autorização imediata _____

Data _21_ /_05_ /_2023_

Assinatura _Margarida cura_

U. PORTO
FACULDADE DE
MEDICINA DENTARIA
UNIVERSIDADE DO PORTO

DECLARAÇÃO

Monografia/Relatório de Estágio

Declaro que o presente trabalho, no âmbito da Monografia/Relatório de Estágio, integrado no MIMD, da FMDUP, é da minha autoria e todas as fontes foram devidamente referenciadas.

17 / 05 / 2023

Margarida Cura

O / A Estudante

U.PORTO

FACULDADE DE
MEDICINA DENTÁRIA
UNIVERSIDADE DO PORTO

Eu, Pedro Manuel Vasconcelos Mesquita, Professor Auxiliar na Faculdade de Medicina Dentária da Universidade do Porto, declaro, para os devidos efeitos, que o trabalho Monografia intitulado "Dentigerous Cyst – The prevalence in a Portuguese population", desenvolvido pela estudante Margarida Pinho e Melo Ança Cura, cumpre os requisitos e está de acordo com as regras estipuladas na FMDUP. Mais informo que foi por mim conferido e que se encontra em condições de ser apresentado em provas públicas.

Porto, 16 de maio de 2023

Assinado por : Pedro Manuel Vasconcelos
Mesquita
Num. de Identificação: 08069383
Data: 2023.05.16 23:40:45+01'00'

O Orientador

CHAVE MÓVEL

(Prof. Dr. Pedro Manuel Vasconcelos Mesquita)

Anexo IV – Parecer da Comissão de Ética para a Saúde da FMDUP

Exmª Senhor(a)
Margarida Cura
Faculdade de Medicina Dentária da U. Porto

Assunto: Parecer relativamente ao Projeto de Investigação nº 22/2022.
    (Quisto dentígero - prevalência numa população portuguesa).

Informo V. Exa. que o projeto supracitado foi analisado na reunião da Comissão de Ética para a Saúde, da FMDUP, no dia 17 de janeiro de 2023.

A Comissão de Ética é **favorável** à realização do projeto tal como apresentado.

O formulário definitivo de apresentação do trabalho, aprovado pela Comissão de Ética para a Saúde, da FMDUP, acompanha a presente comunicação.

A Comissão de Ética recomenda a existência de um seguro de responsabilidade civil e relembra que a inexistência de seguro responsabiliza diretamente os investigadores.

Subject: Recommendation on the research project nº 22/2022.
    (Quisto dentígero - prevalência numa população portuguesa).

I hereby inform that the aforementioned project was analyzed on january 17^{Th} 2023, by the Ethics Committee for Health of the Faculty of Dental Medicine,

The Ethics Committee is **favourable** to the project execution.

The final submission form approved by FMDUP's Ethics Committee for Health is attached.

The Ethics Committee recommends the existence of liability insurance and recalls that the absence of insurance directly holds researchers accountable.

Com os melhores cumprimentos,

O Presidente da Comissão de Ética para a Saúde, da FMDUP

Assinado por: **Inês Alexandra Costa de Morais Caldas Paiva**
Num. de Identificação: 10325794
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Professora Doutora Inês Alexandra Costa de Morais Caldas

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Anexo V – Parecer da Unidade de Proteção de Dados da UP

U.PORTO	Unidade de Proteção de Dados	DATA: 06/01/2023

PARECER A-T1/2023

Nome	Margarida Pinho e Melo Anção Cura
Nº Mecanográfico	201903492
Unidade Orgânica	Faculdade de Medicina Dentária da Universidade do Porto (FMDUP)
Título	Quisto dentígero – prevalência numa população portuguesa
Ticket Nº	2022110215004813

Sumário do Pedido

No âmbito da unidade curricular de "Monografia/Relatório de Estágio", integrada no plano de estudos do Mestrado Integrado em Medicina Dentária da FMDUP, pretende a requerente calcular a prevalência de quisto dentígero numa população portuguesa e estudar a taxa de concordância entre o diagnóstico clínico e o diagnóstico histológico dos casos analisados.

A população em causa é constituída pelos pacientes que frequentaram a consulta dos mestrados de Cirurgia Oral e Patologia Oral da FMDUP, desde o ano de 1999 até à atualidade, que tenham tido um diagnóstico de patologia óssea. Serão incluídos os pacientes de ambos os sexos, com idade igual ou superior a 18 anos. Serão excluídos aqueles cujos registos apresentem pelo menos uma das seguintes condições: 1) não apresentem ortopantomografia ou tenham uma radiografia de má qualidade de imagem; 2) não incluam exame anatomopatológico; 3) não se encontrem bem documentados com todas as informações necessárias referentes ao paciente.

Nenhum paciente será chamado para observação, ou examinado especificamente para este estudo. Os dados serão exclusivamente recolhidos dos registos clínicos e da análise das radiografias e exames anatomopatológicos, sendo registada apenas a seguinte informação, expurgada de identificadores pessoais diretos: idade, sexo, registos radiográficos e resultados do exame anatomopatológico.

Conclusões

Apesar de a requerente ter acesso ao registo clínico dos pacientes da FMDUP, apenas extrairá, para fins de investigação, relativamente aos pacientes que cumpram os critérios predefinidos, os dados idade e sexo, que associará à análise dos registos radiográficos e aos resultados do exame anatomopatológico.

Deste modo:
   (1) podendo o acesso a informação de saúde, desde que anonimizada, ser facultado para fins de investigação, nos termos da Lei n.º 12/2005, de 16 de janeiro;
   (2) sendo residuais as probabilidades de identificação dos titulares dos dados recolhidos para este estudo, tendo em conta os meios suscetíveis de ser razoavelmente utilizados para identificar direta ou indiretamente uma pessoa singular;
   (3) estando o tratamento de dados aqui em causa limitado a fins de investigação científica;

somos do parecer que este tratamento de dados não carece de autorização prévia do Senhor Reitor, podendo a requerente avançar com a sua realização, sem necessidade de mais formalismos.

a Encarregada da Proteção de Dados
da Universidade do Porto

Assinado por: SUSANA RODRIGUES PEREIRA
Num. de Identificação: 11094042
Data: 2023.01.06 17:11:52 +0000

Doutora Susana Rodrigues Pereira

U.PORTO
FACULDADE DE MEDICINA DENTÁRIA
UNIVERSIDADE DO PORTO

AUTORIZAÇÃO RAI-FMDUP 04_2022

Pedido para a reutilização de registos clínicos para fins de Investigação

Investigador: *Margarida Pinho e Melo Ançã Cura*

E-mail: margarida.cura13@gmail.com   Tlm: 910 967 352

O seu pedido de reutilização de registos clínicos para fins de investigação foi registado com o número em epígrafe, e foi por mim **autorizado**, no uso dos poderes legais em que estou investido como Responsável pelo Acesso à Informação (RAI) da Faculdade de Medicina Dentária da Universidade do Porto.

A presente autorização, que tem um âmbito estritamente jurídico e natureza imperativa, no domínio do acesso e reutilização da informação de saúde, dos registos clínicos, à guarda legal e institucional da FMDUP, não dispensa o necessário e pertinente parecer da Comissão de Ética, autorização da Universidade do Porto para tratamento de Dados Pessoais em Projectos de investigação e autorização do Director da FMDUP. Por isso mesmo, da comunicação da presente deliberação, deverá ser dado conhecimento ao Exmo. Senhor Director da FMDUP, já que a investigação deve ser abordada numa perspectiva integrada, onde o requerente deve ser o primeiro a assumir, que o Estatuto de Investigador significa um conjunto de direitos e obrigações, quer de natureza jurídica, quer de natureza ética, quer, ainda, com o necessário enquadramento na estratégia institucional da FMDUP.

O presente pedido de reutilização de registos clínicos para fins de investigação, intitulado: *"Quisto dentígero – Prevalência numa população portuguesa"* subsume-se no fenómeno da reutilização para fins de I&D, consagrado quer na Lei 26/2016, de 22 de Agosto, quer na Directiva 2013/37/EU, de 26 de Junho, do Parlamento Europeu e do Conselho.

Aproveito esta oportunidade para a felicitar por ter feito este pedido de reutilização de registos clínicos para fins de Investigação & Desenvolvimento e para a informar, que a reutilização de documentos do sector público, neste caso, informação de saúde constante de processos clínicos, sem autorização da entidade competente, o RAI, é uma contra-ordenação prevista e punida nos termos do artigo 39º, da Lei 26/2016, de 22 de Agosto.

Não hesite em me contactar, para o endereço rai@fmd.up.pt ou para o Tlm: 967 020 912, para esclarecer qualquer dúvida.

Com os melhores cumprimentos, votos de sucesso para o seu projeto de investigação, e na expectativa que a mesma venha a contribuir para a sociedade do conhecimento que todos, legitimamente, almejamos.

Considere-me, sinceramente, ao seu dispor

Porto, 24/10/2022

Américo dos Santos Afonso
RAI – Art.º 9, Lei 26/2016, de 22 de Agosto

Faculdade de Medicina Dentária da Universidade do Porto
Rua Dr. Manuel Pereira da Silva, 4200-393 Porto PORTUGAL